

**Mapping conservation on the ground:
Situational analyses of a biosphere reserve in Mexico**

by

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Abstract

The Sierra de Huautla region is one of 41 protected areas in Mexico designated as a biosphere reserve. SBHR is inhabited by 31 communities, which work together to safeguard the natural environment of that area with two government-affiliated agencies, and other local actors. Drawing upon frameworks from the field of Science and Technology Studies, specifically from Social World Arenas and Actor Network Theory, I analyze how conservation initiatives shape and transform theoretical, social, and physical landscapes. Given that my research focuses on the actual practices people are engaged in while involved in conservation efforts, my research is primarily informed by ground-level qualitative work, and I make use of Situational Analysis as my primary method of data collection and interpretation. I adopt SA to identify the many and varied actors (both human and non-human) that contribute to the construction of the Sierra de Huautla biosphere as a 'natural environment'. My research also looks at how various actors (scientists, local community inhabitants) perform activities and roles within the complex contexts of conservation projects. This work offers insights about the genesis of conservation initiatives, the varied modes of participation they support and the challenging institutional constraints, which often make it difficult to fulfil conservation goals. These insights provide valuable ideas, precedents, and guidelines for sites where similar collaborative conservation initiatives are anticipated or being established.

Keywords: conservation; natural protected areas; actor network theory, situational analysis; local community participation

Dedication

Según se sabe en el África negra y en la América indígena, tu familia es tu aldea completa, con todos sus vivos y sus muertos. Y tu parentela no termina en los humanos. Tu familia también te habla en la crepitación del fuego, en el rumor del agua que corre, en la respiración del bosque, en las voces del viento, en la furia del trueno, en la lluvia que te besa y en el canterío de los pájaros que saludan tus pasos... (Galeano, 2012, p. 1825).

Dedico este trabajo a mi aldea completa. En especial a mis solidarios, comprensivos y pacientes amores Diego y Paulino.

[As people know in black Africa and indigenous America, your family is your entire village with all its inhabitants, living or dead. And your relatives aren't only human. Your family also speaks to you in the crackling of the fire, in the murmur of running water, in the breathing of the forest, in the voices of the wind, in the fury of thunder, in the rain that kisses you and in the birdsong that greets your footsteps (Galeano, 2012 p. 1825).

I dedicate this dissertation to my entire village. Especially to my caring, and supportive loved ones: Diego and Paulino]

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List of Acronyms

ANT	Actor Network Theory
BR	Biosphere Reserve
CEPF	Critical Ecosystem Partnership Fund
CI	Conservation International
CIBYC	Centre for Research in Biodiversity and Conservation
CONACYT	National Council for Science and Technology
CONANP	National Commission for the Protection of Nature
EED	Ecology and Evolution Department
GT	Grounded Theory
ITEC	Institute for Tropical Ecology and Conservation
IUCN	International Union for the Conservation of Nature
IUPN	International Union for the Preservation of Nature
LGEEPA	General Law of Ecological Equilibrium and Environment Protection
NGO	Non-Governmental Organization
NPA	Natural Protected Area
OAS	Organization of American States
PET	Program for temporary Employment
PROCODES	Program for Conservation and Sustainable Development
PROSELBA	Projects and Studies in Deciduous Forest
REMEED	Resource and Environmental Management and Environmental Education Department
SA	Situational Analysis
SEMARNAT	Ministry of Environment and Natural Resources
SHBR	Sierra de Huautla Biosphere Reserve
SNI	National System of Researchers
STS	Science and Technology Studies
SWA	Social World Arenas
TDF	Tropical Dry Forest
TNC	The Nature Conservancy
TSD	Taxonomy and Systematic Department
UAEM	State of Morelos Autonomous University

UMA	Wildlife Management Unit
UN	United Nations
UNEP	United Nations Environmental Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
WNBR	World Network of Biosphere Reserves
WWF	World Wildlife Fund

Chapter 1. Motivation

This chapter provides an account of my experiences in the field of conservation and the personal reflections and motivations that moved me to carry out the work described here. I provide details regarding how this research project came into being, its initiating ideas, and what experiences—directly or indirectly—allowed its development. Additionally I provide a brief section outlining the nature of the problem that my study elucidates.

1.1. Personal Background

I have worked in the development and implementation of conservation projects¹ since 2002, the year I completed my undergraduate degree in Psychology. My experiences with conservation began with volunteering at The Institute for Tropical Ecology and Conservation (ITEC), an organization located in Panama on the island of Colon in the province of Bocas del Toro. The institute's mission was to promote, encourage and support conservation in Panama. Operating conservation programs on sea turtles and the rain forests along the Caribbean coast of Panama, the institute conducted seasonal education programs aimed at teaching local children and adults basic ecology and conservation ethics. Over time, my involvement with ITEC and its conservation programs grew. I started working for ITEC as a Teacher Assistant and Assistant Director; then I became the coordinator of the Environmental Conservation Program in local schools. This opportunity enabled me to develop a Conservation Education Program funded by the Critical Ecosystem Partnership Fund—which has become one of the larger international non-governmental organizations (NGO) actively leading conservation work in Latin America and the Caribbean. The conservation

¹ Programs that fall under the category of 'natural conservation' include ecotourism, environmental education and outreach, development of teaching materials, and scientific research on conservation.

education program involved teaching basic ecological and conservation principles to children in 21 schools and NGO collectives actively working in the area surrounding Bocas del Toro, Panamá.

From the beginning of that Conservation Education Program, I worked directly with the teachers and conservation professionals in Panamá and I learned the importance of involving people who were directly affected by projects either as recipients of workshops or as participants in conservation activities. Another important lesson learned was that working through official channels such as NGOs and the local government can be slow. For example, during the implementation of this program (2003-2007) there were three different coordinators at the Ministry of Education due to the frequent changes in governmental offices, so every year meetings were held in order to re-explain the objective of the program. This process of orientation for new officials every year interfered with the activities we were carrying out on the ground with teachers and NGO members and in many cases hindered the possibility to work with more people. However, what really moved the project along was the maintenance of informal networks of individuals on the ground (teachers, administrators, local students) who were committed to the project, who were interested in attending workshops and working together in the development of outreach materials.

My involvement with ITEC then led me to become affiliated with another organization: The Centre for Research in Biodiversity and Conservation (CIBYC). CIBYC is the institution responsible for managing and administering the Sierra de Huautla Biosphere Reserve (SHBR) in Morelos, Mexico. Initially, I worked as a volunteer on eco-tourism projects, and then I joined the environmental education department. There, I was responsible for the design of field activities in collaboration with local community inhabitants; I conducted workshops, designed interpretive trails and trained local community participants to work as local guides. Given that my activities had a strong field component, I was constantly confronted with the—often challenging—interplay between local realities and extra-local perspectives guiding conservation efforts. For example, from my own experiences working in the development of a teaching material about the biological species of the Biosphere Reserve (CONABIO, 2005) the interplay of perspectives, priorities and the motives that guided what each of the individuals considered relevant for the task. While for scientists the use of scientific names for

biological specimens was appropriate, community inhabitants were more interested in using local names for species that were culturally relevant.

There were similarities between the Mexican project and the Panamanian project. In both cases, the social, political, and personal commitments of all stakeholders engendered conflicts and challenges in working relationships, but also there were many occasions when successful joint efforts occurred. I learned that conservation initiatives are continuously mutating, succeeding and failing in many ways often overlooked but nevertheless relevant and significant for those who are directly involved in conservation work on the ground. My experiences in both countries motivated me to conduct this study.

1.2. Purposes and Research Problem

The purpose of the research reported here was to explore how the implementation of a collaborative biodiversity conservation initiative evolved in practice, by exploring the interplay of diverse elements and actors in SHBR—where I spent years working as a member of its staff. With particular focus on conservation models that involve participatory arrangements with local communities, my study explores the case of SHBR as an example of what has been generically termed 'integrative conservation initiatives' (Jeanrenaud, 2002; Esposito, 2002).

Briefly explained, the 'conservation at any cost' paradigm, which has been seen to ignore the needs and voices of local stakeholders, has been gradually replaced by a more inclusive 'integrative conservation' paradigm since the 1970s (Brooks, Waylen & Borgerhoff Mulder, 2013; Guerrero & Sguerra, 2007; Wilshusen, Brechin, Fortwangler, & West, 2002). In subsequent years, particularly in Latin America, the designation of integrative natural protected areas (INPAs) has been the dominant environmental policy for ecological protection in the region and has received strong support from donor agencies, compared with non-integrative NPAs (Chapin, 2004; Heinen, 2012; Rodriguez, et al. 2007; Toledo, 2005).

Deforestation, forest degradation, and biodiversity loss have advanced at alarming rates, especially in the tropics (Gordon et al., 2010, Martin-Lopez, Martin-Fores,

Gonzalez, & Montes, 2010; Stokstad, 2010). INPAs have been proposed as a conservation model successful in reducing deforestation, preventing land clearing, and decreasing forest fires (Butchart, et. al., 2012; Ferraro, Hanauer, & Sims, 2011; Gordon et al., 2010). On the other hand, some scholars attribute these positive outcomes to factors such as location (limited access to protected land) or population migration patterns (an increase in areas of vacated land) rather than to the integrative forms of NPA initiatives or to genuine collaboration among diverse conservation stakeholders (Cantiani, 2012; Diaz, Nahuelhual, Echeverria, & Marin, 2011; Garcia-Barrios, et al., 2009; Secco, Pettenella, & Gatto, 2010).

This debate underlies the need for a fine-grained study of local conservation in action in order to more accurately trace the outcomes of day-to-day decisions within INPAs. There is limited literature on integrative conservation initiatives informed by ground level qualitative research, and most are case studies in South Asia and Africa; Latin America is scarcely represented (Galvin & Haller, 2008; Heinen, 2012; Brooks et al., 2013)

In this context, my research on SHBR looks at how different local conservation cases occur and how day-to-day decision-making processes within INPAs may affect integrative conservation outcomes. This research provides a detailed empirical report of integrative conservation on the ground, and delineates the daily activities of scientific, political, and community actors within this protected area.

Using theoretical frameworks from the field of science and technology—specifically Social Worlds/Arenas (Clarke, 2005; Clarke & Leigh, 2007; Esko, Tuunainen & Miettinen, 2012) and Actor Network Theory (Jepson, Barua, & Buckingham, 2011; Latour, 2005; Nimmo, 2012), I examined the genesis of the Sierra de Huautla Biosphere Reserve, the participation of local inhabitants, and the motives driving scientific work in this protected region.

My study shows how conservation initiatives shape and transform theoretical, social, and physical landscapes and thus contributes to the current debates about how conservation projects are ‘virtually’ constructed (Carrier & West, 2009; West, Igoe, & Brockington, 2009). Virtualism refers to “the way decision-making authorities—who are

often strongly disconnected from the reality in the field—designed the protection of nature” (Blondet, 2010, p. 3). This vision often ignores the social and political conditions of communities located in the places where a protected area has been established, such as the case of SHBR.

My work advocates for viewing conservation as a fluid continuum; it is meaningless and impractical to slot natural sites into generic or fixed categories because every site is uniquely constituted, contingent, and changeable. Though my research is site-specific, it provides valuable ideas, precedents, and guidelines other sites where similar collaborative conservation initiatives are anticipated or being established.

Chapter 2. Natural Protected Areas

This chapter presents an historical account of the creation of natural protected areas (NPAs), and reviews current international debates about the purpose of their creation. Since SHBR is based on a model for conservation that involves local participation, the Biosphere Reserve (BR) model, it would be important to elaborate on this particular model.

2.1. What Is a Natural Protected Area

Natural protected areas are “geographical spaces, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (Heinen, 2012 p.4). These areas take many forms—ranging from pristine natural habitats and cultural sites to multi-functional landscapes—each with very distinct management structures. Examples of NPAs are national parks with state-affiliated government managers and natural areas established and managed by indigenous and local communities (Robson, 2007; Sckrekenberg, 2010).

According to the International Union for the Conservation of Nature (IUCN), protected areas currently cover 12.7% of the world’s land surface (Bertzky et al., 2012). NPAs are more numerous in developing regions (13.3%, worldwide total area) than in developed regions (11.6%), with the highest number being located in Latin America. Overall, the contribution of integrative models to the total protected land in the world increased from 14% in 1990 to 32% in 2011 (Bertzky, Corrigan, Kemsey, Kenney, Ravilious, Besançon, & Burgess, 2012).

Particularly in Latin America, for many decades integrative NPAs (INPASs) have been the dominant paradigm for ecological protection and are the most supported policy

by donor agencies (Chapin, 2004; Heinen, 2012; Janzen, 1988; Redford, 1990; Rodriguez et al. 2007; Toledo, 2005).

2.2. Internationalization of Natural Protected Areas

The starting point for my study of conservation in SHBR, as a INPA, is an in depth revision of the extra-local character of this models and the relevance of pointing to how this trans-local process ultimately was adopted by countries of the south, particularly Latin America.

Natural Protected Areas (NPAs) came onto the international political agenda in the twentieth century, gradually through increasing awareness of the need to protect natural resources along with global-scale adoption of many environmental treaties backed by advocacy groups. The first international group to advocate for protected areas on the American continent was the Pan American Union, which, under the auspices of what is now the Organization of American States (OAS), developed the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere in 1940 (Stairs, 2007). This agreement under international law intended to safeguard wildlife through protecting natural habitats, and it was the first agreement to require member states in the Americas to designate national parks and other protected areas (Bowman, 1999; Stairs, 2007).

In 1948, the International Union for the Preservation of Nature (IUPN) was created following a series of meetings with scientists and conservationists from the International Union of Biological Sciences. IUPN had active involvement from national and international actors, governments, and non-governmental conservation groups. Its foundational objective was “to assess and advocate conservation measures in all countries” (Stairs, 2007, p. 16). In line with this objective, IUPN’s initial activities comprised listings and inventories of protected areas in the 95 member countries. With the purpose of promoting the creation of NPAs, IUPN’s first article identified NPAs as the “only appropriate legislative instrument to be promoted” (Stairs, 2007, p.16). With protected areas at its core, nature conservation became a matter of law enforcement and prescriptive recommendations for the countries of the south (Buscher, 2013).

The International Union for the Preservation of Nature was the precursor of the International Union for the Conservation of Nature and Natural Resources (now IUCN), which is currently the leading worldwide authority administering conservation through protection of nature (Heinen, 2012; Stairs, 2007). In 1958, IUCN formed a special International Committee on National Parks whose task was to “deliver competent management of NPAs, particularly by providing technical advice and assistance of international experts to countries with national protected area management bodies” (Stairs, 2007, p. 16).

The creation of United Nations (UN) bodies also facilitated the globalization of NPAs. For instance, the United Nations Educational, Scientific and Cultural Organization (UNESCO) collaborated with IUCN pioneer experts to expand NPAs (Stairs, 2007). IUCN also consolidated strong cooperative ties with the United Nations Environment Programme (UNEP); in coordination with these global bodies, IUCN organized worldwide regional meetings advocating the establishment and “competent management” of NPAs (Stairs, 2007 p. 17). The most influential of these meetings today are the World Parks Congresses held every ten years since 1962 (McNeely, 1995; Stairs, 2007). The IUCN World Parks Congress is the largest global forum on protected areas and the “world’s most influential gathering of people involved in protected area management who set the global agenda for natural protected areas for the following decade” (IUCN, 2012). The first (1962) and second (1972) IUCN World Park Congresses were characterized by overrepresentation of delegates from developed countries and the set agenda was directed towards the preservations of natural resources. However, the relative success of national parks in the United States was due at least in part to the fact that population densities were low in those countries to begin with and that indigenous peoples had been largely removed from many areas as part of national policy as those countries were developing. Such was not the case in most developing countries with their large rural populations dependent (at least in part) on extractive activities in natural areas (Campbell & Vainio-Mattila, 2003; De Boer & Baquete, 1998; Groom & Harris, 2008). A shift of an international agenda began to change with the World Conference on Protected Areas held in 1982, in Bali, Indonesia where the majority of participants came from developing countries and advocated for the inclusion of indigenous peoples. The conference was renamed “National Parks, Conservation and People” and is considered

among the starting points of a shift in the conservation paradigm, as we shall see with detail in the next two sections.

International advocacy for NPAs was supported by a prominent idea of global patrimony that required to apply 'concerted global measures' worldwide. Since UNESCO's mandate concerned global problems at the interface of environmental and societal issues, it launched various intergovernmental commissions in coordination with IUCN and with support from scientific and academic conservation communities (Gomez Pompa & Kaus, 1992; Halfter, 20012; Stairs, 2007).

Conservationists argued that some places were so valuable that they were most appropriately considered a common heritage of all humanity and therefore required actions of global scale (Mc Neely, 1982; Stairs, 2007). NPAs were increasingly considered 'national efforts worthy of full international concern (McNeely, 1982, as cited in Stairs, 2007). In the following decades there was a well-established growing recognition that biological diversity 'was a global asset of tremendous value to present and future generations' (UNEP, 2012). In this context, the United Nations Environment Programme (UNEP) convened the Ad Hoc Working Group of Experts on Biological Diversity in November 1988 to explore the need for an international convention on biological diversity. By February 1991, the Ad Hoc Working Group had become known as the Intergovernmental Negotiating Committee. Its work culminated on 22 May 1992 with the Nairobi Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity. The Convention was opened for signature on 1992 at the United Nations Conference on Environment and Development (the Rio "Earth Summit") and it officially entered into force on December 1993. This convention among the vast majority of the world's governments set out commitments for maintaining the world's ecological underpinnings—including funding decisions and priorities (Convention on Biological Diversity, 2012).

The growth of funding organizations providing the economic means to realize the global ideal of protection of nature around the world during the 1960s paralleled the globalization of protected area advocacy shored up by a discourse of global patrimony (Stairs, 2007). For instance, the World Wildlife Fund (WWF) was founded in 1961 to coordinate and raise funds for the IUCN's activities (Chapin, 2004; Heinen, 2012). Over

the years, WWF established regional offices in more than 100 countries and has become the world's largest conservation funding organization (Heinen, 2012). Similarly, The Nature Conservancy (TNC) started in the mid-1940s with a small group of scientists promoting natural protected areas in the United States and beginning fundraising in 1951 (Chapin, 2004). Later, Conservation International (CI) was created in 1984 by former WWF and TNC (Chapin, 2004). These three agencies are today's most important funding mechanisms for conservation worldwide. They financially support the work in NPAs developed by IUCN and UNESCO, and much of their present-day activity is tied to large-scale conservation.

In the 1990s, WWF, TNC, and CI formally supported the globalization of conservation by rewriting their mission statements to focus on “large-scale conservation” approaches rather than local species conservation. Including “tools such as ‘hotspots’ for CI and ‘the global 200 eco-regions’ for WWF-USA” (Rodriguez, 2007, p. 755), these ‘global approaches’ were framed with reference to the increasing need to “take on the huge global threats to ecosystems” (Chapin, 2004, p. 22). Control over funding for NPAs gave these agencies considerable power over the conservation agendas of local groups receiving funding. Since 1990, newly created protected areas—framed in terms of these agencies’ conservation tools—increased by 58% as of 2012 and will continue to increase as these agencies call for at least 17% of the world’s ‘priority terrestrial regions’ to be protected by 2020 (Bertzy et al., 2012).

Natural Protected Areas around the world follow the management system formulated by the IUCN, in place since 1992², which recognizes six categories, as described by Heinen (2012):

- (1a) Nature reserves are strictly protected areas set aside to protect biodiversity and are managed for scientific research and monitoring.
- (1b) Wilderness areas are usually large unmodified or slightly modified areas that retain their natural character. They have no permanent or significant human habitation and are protected and managed to preserve their natural condition.

² The list of protected are categories was revised and modified in 1994 as a result of a paradigm shift in natural conservation.

- (2) National parks are the most used protected area category worldwide. “National parks are generally large areas managed to protect more than one important natural feature and/or wildlife population” (p. 5).
- (3) Natural monuments “are generally smaller than national parks and are set aside to protect one or several important natural features” (p. 6).
- (4) Habitat/species management areas aim to protect particular habitats or species. Management of these protected areas involves active interventions to maintain habitats or to address the requirements of particular species.
- (5) Protected landscapes/seascapes refer to areas where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural, and scenic value, and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and both its associated nature conservation and cultural values.
- (6) Protected areas with sustainable use of natural resources also called managed resource/extractive reserves are generally large reserves whose main purpose is the conservation and sustainable use of important species and their gene pools. Active removal of forest products is permitted and encouraged. These areas tend to be important economically for local communities.

(p. 6)

These global management categories are recognised by international bodies such as the United Nations, as well as by many national governments for defining and recording protected areas and, as such, they are increasingly being incorporated into government legislation.

In summary, the twentieth century represented a significant phase in the history of NPAs (Chapin, 2004; Heinen, 2012; Stairs, 2007)—the advent of international cooperation among governments and states with respect to the shared agenda of nature conservation (Chapin, 2004; Stairs, 2007). The large-scale replication of NPAs has been based on an emerging discourse of global patrimony that advanced notions such as ‘resources of global significance’ or ‘natural global capital’ (Stairs, 2007, p. 18). This ‘global’ appeal quickly gained the NPA movement transnational acceptance and considerable support from international agencies. These agencies collaborated with local conservation groups and lent substantial financial support to the conservation movement on a worldwide scale (Heinen, 2012; Ignatow, 2012; Stairs, 2007; West et al., 2006). While each country had its own history of NPA endorsement, the overall

movement has been internationally driven (Haila, 2012; Stairs, 2007) and extended in particular to developing regions such as Latin America.

2.3. Perspectives on Natural Protection

There are two positions in the debate on humanity's responsibility for the conservation of NPAs extensively reported in the literature (Guerrero & Sguerra, 2007; Kleeman, de la Vega Renert & Schultz, 2010; Toledo, 2005; Wilshulsen et al., 2002). At one extreme, those who argue for top-down management based on bio-scientific knowledge support the protectionist/orthodox approach—characteristic of the earlier history of natural protection. At the other extreme, those who argue for community-based management guided by multidisciplinary information and shared responsibility support the people/social-oriented approach—characteristic of a shift in conservation agenda.

The central tenet of the “protectionist” approach (Wilshulsen et al., 2002, p. 19) labelled as “orthodox” in the Latin American conservation literature (Guerrero & Sguerra, 2007, p. 14) is that NPAs should focus on the conservation of nature, restrict human use, and be managed by natural scientists (Halfter, 2012; Toledo, 2005; Wilshulsen et al., 2002; Redford, 1993). Wilshulsen et al. pointed to key elements of resurgent protectionism, summarized in the following claims:

1. “Protected areas require strict protection” (p. 21),
2. “Biodiversity protection is a moral imperative” (p. 21),
3. Conservation linked to resource use “does not protect biodiversity” (p.21),
4. “Harmonious, ecologically friendly local communities are myths” (p.22),
5. “Emergency situations require extreme measures”(p.22)

The arguments of most protectionist scholars are based on their working experiences in the ‘tropical world’ where most protected areas are located (Chapin, 2004). Advocates of the protectionist paradigm also contend that practitioners trained in the biological sciences are best qualified to manage NPAs because they have the theoretical and analytical tools to identify and protect rare and threatened species and

ecosystems (Guerrero & Sguerra, 2007; Mascia, et al., 2003 Wilshusen, et al., 2002). Often, proponents of this approach promote the establishment of NPAs' categories which restrict human occupation and use (Wilshusen et al., 2002, p.21).

In contrast to the protectionist approach, proponents of the “people-oriented approach” (Chapin, 2004, p. 19), labelled as 'social' in Latin American literature (Guerrero & Sguerra, 2007 p. 14), emphasize the link between the social context of conservation initiatives and successful conservation of the natural environment (Berkes, 2009; Chapin, 2004; Halfter, 2012; Whilshusen et al., 2004). 'People-oriented' arguments combine human rights considerations with practical suggestions for action in natural protected areas that are already inhabited. Advocates of this paradigm contend that greater participation of local communities in NPAs management is required if conservation efforts are to succeed.

While Latin American governments have been promoting the establishment of integrative conservation models since the 1980's, neo-protectionist ideas and perspectives remain influential (Buscher, 2013; Guerrero et al., 2007) and can often—as we shall see later—affect the operationalization and everyday decisions of conservation initiatives.

2.4. Paradigm shift in the management of natural protected areas

It is important to review the NPA developments and drastic changes, which took place from the mid-1970's, as this helps understand how integrative conservation models gained prominence in conservation history.

In the 1970's, it was increasingly accepted that conservation was an extremely complex processes that could not be planned and administered in a top-down fashion (Buscher, 2013). The basis for this change was a shift in thinking about local people's participation in conservation as something necessary. One simple reason was the fact that human populations already inhabited areas with high biodiversity and this compelled conservationists to switch from a rigorous protectionist paradigm—where areas were to be protected through the exclusion and eviction of human populations (Brockington et

al., 2006; Peres & Terborgh, 2004)—to an approach that included local inhabitants in conservation initiatives within natural protected areas (Fraga, 2006; Toledo, 2005).

The change in conservation paradigms occurred also because governments and conservation agencies received pressure from a number of organizations to extend the rights to administer natural resources to other stakeholders such as local communities and non-governmental agencies (Agrawal, 2012; Lemos & Agrawal, 2006). These pressures included the demand from communities and indigenous groups for greater control over their lands (Chapin, 2004) and the right to receive funds from international donors—which nowadays is conditional upon local community participation (Chapin, 2004; CEPF, 2012).

Participatory approaches were developed as possible remedies (Campbell & Vainio-Mattila, 2003) to counter the top-down, strict protectionist approaches, which had persisted for decades as the dominant paradigm in protected area contexts. The application of strict protection approaches had resulted in the exclusion and marginalization of local and indigenous communities and this ultimately affected adversely local and regional ecosystems (Colchester, 2000; Stevens, 2000).

Officially, local communities were included as stakeholders in conservation initiatives, having various degrees of involvement in the design and implementation of projects within natural protected regions (Brechin et al., 2003; Chapin, 2004). The underlying principle of this paradigm shift was that biodiversity conservation in a context of local community participation would—ideally—deliver economic benefits on multiple levels, alleviate poverty, protect threatened cultures (Porter-Bolland et al., 2012; Ferraro, et al., 2011; Galvin & Haller, 2008) and promote peace and friendship among countries in conflict (Buscher, 2013). In sum, management of NPAs became co-management and people-oriented initiatives became hegemonic models of conservation. These are also referred to as ‘integrated conservation and development programs’ and ‘community based natural resource management’ models (Brechin et al., 2003; Buscher, 2013; Chapin, 2004).

People oriented or integrative conservation initiatives (INPAs) were especially applicable in NPA models that allow resource use. The shift in paradigm had an effect in

the IUCN categories which were modified in 1994 and category (1a) and category (6) were added into the IUCN management types. Most of the recently created NPAs in Latin America fall within the newer IUCN multi-management categories (4-6) where sustainable levels of human activities are allowed and local participation is strongly encouraged and supported (Stairs, 2007).

2.4.1. Biosphere Reserves

Biosphere Reserves (BR) were among the models that resulted more adequate to apply integrative and social conservation paradigm . According to Batisse (1993), “UNESCO’s Man and the Biosphere (MaB) programme was ‘the first deliberate international effort to identify ways and means of sustainable development of terrestrial ecosystems” (p. 3). The United Nations Educational Scientific and Cultural Organization (UNESCO) conceived BRs as models that aimed to reconcile the needs of humans and the need to protect natural environments in the 1970’s. Today, there are more than 500 biosphere reserves worldwide in over 100 countries, internationally recognized and connected through the World Network of Biosphere Reserves (WNBR) but managed nationally within the countries’ own governance systems (UNESCO, 2012).

From its beginnings, the BR model represented a special conservation approach where ecological protection was integrated with the needs of the local population, based on sustainable human-environment interfaces within the designated park boundaries (Halfter & Ezcurra, 1989; UNESCO, 2012). The idea was explicitly based on a three-fold set of complementary functions (Halfter, 2011): (1) conservation, (2) development or social integration, and (3) scientific research. Conservation was implemented through tiered land-use designations within the protected area that allowed for different levels of resource use for the local populations through mechanisms of social integration and research—particularly interdisciplinary research—that assured technical basis for the overall management of these sites (Batisse, 1982; Halfter, 2011; Heinen, 2012).

This distinct model brought into the picture a complex interface between social and ecological factors. The reason for this was that initiatives that included people tied together disparate and often conflicting agendas, responded to distinct rationales and

thus easily made conservation in natural protected areas a problematic endeavour (Brechtin et al., 2004; Chapin, 2004; Fraga, 2005; Waylen et al., 2010).

2.5. Current research on integrative natural protected areas

Questions about the effects and influences (changes in both, nature and social landscapes occurring as a result of people oriented interventions) of conservation initiatives in local communities are not new, but today they are being asked with greater emphasis (Agrawal, 2012; Escobar, 2010; West, 2001). This questioning intensified as new forms of integrative natural protected areas increasingly appeared in the landscape (Bowler et al., 2010; Buscher, 2013; Waylen et al., 2010).

Research reports divergent results regarding the effectiveness of people oriented approaches in Latin America (Heinen, 2012; Halfter, 2012). On the one hand, most scientific reports coming from international assessments published by large-scale conservation organizations are in general very optimistic portraying integrative natural protected areas as places that are critically important for biodiversity conservation, and also vital for the improvement of social conditions.

For instance, the recently released Protected Planet Report produced by United Nations Environment Programme World Conservation Monitor Centre concludes that protected areas—in particular those Biosphere Reserves under co-management arrangements with indigenous and local communities—not only support healthy ecosystems and threatened species, but also provide multiple benefits to people” (Bertzky, et al. 2012, p. 49). However, the reliability of data of such policy driven reports barely includes significant ground level qualitative information which has been shown to be critical to assess the impact of conservation initiatives in local livelihoods (Agarwal, 2001; Manzuri & Rao, 2004; Rodriguez, et al., 2007; Sachs et al., 2009; Tawake, Parks, Radikedike, Aalbersberg Vuki & Salfsky, 2001).

On the other hand, there is a growing body of research coming from open communities of scientists and working groups of scientists and managers who report a dissimilar story of integrative conservation effectiveness (Collaboration for Environmental Evidence, 2012). This bulk of research reports consistently argue that there is not

sufficient information to state that community based initiatives in NPAs improve ecological and biodiversity protection, or improve local livelihoods and conditions (Alcorn, 1993; Bowler, et al., 2009; Chapin, 2004; Collaboration for Environmental Evidence, 2012; Waylen, et al., 2010). For instance, studies of satellite data that compared periods of percentage of forest cover before and after the establishment of BRs suggest only moderate differences in forest cover between the two periods (Armenteras, Rodriguez & Retana, 2009; Bowler, 2009; Brooks et al., 2013; Nepstad et al., 2006; Tiwari & Kayenpaibam, 2006). Similarly, studies also report that there is not strong evidence of actual conservation of species richness (Mishra & Banerjee, 1997) or biodiversity recovery (Waylen et al., 2010) in these natural protected sites.

Research reports that despite the efforts to prevent habitat and species loss within area-based conservation measures, tropical deforestation, forest degradation and biodiversity loss advanced at alarming rates, especially in the tropics (Gordon et al., 2010, Martin-Lopez, Martin-Flores, Gonzalez, & Montes, 2010). In fact, reports showed that “overall, efforts to stem biodiversity loss were clearly insufficient, with a growing mismatch between increasing pressures and inadequate responses” (Butchart et al., 2010, p.4).

Studies measuring the effectiveness of people oriented initiatives in reducing poverty and/or improving local livelihoods report that there is insufficient evidence to conclude that integrative natural protected areas have a positive effect on local communities even in terms of local involvement and participation (Bowler et al, 2010; Barrance & Schreckenber, 2009; Waylen et al., 2010). For instance, Stoll-Kleeman et al. (2010) conducted an assessment of effectiveness of community participation in 276 BRs worldwide and reported that while managers manifested an alignment with local inclusion and value local input, local community inhabitants working in collaborative undertakings in BRs “felt they should be more involved in BR design and management” (p. 235). Additionally, citing a broad range of examples at local, regional and national scales, scholars have argued that current integrative conservation approaches have not sufficiently achieved equal distribution of benefits from conservation initiatives among those local stakeholders involved (Abbot, Thomas, Gardner, Neba, & Khen, 2000; Colding & Folke, 2001; Keller, Mehta, Ebbin & Lilchtenfeld, 2000; Wainwright & Wehrmeyer 1998; West & Brechin, 1991)

It has also been argued that there is an absence of consensual indicators of success in integrating the 'social aspect' in people oriented initiatives due to the disparity and diversity of the cases reviewed in terms of the socio-political context and background of each site (Agrawal, 2012; Barrance & Schreckenberg, 2009).

A more recent review of 68 case studies³ of integrative conservation projects reported that: the social-cultural and local dynamics specific to the places where projects were carried out, and the specific conditions in which conservation projects originated were key factors in shaping the outcomes of conservation interventions (Waylen et al., 2010). However, while it has been well acknowledged that conservationists need to prioritise understandings and explorations of the 'communities'—and all the complex socio-political factors they work in (Alcorn, 1993; Fraga, 2005; Toledo, 2005)—there still is a “reluctance to view conservation as a social and political process” (Waylen et al., 2010, p. 20).

In sum, although the paradigm shift on conservation has placed a strong focus on integrative models, consensus does not yet exist on the effectiveness of integrative conservation initiatives and most research concludes that there is limited information and lack of studies focused on the socio-political contexts and micro-local dynamics of particular cases where conservation initiatives occur (Bowler, et al, 2010; Waylen et al., 2010).

³ Publication dates of case studies ranged from 1988 to 2007 and comprised 31 different countries.

Chapter 3. Situating the Research in Sierra de Huautla Biosphere Reserve, Mexico

This chapter reviews Mexico's history of natural protection, focusing on the shift in Mexican governmental environmental policy to seek greater input from stakeholders such as academic, local, and regional actors. I set out the rationale for selecting Sierra de Huautla Biosphere Reserve as the location for my study and discuss my research questions in context of this reserve.

3.1. History of Natural Protection in Mexico

Mexico is a significant focus for conservation efforts in the form of natural protected areas. Mexico's diversity of species not only ranks high in Latin America and the Caribbean (Cantu, Wright, Scott, & Strand, 2004; Dinerstein et al., 1995), but also ranks fourth in the world after Indonesia, Brazil, and Colombia (Cantu, Wright, Scott, & Strand, 2004). This biological richness results from great habitat variation, diverse ecological regions, complex topography, climate, geology, and geographical location (Gerritsen, 2012; Trejo, 1998). These characteristics of the Mexican landscape have attracted considerable attention from both national and international conservation agencies, particularly in the establishment of NPAs (Garcia-Frapolli, Ramos-Fernández, Galicia, & Serrano, 2009).

The Mexican conservation literature distinguishes between 1) social initiatives for conservation and 2) government-led NPAs (Halffter, 2011; Ochoa-Ochoa et al., 2009). Social initiatives include all community land-protection initiatives with the ultimate purpose of conserving biodiversity. These initiatives are not new to Mexico; they trace back to pre-colonial cultures. For instance, the Mayan 'pet kot' was a patch of forest where useful trees were protected and purposefully planted to provide fibres, food, and other basic needs (Gómez-Pompa & Flores, 1987; Gómez-Pompa & Kaus, 1992). The

first known private social conservation initiative in Mexico was established around 1824 by the German botanist Karl Sartorius in El Mirador, Veracruz (Ochoa-Ochoa et al., 2009).

Government-led NPAs began with the creation of two national parks: El Desierto de los Leones in 1917 and El Bosque Nacional Mineral del Chico in 1922” (Simonian, 1995, p.94). These parks followed the ‘strict conservation model’ of the United States: created through expropriation of land and top-down decrees with the purpose of preserving places with high scenic value and minimizing human interference (Garcia-Frapolli et al., 2011; Koleff & Urquiza-Haas, 2011; Simonian, 1995; Stairs, 2007). Simonian (1995) described the earlier history of natural protection:

In many respects, the Mexican national park experience paralleled that of the United States. Like their U.S. counterparts, Mexican officials rarely created national parks that incorporated whole ecosystems and they, too, protected coniferous and alpine forests much more frequently than less ‘scenic’ ecosystems. (p. 94)

The first national parks expropriated land through a Public Interest Act within the land reform law of 1917. As new parks were established, land tenure conflicts emerged and the original decree of land expropriation was contested. However, most of the country’s land (around 95%) is not state-owned but rather private property or *ejido* land—a communally owned land regime (Garcia-Frapolli et al., 2009). The *ejido* sector was created by the land reform that followed the Mexican revolution of 1910. The fact that all land management decisions had to be negotiated with the legal owners presented challenges to the federal government’s administration of NPAs (Halffter, 2011; Koleff & Urquiza-Haas, 2011).

During the 1930s, the Mexican government implemented a ‘utilitarian’ approach to conservation: valuing biodiversity in terms of its social utility (Simonian, 1995; Stairs, 2007). Without changing the law, the government established parks but preserved communal land tenure. Thus, *ejidos* maintained land rights, but land use within park boundaries had to adhere to principles of sustainable conservation, understood as suitable and durable land-use practices with low impact on pristine conditions (de la Maza Elvira, 2005). The expropriation act was to be used under extreme circumstances when non-conservation land use affected public interests.

By 1940 Mexico had more national parks than any other country (Wakild, 2011). Together these parks protected more than two million acres of land in fourteen states. Rather than being reserves set aside solely for ecology or politics, the parks were inhabited landscapes subject to diverse activities, from growing crops to producing charcoal (Stairs, 2007; Wakild, 2011). Mexico's approach to biodiversity conservation entered a new phase in the late 1980s, responding to an internal sense of environmental crisis as well as international developments in economic policy which directly impacted the management and design of conservation projects within NPAs (Garcia-Frapolli et al, 2009; Halffter, 2011; Stairs, 2007).

3.2. A Shift in Mexican environmental policy

In the late 1980s and through the mid-1990s, Mexico underwent an enormous neoliberal transformation that affected almost every level of its economic, political, and social systems (McAfee & Shapiro, 2010; Walkild, 2011). Neoliberal policies that include free trade and less government input altered environmental management of industry, forests, water, agricultural land, and fisheries in Mexico (Breuing, 2006). Neoliberal policies particularly emphasised the transfer of environmental management to local or nongovernmental institutions. The shift towards a neoliberally-inspired environmental policy design for NPAs in Mexico was evident also in the increase of conservation strategies aimed at improving rural economy and the preservation of Mexican ecosystems. In this context, Mexico established an unprecedented number of natural wildlife reserves, and biosphere reserves where community actors were considered central 'participants'.

In Mexico, depressed economic growth often encourages the extraction of natural resources for subsistence-level living. Neoliberally-inspired integrative and participatory conservation was seen as both an effective environmental policy enforcement in rural areas and as an instrument of economic development, a means to break the feedback loop between environmental degradation and poverty (Blauert & Dietz, 2004; Breuing, 2006; Esposito, 2001; Stairs, 2007).

Proponents of neoliberal governance models in Mexico suggested that they could lead to increased democracy, as responsibility for environmental governance was moved from the state towards communities and local institutions (Breunig, 2006; Vacanti-Brondo & Brown, 2011). Neoliberal conservation efforts supported at the time, drew on transnational networks for governance, and assumed the generation of 'integrative' environmental governance' models which brought together states, businesses, NGOs, and communities to share the responsibility for conservation efforts (Stairs, 2007; Vacanti-Brondo & Bown, 2011).

The official shift to an integrative approach in Mexico occurred in the late 1980s, accompanied by structural changes in the government bodies in charge of environmental management and by the modification of environmental law and policy. For instance, the Mexican Congress enacted the General Ecological Equilibrium and Environmental Protection Law (LGEEPA) in 1988. LGEEPA was Mexico's first comprehensive environmental law. Unlike other environmental laws in Latin America, LGEEPA not only regulated environmental pollution but also prioritized natural-resource protection. It was a seminal piece of environmental legislation (Branes, 2001; Ponce Nava, 2012).

LGEEPA was amended in 1996 to add the concept of sustainable development and to offer explicit mechanisms for decentralization. While LGEEPA applies to all government levels, the 1996 amendment recognized the need for inter-agency, state, and municipal government participation at the implementation stage of environmental activities (Cartron, Ceballos & Felger, 2005). This decentralized scheme grants certain capacities for decision-making and legal framework design to states and municipalities. In particular, the Management Plans constitute an NPA policy instrument that can be used to attend to 'locally set priorities' on a case-by-case basis. This public participation feature of LGEEPA was described at the time as one of the tools for fostering decision-making and democratization in Mexico (Blauert & Dietz, 2004; Stairs, 2007).

The inclusion of local actors included academics and scientists in the environmental policy sector. The Mexican government incorporated a large number of

scientists—mostly natural scientists—as ‘non-political’ technical experts into its staff ⁴. Among those academics who stepped into governmental roles was Julia Carabias Lillo, an applied ecologist who was appointed head of the Environmental Ministry in 1994. Carabias had spent much of her career as a researcher and active environmentalist. She had coordinated several programs aiming to develop and adopt natural-resource management practices as the basis for sustainable rural economic development (Stairs, 2007). Carabias brought a commitment to the so-called “green agenda”, an agenda of ‘inclusion and decentralization’ in Mexican conservation policy (Budedo, 1997; Diez, 2006; Gaudiano, 2006; Stairs, 2007). This commitment was laid out in the six objectives of the National Environmental Plan:

- 1) To strengthen mechanisms and instruments for the conservation and sustainable use of biodiversity, increase participation and responsibility of society, and achieve greater coverage and representativeness of protected natural areas, consolidating its operation, administration and management.
- 2) To promote new regulations and strengthen the mechanisms for urban and rural development through the identification of new options based on the sustainable use of natural resources and ecosystems.
- 3) To promote the regulation and promotion of new markets and sectors oriented to economic development of environmental infrastructure.
- 4) To strengthen the management capacities and participation of society as part of an active process of law enforcement, integration of new information systems and decentralization of environmental management.
- 5) Take advantage of financial and cooperation opportunities to foster an active presence and efficient performance in the international context.
- 6) Raise levels of compliance with environmental legislation through a strategy that is geared to the achievement of environmental goals and merge greater coverage of inspection and surveillance activities, promoting voluntary compliance with standards and social participation.

(SEMARNAP, 1996, as cited in Stairs, 2007)

⁴ Julia Carabias Lillo became head of the Ministry of Environment and Natural Resources in 1994. Her team was not associated with the political party that had governed Mexico for almost 70 years, the PRI (Party of the Institutionalised Revolution), nor had it held office before or been elected and moved up through parliamentary experience. This, coupled with community-level experience and emphasis on teamwork, gave Carabias’s staff considerable legitimacy among civic society and the scientific community.

Carabias Lillo remains a prominent voice for sustainable environmental policy in Mexico and is also considered a key actor in the neoliberal restructuring of the country's environmental policy (Breunig 2006; Hernandez, 2013; Wilder, 2010).

In the 1990s, the continuing agenda of participation and decentralization created the National Commission for Natural Protected Areas (CONANP) specifically to manage NPAs. Although affiliated with the Ministry of Environment and Natural Resources, this commission was conceived as a decentralized body with its own financial mechanisms. It comprised seven regional offices (CONANP, 2012; Stairs, 2007) whose purpose was to promote consensus among sub-national actors (municipalities and state government agencies) towards a shared conservation agenda based on local and regional inputs.

As part of the shift away from centralized and strict conservation models, local community inhabitants within NPAs legally became key actors in the operation of conservation programs (Blauert & Dietz, 2004; Gracia Frapolli, 2009; Stairs, 2007). This commitment to broader participation translated into the 1996 LGEEPA amendment. Mexico's municipalities (its smallest and most local administrative subdivision) gained virtual autonomy over NPA attributions, such as the creation and administration of environmental conservation zones, measures to assure the prevention of hazardous waste, and measures to assure collaborations between private initiatives and local authorities. These attributions were framed within three main objectives: an exercise of inter-jurisdictional governance, the promotion of social participation, and the strengthening of environmental policy instruments (Belausteguigoitia, 2001).

Local non-governmental organizations (NGOs) also expanded their NPA involvement within the decentralizing 'green agenda'. Their increasing input in NPA management was facilitated by the expansion of environmental NGOs in Mexico during the 1990s (Chalmers et al., 1997; Zabin, 1997). Since many of them wished to advance Carabias's green agenda, collaborations and alliances across sectors were common at the time.

Mexico's period of decentralization and local inclusion was characterized by intensive restructuring of environmental legislation and policy. A number of conservation programs were created within NPAs. The Ministry of Environment and Natural

Resources, led by Carabias, formed working groups composed of wildlife biologists, academics, managers, influential local ranchers, and government staff; these groups were tasked with designing programs that would preserve ecosystems and wildlife while creating 'greener' economic opportunities for each NPA's rural inhabitants (McAfee & Shapiro, 2010). Neoliberally inspired programs initiated at this time included the Wildlife Management Units (UMAs), originated by non-governmental groups, and two governmental programs: the Program for Conservation for Sustainable Development (PROCOCODES) and the Program for Temporary Employment (PET).

PROCOCODES and PET are examples of instruments of the Mexican "conservation economy" (Comision Nacional de Areas Naturales Protegidas, 2007, p.12). Within the 'green agenda', these programs are applied in synchrony as an attempt to provide long-term economic benefits for communities and for conservation (CONANP, 2007). Such integrative programs as PROCOCODES and PET have been rightly deemed as neoliberal conservation mechanisms in that they combine anti-poverty goals with government rule-making and decentralized institution-building (Breuing, 2006; Hernandez, 2013).

As noted, academics and research organizations possess considerable public credibility and authority to inform decision-making, agenda-setting, and management within NPAs, and their reach often extends beyond governmental policy-making (Durand & Lazos, 2008; Durand & Vázquez, 2011; Garcia-Frapolli, et al. 2009; Halffter, 2011; Stairs, 2007). Among the models favoured by the contemporary conservation agenda in Mexico is the Biosphere Reserve (BR), because it integrated the local community's needs with innovative mechanisms for natural-resource management and extraction, and it offered an adequate model for the implementation of the newly created conservation programs (Halffter & Ezcurra, 1987; Halffter, 2011; Stairs, 2007; Simonian, 1995).

3.3. A Distinct Biosphere Reserve model in Mexico

In 1987, two Mexican academics—Gonzalo Halffter and Ezequiel Ezcurra—presented the "Mexican Modality" of conservation at the Fourth World Wilderness Congress organized by UNESCO (Halffter & Ezcurra, 1987, p.193). Working from the

established precedents of an integrative approach to conservation and a well-developed overseas network, Halffter and Ezcurra were among the promoters of integrating the development/economic and conservation aspirations of Mexico. Halffter, an entomologist with training and research experience from the U.S., and Ezcurra, also largely trained in the U.S., proposed an explicit 'development dimension' to the emerging Mexican model of BRs, where conservation of nature and economic development for rural people were to be compatible (Simonian, 1995; Stairs, 2007).

The Mexican modality of BRs was to be "locally and regionally requested" (Halffter & Ezcurra, 1987, p.194). According to this modality, the integration of local people in the activities and programs of each reserve had a dual objective:

First, it contributed to the development of alternatives that allowed a better living standard for the local populations of Mexican BRs which often are placed in economically disadvantaged areas. The second objective was directly linked to the genetic resource conservation of the area. The only possible solution to conservation is to help the hungry peasants to produce what they needed without destroying the natural richness that belongs to all. (p. 193)

Another feature of the Mexican modality was that "Biosphere Reserves were to be given administrative independence by commissioning their management to research institutions that responded to the higher (state and federal) authorities of the states where Biosphere Reserves were decreed" (Halffter & Ezcurra, 1987, p195). Santana-Castellón (2013) described Mexican BRs as:

Being originated from a scientific discovery in the context of a paradigm shift in the conservation field, being brought up by an alliance between university conservationists and local communities, as bio-cultural approaches to the conservation of land. Mexican Biosphere Reserves were spaces that directly linked management and scientific research to develop adaptive management strategies, places where legitimate stakeholder participation platforms were provided in reserve management, and places where environmental education programs exist as multi-directional communication mechanisms.

The Mexican modality of BRs epitomizes the previously described ideas characterizing the more recent integrative approach of natural protection in Mexico, notably because this model combined the usual activities in a BR with two new ones:

“the participation of local people and a continuous research activity” (Halffter & Ezcurra, 1988, p.188). Within its framework, local input from inhabitants or original residents of the areas was evidently channelled by the applied ecologists’ initial problematization of the situation. This problematization was driven by the scientists’ interest in biodiversity protection and their primary concern with economic solutions for rural inhabitants inasmuch as local needs were compatible with landscape conservation and, the protection of key species.

To ensure that the aforementioned activities were conducted in a proper and organized manner, all established BRs were to follow a Management Plan (MP). The MP is a central, overarching program that sets out the many site-specific projects and activities which can be developed in each BR (Halffter, 2011). This MP “must regulate all activities in the area, and guarantee that the short- and long-term objectives of the reserve will be achieved satisfactorily” (Halffter, 2011; Ortega-Rubio & Arguelles, 1999). BRs have become a cornerstone of Mexican conservation policy and are currently one of the most widely used models for land-use protection in Mexico, which boasts the second largest number of BRs (41 in total) in the world, covering nearly 6.5% of the country’s territory (Comisión Nacional de Áreas Naturales Protegidas, 2012).

3.4. Current research on Mexican Biosphere Reserves

Recently—more than two decades after a national wave of conservation-science policy efforts and the promotion of collaborative and more participatory approaches to Mexican BR management—the Mexican government has conducted systematic reviews of the protected-area system, including numerous BRs. In 2009, the Mexican government released the most comprehensive, state-of-the-art, national review of its biodiversity conservation system (Koleff & Urquiza-Hass 2011 ; Urquiza-Haas, 2009). The review—described as a large, multi-institutional project—was conducted as part of the commitment held by the Government of Mexico under the Convention for Biological Diversity Programme of Work on Protected Areas, signed in Kuala Lumpur in February 2004. The review centered on assessing the effectiveness of the Mexican NPA system.

In this review's report on the size, connectivity, and representativeness of Mexico's NPA network, 11 eco-regions were under-represented. These under-represented eco-regions were mainly composed of lower-elevation ecosystems, such as tropical dry forest. BRs, especially those located in southern states (the Yucatán Peninsula and Chiapas), were among the NPAs with higher effectiveness in conserving species and land coverage (Urquiza Haas, 2009). The review recommended increasing the number of protected areas in lower-elevation ecosystems where few NPAs currently exist (Bezaury Creel & Gutiérrez Carbonell, 2009; Dirzo, Montagut & March, 2009; Halffter, 2011).

The large-scale 2009 governmental review mainly evaluated NPAs in terms of ecological and ecosystem protection; it paid less attention to their performance in terms of social conditions and benefits for local communities. The Mexican conservation literature offers few studies with a sociological perspective and informed by a ground-level qualitative analysis (Castillo & Toledo, 2000; Halffter, 2011): Gerritsen's (2003) work in El Cielo Biosphere Reserve; Kaus's (1993) work in Mapimi Biosphere Reserve; Durand & Lazos (2002) work in Los Tuxtlas Biosphere Reserve; and Fraga's (2006) detailed report of the challenges faced by indigenous communities in the creation of Ria Lagartos Biosphere Reserve. These studies' overall findings suggest that BRs in Mexico fail to address broad social problems and often criminalized inhabitants by imposing penalties upon those who accessed core zones of protection or those who used natural resources even for non-commercial purposes (Durand, 2002; Gerritsen, 2003; Halffter, 2011). This literature also suggests an inaccurate assumption of homogeneity in the social, political, economic, and spiritual values of Mexican communities, resulting in the oversimplification of the communities where BRs are expected to function. Accordingly, conservation scholars have recently called for considering factors such as internal power dynamics, gender, race, and social status, and exploring how these factors intersect with the extent of community access to benefits from conservation and participation (Bonilla-Moheno & Garcia-Frapolli, et al., 2009; Durand & Vazquez, 2011; Halffter, 2011).

Mexican BRs, especially those with a research laboratory or associated with a research institute, have become the means for a truly important contribution to the production of knowledge about biodiversity in tropical ecosystems (Halffter, 2011; Martinez et. al., 2006; Castillo & Toledo, 2000). However, little is known about the extent

to which they have fulfilled the commitment to solve locally relevant environmental problems. The most significant effort to evaluate the involvement of scientific researchers in applied conservation projects in Mexico was conducted by Castillo & Toledo in 2000. Their study assessed the performance of five ecological research institutions in projects such as livestock management, wildlife management, forestry, ethno-ecological rescue, landscape modelling, and ecological restoration. They found that only a small number of projects—conducted in two institutions⁵ in the southern states of Chiapas and Yucatán—played a significant role in the development of applied ecology research in Mexico. Most of these projects concerned forestry and agriculture; relatively few dealt with livestock management and production, even though this activity has been extensively reported as a major cause of deforestation and land-use change in the country's tropical climates (Simonian, 1995; Trejo & Dirzo, 2000; Velazquez *et al.*, 2003). Castillo & Toledo (2000) also reported that “a factor that appeared to play a part in the decision about institutional research emphasis was the system of academic rewards” (p.71).

3.5. Why a study of Sierra de Huautla Biosphere Reserve?

Sierra de Huautla offered an ideal site in which to study the Mexican modality of BRs in action. Sierra de Huautla Biosphere reserve is located in the Mexican state of Morelos (see Figure 3.1). Morelos has been a significant place to focus on conservation efforts in natural protected areas in Mexico because it has been described as one of the most biodiverse states in terms of species diversity (Toledo, 2005; Trejo & Dirzo, 2000; Durand, 2010). The state of Morelos has attracted considerable attention from both, national and international actors in terms of conservation efforts. For instance, of the 4,941 km² land area comprising the State of Morelos, 26.7% is currently protected by law making Morelos one of the states with the highest proportion of protected area in the country (fourth place nationally) (Dorado, 2012; Durand, 2010).

⁵ These two institutions are: The Natural History Institute of Chiapas and the Department of Management and Conservation of Natural Resources (PROtropical) within the Autonomous University of Yucatán.

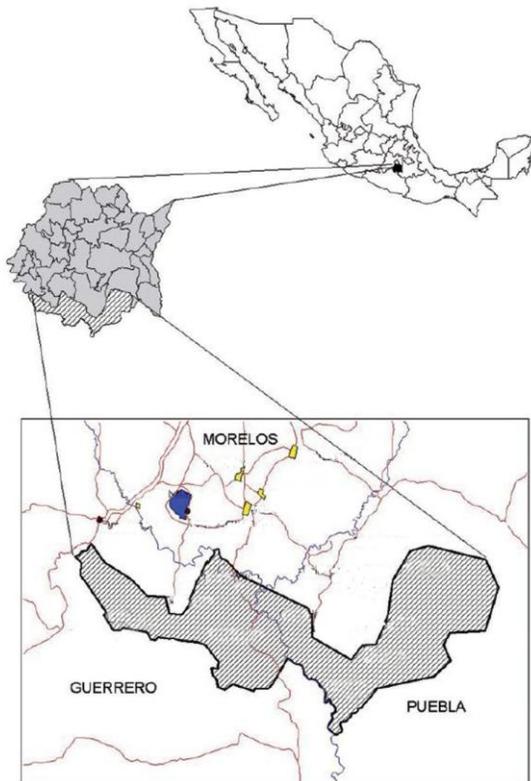


Figure 3.1. SHBR location. Adapted from Map by Erwin Marti 2002.

This protected site was created in 1998, when the Mexican modality of BRs had already developed strong political momentum, by virtue of a considerable scientific support network from within governmental agencies and academia (García-Frapolli *et al.*, 2009; Stairs, 2007). SHBR was created along with a research centre specifically mandated to monitor the reserve's biological and social conditions. Linking area-specific conservation research centres with NPAs had become the favoured strategic approach for new BRs, reflecting Mexico's conservation commitment to a stronger research-practice link (Blauert & Dietz, 2004; García Frapolli *et al.*, 2009; Simonian, 1995; Stairs, 2007). As reviewed, academics and research organizations possess considerable public credibility and authority to inform decision-making, agenda-setting and management within natural protected areas and often reach far beyond governmental policy-making (Durand & Lazos, 2008; Durand & Vázquez, 2011; Garcia-Frapolli *et al.*, 2009; Halfter, 2011; Stairs, 2007), thus an inquiry into scientific work in conservation could provide

insights about the work of conservation scientists. Such research has been absent from Mexican conservation literature.

Secondly, since its official decree, SHBR has been co-managed by the National Commission of Natural Protected Areas (CONANP) and the Center for Research in Biodiversity and Environment (CIByC) at the State of Morelos Autonomous University (UAEM). This unique arrangement also involved other stakeholders including 31 communities, local groups, and a non-governmental organisation, reflecting the participatory and inclusive approach to conservation underlying the Mexican BR model. Exploring the lived experiences of local inhabitants in SHBR is relevant as these individuals ultimately are the ones most impacted by conservation regulatory frameworks. The impacts of conservation projects on the lives of people are highly variegated and context specific and thus research on the first hand experiences of SHBR inhabitants can bring insights about how participation is arranged among diverse stakeholders and about who or what benefits.

The fact that SHBR was recently designated a world heritage site (2006) had resulted in a significant amount of international attention—through continuous reports and media monitoring. SHBR provides an excellent opportunity for extending the implications of the results in this particular case, for conservation policy in Mexico and beyond.

These three major reasons to choose SHBR as a case study site for my research also shaped the statement of the research questions.

3.6. Research questions

Studies conducted in BRs have often referred to the ‘internationally-driven character of the country’s environmental agenda’ (Durand, 2010; Garcia-Frapolli, 2011; Rodriguez, 2007). It is common to find information alluding to the increasing impact of ‘large international NGO’s on the global conservation agenda’, as well as the ‘significant contribution of international development agencies to inform guidelines and strategies for the implementation of conservation measures and projects in Latin America’ and particularly in Mexico (Betancourt Posada, 2006; Durand & Jimenez, 2010; Rodriguez,

et.al., 2007). However, details of how such impact and contributions take place are scant. Accordingly, I was interested in understanding how Sierra de Huautla was established as a protected area and I wanted to understand the larger political conditions (national and international), which appeared to influence the creation of this conservation enterprise. In particular, I sought to explicate and unpack the circumstances under which this region was considered as requiring conservation action. Within this line of thought, the first research question for this study emerged: *What was the motivation for establishing the SHBR and what were the political conditions, both national and international, which influenced the decision to designate SHBR as a protected area?*

The lack of consensus on the effectiveness of integrative conservation initiatives and the need for studies focused on the socio-political contexts in particular cases discussed in Chapter 2 motivated my interest in conducting research 'on the ground.' Given the centrality of social inclusion and participation of local community stakeholder—within the Mexican environmental policy agenda during the 1980's and 1990's— a further question was how the members of the SHBR community understand their own role in conservation projects and how local inhabitants experienced conservation projects implemented in SHBR. In the context of these ideas, the second research question for this study was: *What are the experiences and activities of local inhabitants participating in conservation projects carried out in collaboration with extra-local actors in SHBR?*

Given that scientific research is one of the Biosphere Reserve mandates—particularly significant in the Mexican modality—I sought to explore the work of scientists devoted to conducting studies in Sierra de Huautla. The lack of consensus on the effectiveness of INPAs has been largely described in the literature, a continuous process of degradation in natural protected areas has been reported, particularly in tropical forests. In this context, it appeared reasonable to wonder: *What are the views, theoretical perspectives and positions of SHRB scientists that inform how they administer conservation decisions and regulations that impact the conservation in SHBR?*

It is important to acknowledge that through the process of engaging my research in SHBR there were some shifts and refinements in the focus of the questions reported

in this chapter. My ongoing analysis as research data was collected and analyzed, led to a continuous modification of the framing of research questions (Charmaz, 2007; Corbin & Strauss, 2008).

Chapter 4. A Political Ecology Approach

This chapter reviews current literature on political ecology and conservation, to which my thesis contributes.

Political ecology developed from a need to consider the social, political, and economic stakes in matters related to the environment (Escobar, 2010; Sundberg, 2009). This interdisciplinary field “studies the relationships between society and nature in contexts of power including a consideration of the discourses and practices through which nature—and other notions—are historically produced and known” (Escobar, 1996 p. 325). As an analytical framework for conservation, political ecology accounts for “the way everyday environmental practices and politico-economic relations articulate to remake the world” (Sundberg, 2011).

This field of study developed over several decades and has been described as the outgrowth of intersections among geography, anthropology, development studies, political economy, cultural ecology and ecology (Davidsen, 2010; Escobar, 2010; Zimmerer & Basset, 2003; Sundberg, 2011). Its main objective was to devise a radical critique of the apolitical perspective and depoliticizing effects of mainstream environmental and developmental research and practice (Davidsen, 2010; Le Billon, 2001). Political ecology thus combined human ecology and political economy, a theoretical merger that attempted to overcome each field’s deficiencies: human ecology’s disregard of power and political economy’s incomplete conceptualization of environment (Bassett, 1988; Bryant, 1992; Escobar, 2010; Neumann, 1992).

Political ecology has been called an area of inquiry facing an identity crisis (Penna-Firme, 2013), mostly for situating itself at the crossroads of the natural and social realms and for being explicitly problem-oriented rather than discipline-driven (Davidsen, 2010). There have been recent scholars concerned about political ecology becoming ‘politics without ecology’ (Walker, 2005). Scholars argue that there has been an increasing emphasis within political ecology studies to examine discourse, the state of

current ecological and conservation science, problems associated with the relation between conservation practice and neo-liberalism; issues of security, violence and their interface with conservation, however there is a lack of attention to bring biophysical ecology back to the center of political ecology. Scholars argue that this limitation has diminished political ecology's capacity to contribute to solutions to environmental problems (Davidsen, 2010; Walker, 2005).

Political Ecology's heterogeneous character has also been called a virtue, for reflecting the field's core ideas of pluralism and non-hierarchy (Cairns, 2011; Davidsen, 2010). Due to its diverse underpinnings, political ecology is a field that offers "some potential to open dialogue between social science-trained critics of conservation and natural science-trained advocates" (Adams & Hutton, 2007, p. 171). It differs from other approaches toward human-environment relations by taking into account often neglected issues in nature conservation, degradation and legitimization of territories such as power relations, inequality and poverty, class, gender, ethnicity, and racial claims (Argawal, 2002; Escobar, 2010; Hart, 1991).

In the past three decades, political ecologists have dealt with four main themes: (1) degradation and marginalization, (2) conservation and control, (3) environmental conflict, and (4) environmental identity and social movements (Robbins, 2004, p.13). All currently active research relates to biodiversity conservation in some way (Adams & Hutton, 2007; Brown, 1998; Stairs, 2007): social conflicts over forest resources, protected areas, agricultural regimes, and productive regions (Bryant and Bailey, 1997; Baker, Milner-Gulland & Leader-Williams, 2011; Lane, 2003); displacement as a result of establishing and enforcing protected areas, and the troubled relationship between conservationists and rural groups (Brockington, Igoe & Schmidt-Soltau, 2006; Brockington & Schmidt-Soltau, 2004); and, more recently, war and violence linked to conflicts of natural resource use and political economies (LeBillon, 2001; Buscher, 2013).

Political ecology has focused on challenging the view that conservation is a non-political activity by showing instead its political dynamics and 'coercive dynamics' (Bryant, 2000). Some work is specifically concerned with exposing the colonialist tendencies of the international conservation movement. Political and territorial agendas

are suggested by the strong ties of many conservation organisations to former colonial powers and by the disproportionate number of areas of conservation concern within former colonies. Contemporary conservationist thinking and practice may have inherited colonial ideas of nature; this insight draws from postcolonial theory on the relationships among representation, knowledge making, subject making, and domination (Guha, & Martinez Alier, 1997; Prakash, 1994). Notably, the “Third World”—the site of many forms of environmental intervention—continues to be authored and scripted in terms of Northern forms of representation and thus, remains a focus of interest in political ecology (Buscher, 2010; Buscher, 2013; Escobar, 2010; West, 2009; West & Carrier, 2004; West, Igoe & Brockington, 2006; Wilhulsen et al., 2002).

The effects of Northern forms of representations applied worldwide are profound and dangerous as they shape the lives of people in poor countries and thus, these effects have been subject of interdisciplinary studies within the field of political ecology. Contributors show how Western forms of representation of ‘nature’ and ‘conservation’ have come to portray a virtual image of the world that disregards all local, situated social and cultural arrangements. NPAs are considered as just one example of these virtualizations.

4.1. Virtualism

Studies of virtualism are among the research analyzing imposed forms of environmental intervention (Carrier, 1998; West et al., 2006). In the eyes of political ecologists, particularly social anthropologists, environmental interventions such as protected areas constitute a form of ‘virtualism’, defined as “the attempt to make the world look like and conform to an abstract model of it” (Carrier, 1998). Carrier (1998) coined virtualism to criticize economic thinking and policies that tended to abstract human decision-making from its complex social context and to build models of the world and how it works; this mode of engaging the world disregards the full range or complexity of people's daily lives, practices, and social activities.

Political ecologists argue that “protected areas necessarily seek to protect nature and biodiversity by abstracting them from their complex social contexts; as such, much

protected-area legislation and policy is a practical exercise in virtualism” (West & Brockington, 2006, p. 609). For instance, designating natural protected areas necessarily defines acceptable human actions and therefore restricts human behaviour in a particular location. West et al. (2006) describe protected areas in the following terms:

Protected areas have increasingly become the means by which many people see, understand, experience, and use the parts of the world that are often called nature and the environment. This virtualizing vision—although rarely uncontested—has imposed the European nature/culture dichotomy on places and people where the distinction between nature and culture did not previously exist. As such, protected areas have become a new cosmology of the natural—a way of seeing and being in the world that is now seen as just, moral, and right. (p. 255)

Social anthropologists working through the lens of virtualism have shown that integrating an environmental dimension into development projects has led to the bureaucratization of conservation programs. Such institutionalization is often accompanied by a form of virtualism in the way decision-making authorities—usually disconnected from realities in the field—design the protection of nature (Blondet, 2010; Carrier & West, 2009; Oneweer, 2009; Rettie, 2009). This virtual design characterizes the Western way of understanding nature and its preservation. It often ignores the social, economic, and political context of communities in places where protected areas are established, yet it is the theoretical approach most used by development and conservation organizations worldwide (Blondet, 2010; West et al, 2009).

The material, textual, political and all the conditions by which conservation discourses, practices, and institutions “remake the world” (West, et al., 2006, p. 255) are part of the virtualizing process. These “subtler virtualisms” (West & Brochington, 2006, p. 609) are for instance, the detailed histories of particular protected areas, which are often simplified by omitting the role people have played in forging these landscapes.

4.2. Neoliberal Conservation

Virtualism is strongly connected to the neoliberalization of conservation, another contemporary trend identified by political ecologists (Buscher, 2008; 2013). Neoliberal

conservation is the attempt to make the conservation of nature compatible with capitalist market dynamics (Buscher, 2013). Neoliberalism is both an ideology and a set of processes facilitating the spread of free markets; it is often expressed through deregulation, privatization, and decentralization (Cairns, 2011). The past 20 years have given rise to a 'green neoliberalism' (Bakker, 2010; Hanson, 2007) involving a set of "institutions, discourses, and practices that facilitate the objectification and commodification of nature's values...[making] efficient use and exchange of 'natural capital'" (Hanson, 2007 p. 247).

Green neoliberalism has shaped biodiversity conservation and correspondingly created a new literature on 'neoliberal conservation' efforts (Böscher & Whande, 2007; Castree, 2008; Heynen et al., 2007; Heynen & Robbins, 2005; Igoe & Brockington, 2007). Neoliberal conservation is not a type of neoliberal strategy or conservation strategy, but rather a set of mechanisms, practices, and interventions introduced to other forms of conservation in order to make capitalism and conservation compatible (Brockington and Duffy, 2010). Political ecologists studying neoliberal conservation aim to understand this set of tools as well as the processes that perpetuate them (Buscher, 2013; Castree, 2008; Heynen & Robbins, 2005; Igoe & Brockington, 2007).

Studies of neoliberal conservation merge well with critiques of biodiversity conservation, especially in the mechanisms that govern natural protected areas or the initiatives that create new forms of them (Buscher, 2010; Vacanti-Brondo & Bown, 2011). One neoliberal conservation initiative subject to political ecology studies is 'green grabbing': the increasing appropriation of land and resources for environmental ends, particularly in developing countries. Green grabbing ranges from protected areas to forest enclosures under the Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD) (Fairhead, Leach & Scoones, 2012; Fano-Morrisey, 2012).

Another neoliberal conservation mechanism is the re-regulation of community land, such as privatizing communal or state-owned property. Re-regulation occurs under neoliberal land reforms by which states transform previously untradeable land into tradable commodities (Igoe & Brockington, 2007). Subsequently, conservation programs such as ecotourism or marketing local crafts are used to bring rural communities into

business ventures with outside investors (Lemos & Agrawal, 2006). In a study of ecotourism in Africa, Buscher (2013) showed how such programs impose strict land enclosures and pit local groups against each other over menial jobs. While providing some income to some residents, these programs cement existing inequalities instead of alleviating them, especially because touristic services cater mostly to middle-class and elite white enthusiasts (Buscher, 2013).

Recently, political ecology has given critical attention to the ideas and narratives about nature that are being used to frame neoliberal conservation mechanisms (Adams & Hutton, 2011; Breuing, 2006; Liverman & Villas, 2006; MacAfee, et al., 2010; Vacanti-Brondo & Bown, 2011). For example, environmental scientific disciplines such as conservation biology have crafted new academic terms in order to remain politically acceptable in a neoliberal world (Buscher, 2008 p. 230). This reinvention is a product of the 'green economy', defined as "an economy or economic development model based on sustainable development and a knowledge of ecological economics" (UNEP, 2013). While increasingly hailed by large-scale conservation organizations "as a model that will bring about genuine positive change for poorer people" (Fano Morrissey, 2012), the green economy is seen by political ecologists as "a model that is meant to cover up the fact that such economic initiatives are another form of contemporary capitalism which promotes systemic inequality and worsens global environmental problems" (Buscher, 2010). Furthermore, what has transpired in the conservation world is that conservation biologists and social scientists have become too eager to realign themselves with the seductive nature of the neoliberal conservation win-win scenarios, forsaking empirically-grounded analyses (Vacanti-Brondo & Bown, 2011). Accordingly, political ecologists have emphasized the analysis of particular 'green economic initiatives' or 'initiatives of green economy' as a means to understanding the consequences of neoliberal mechanisms (Buscher, 2013; Fano Morrissey, 2012; Vacanti-Brondo & Bown, 2011).

4.3. Participation

Community participation has been a central notion of conservation efforts worldwide for several decades (Brody, 2003; Duitt & Folke, 2011; Empinotti, 2007; Jentof, 2000; Pelling, 1998;). Political Ecologists have dissected the assumption that

local community participation in neoliberal nature conservation projects is democratic and leads to community empowerment through economic development (Buscher, 2013; Escobar, 1998; Forsyth, 2008; Kuymulu, 2011; Reason, 1998).

Several reasons for engaging local inhabitants in conservation programs have been suggested. Some argue that local participation is one way to enhance the success of natural protected areas and to satisfy an ethical imperative to empower individuals (Fraga, 2006; Toledo, 2005). Others argue that having local residents participate in decision-making legitimizes the protection initiatives (Berner, 2001; Berner, 2010; Cifuentes, 2010) and diffuses any tension caused by a perception of privileged intrusion (Chan et al., 2009; Esposito, 2001; MacLaughlin, 2011).

In order to find forms to enhance community participation within conservation projects, various approaches to study participatory arrangements have been developed. For instance, Arnstein's classic typology (1969), articulates levels of citizen participation; this approach provided a turning point in conceptualizing participation within natural protection models. Using a ladder metaphor, Arnstein defines eight types of participation that fall into three major categories: (1) non-participation, (2) tokenism, and (3) citizen power. These categories distinguish mere information and consultation from concrete involvement in decision-making and societal transformation. Since Arnstein's contribution, other typologies have been developed (Agarwal, 2001; Cantiani, 2012; Cornwall, 2008; Maskey, et al., 2006; Wong, Zimmerman & Parker, 2010). For instance, Agarwal (2001) assessed determinants of community participation in India and Nepal, paying special attention to excluded stakeholders (mostly women) in forest conservation initiatives. Agarwal described participation as the "extent of activeness measured as levels that would get higher with increased individual activeness" (p. 1625), and the resulting typology ranged from nominal/passive participation to interactive/empowering participation. Other approaches measure participation in concrete terms and offer a more nuanced understanding. For instance, Maskey et al. (2006) identified forms of participation as: (1) attending meetings and making suggestions, (2) leading discussions at meetings, or (3) making decisions for the group at meetings. He also identified common obstacles to participation in decentralized conservation management: (1) vulnerability (lacking private resources), (2) inferiority (based on discrimination due to

gender and poor education), and (3) the potential for corruption (especially in relation to lack of financial transparency).

Political Ecologists have suggested that studies of participation—within the context of neoliberalism—have simplified an inherently complex process and have provided definitions of participation activities in narrow terms. This has resulted in having conservation initiatives that were and continue to be framed as inherently ‘participatory’ so as to be attractive to potential donors (Berman-Arevalo, 2009; Buscher, 2013; Furniss, 2009; Mosse, 2005; Rodriguez et al., 2007). As such, participatory arrangements are better understood as “mobilizing metaphors” which keep conservation legitimate in a functional neoliberal economy (Buscher, 2013, p. 3). Political Ecologists argue that the uncritical affirmation of local community participation in neoliberal conservation projects as democratic, and the twin assumption that community participation leads to community empowerment, are both misguided. Far from forming a solid base for the democratic management of natural resources or the facilitation of poverty alleviation, decentralized neo-liberal conservation projects that are continually portrayed as “inherently participatory” often lead to the exacerbation of existing inequalities and to the further centralization of power among diverse social actors involved in these projects (Buscher, 2013; Furniss, 2009; Kuymulu, 2011).

According to Buscher (2010), conservation interventions in a neoliberal context “rely on ‘metaphors’, such as participation, ownership, capacity building and good governance, in order to ensure and justify support and resources” (p. 29); it follows that ‘collaborations’, ‘all-inclusiveness’, ‘consensus’ and ‘win–win scenarios’ are merely rhetorical and abstract notions deployed to conceal ideological differences, to allow compromise and the enrolment of different interests—in other words, to make conservation work smoothly.

4.4. Science

In seeking to reveal the broader political dimensions of environmental ideas and practices, political ecologists drew from the research that uncovered politics within the science upon which many environmental policies are built. In the past fifty years, the

idea of scientific knowledge as empirically objective and politically neutral, and of scientific practice as separate from its social or institutional context, has been challenged on many fronts (Clarke, 1997; Fujimura, 1996; Haraway, 1991; Jasanoff, 1995). Science and Technology Studies (STS) comprise a large body of literature analyzing the nature of scientific knowledge and the relationship between science and society. This field seeks to understand the ways in which science and the production of scientific knowledge are influenced by social, political, and other factors and the social and political implications of these influences (Cairns, 2011).

Revealing the political character of science has caused heated controversy and debate, and many scientists—especially in the ‘hard sciences’—have raised concerns that STS represents an attack on their hard-earned credibility and legitimacy (Gould, 2000; Koertge, 1998). Yet, STS scholars are interested in understanding the social and political character of scientific production, not in attacking the accuracy of scientific descriptions or theorems. STS research is predicated on the observation that scientific and technical knowledge is always presented in its final form, unaccompanied by the particulars of how the knowledge developed (Fujimura, 1996; Latour & Woolgar, 1979). Such information could illuminate the connections between scientific work and other human activities, including the institutional, societal, and political realms in which scientific products are created.

Recently, political ecologists have used approaches from Science and Technology Studies to uncover the political character of conservation science (Cairns, 2011; Forsyth, 2003; Forsyth, 2011; Keller, 2009; Walters & Vayda, 2009). Political ecology studies informed by STS literature addresses the place of conservation science in society and the ways in which its products become interlaced with the social/political norms and regulatory/legal frameworks of conservation. For example, Keller’s (2009) analysis of policy making considered the role of scientists in taking an issue from the relatively closed forum of scientific debate to wider social and political circles; scientists do not act alone in this process and are not insulated from forces that make some issues more socially and politically salient than others. Another example is Cairns (2011) study of the Galapagos conservation project, which illustrates the multiple ways in which the boundary between science and society on Galápagos is constructed and contested and the ways these contestations are used to critique arguments that more science

necessarily holds the key to the achievement of sustainable development and conservation in the Latin American archipelago.

Also drawing upon STS political ecologists have recently integrated insights from Actor-Network Theory (ANT) (Callon, 1993; Latour, 2005). These trends have two central tenets: (1) that nature must be studied in terms of the human and non-human as mutually constituted in and through social relations (Escobar, 2010; Nimo, 2011; Jepson, et al 2011), and (2) that there is a need to shift from dualist to relational ontologies (Bosco, 2011; Lorimer, 2007; Nimo, 2011; Sundberg, 2011). In other words, explorations that need to move beyond dualist conceptions of ‘society’ and ‘nature’, or ‘subjects’ and ‘objects’. Instead, relational ontologies posit hybrids of ‘societies-natures’: heterogeneous assemblages in which constituents are inextricably mixed up—not necessarily in structural or hierarchical orders. This approach, political ecologists suggest, seemed to be the only way to capture the “political ecology of it all” (Buscher, 2013): to make connections, and analytically unravel the broader relations among various constituents of non-human character and the situated practices of first hand actors.

4.4.1. Summary of chapter

My thesis aims to contribute to the broad field of Political Ecology, particularly to studies of Integrative Natural Protected Areas. Insights from political ecology studies inform my work, particularly those using the lens of virtualism as a means in which protected areas have sought political legitimization through abstract constructions of ‘nature’, ‘environment’, and ‘negative human effects on nature’ (Rettie, 2009).

Political ecology research into how natural protection initiatives/projects seeks legitimization and economic support by ‘portraying [themselves] as being outside of politics’ (Buscher, 2010) also grounds my analysis of SHBR. In this line of ideas, I seek to scrutinize conservation strategies in SHBR, specifically the scientific practice underlying them. This will allow me to understand how ‘politically neutral’ scientists work can be in practice.

Following the idea that Natural protection, in the context of neoliberalism, has relied on ‘mobilizing metaphors’ (Buscher, 2010, p. 29) such as ‘participation’ and ‘win-win’ scenarios, I account for, and critically analyze, the lived experiences of local inhabitants participating in the SHBR’s conservation projects, in an attempt to challenge oft taken-for-granted assumptions about community inclusion.

Recent work in political ecology situates the discussion of conservation as encompassing non-humans and humans as equally constitutive of ecological interactions and protection situations. This method, informed by recent post-humanist theory (e.g., actor-network theory), has provided political ecologists with new tools and approaches that help researchers produce accounts of phenomena and situations that do justice to the emergent, contingent, and unpredictable character of socio-natural interactions (where innumerable agencies, intentions, and types of participation can be included) (Bosco, 2009; Nimo, 2011). The resulting accounts offer a view of conservation quite different from predominant models, which portray conservation as a global necessity and a moral responsibility of world citizens (Bertzky et al., 2012; Heinen, 2012). By contrast, political ecology reveals/describes how individuals operate, how new forms of organization and practice come about, and how they are or can be (re) negotiated by diverse actors and/or changed. Within this framework, and by drawing attention to the histories of places, the lives of people, and the situated practices occurring in SHBR, my research offers a more nuanced view of conservation practice as a situated and contingent activity.

Next, I explain the methodological perspective that guides my work and more specifically how Situational Analysis (SA) (Clarke, 2005) enabled me to take into account not only the interplay between the individuals of each collective taking part in SHBR conservation endeavours, but also the distinctive roles of non-human actors, including the political/historical conditions and bio-physical forms of the Sierra de Huautla site.

Chapter 5. Methodology

In this chapter, I explain the research paradigm in which I situate my work and discuss the methodology used in my study. This discussion is important as it helps elucidate the selection of appropriate research methods, the ideas that guided me to identify validity threats, and the ways in which I developed my study.

5.1. Research Perspective

We explain social phenomena using our own assumptions and understanding of the world, as well as our theoretical, political, and ideological commitments (Clarke, 2003; Hawkins, 2009; Lather, 1991). As Hawkins's (2009) states, "the ideological frames that we pursue become the glasses through which we see the world" (p.1), thus these frames are of paramount importance in any type of research. The practice of researching social phenomena becomes a quest to expose the underlying approaches, assumptions and ideas used by empirical researchers to generate scientific products and ultimately knowledge concerning everyday life or, in my case, knowledge concerning the everyday experiences of people working in the context of conservation projects.

Some discussions within social research are organized around the idea that there are two paradigms: quantitative and qualitative. This characterization seems an oversimplification that emphasizes types of data and methods rather than foundational beliefs and assumptions, which ultimately shape researchers' decisions and choices for methods. Chalmers (1982) defines a paradigm as "made up of the general theoretical assumptions and laws, and techniques for their application, that the members of a particular scientific community adopt" (p. 90). A paradigm is a comprehensive belief system, worldview, or framework that guides the practice of researchers. The number and names of paradigms vary depending on the authors (Creswell, 2008; Guba, 1990; Lather, 2007; Smith, 1989); most contemporary authors in the social sciences recognize

several competing paradigms. Of note, Lather (2007) refers to four research paradigms: 1) Positivist, 2) Constructivist, 3) Critical Theory, and 4) Post-Structural Postmodern (p. 165).

The positivist paradigm arose from the philosophy of logical positivism and is based on rigid rules of logic and measurement, truth, absolute principles, and prediction (Creswell, 2008; Urquhart, 2011). The positivist philosophy argues that there is one objective reality; consequently, research results are valid only when they provide sufficient proof of the underlying phenomena. Here, the researcher is external to the research site and controller of the research process.

The constructivist paradigm is concerned with the meaning that individuals ascribe to their surroundings, actions, and practices. This worldview argues the importance of culture and context in forming understanding. A participant's experience leads to subjective interpretation (Creswell, 2007). Constructivists contend that research can only elicit how individuals represent their reality via language (Lather, 2007), thus they rely on methods such as interviews and observations.

The critical theory paradigm interlinks research with a political and ideological agenda to address marginalized people (Buscher, 2013; Lather, 2007). Research from this perspective "raises questions to heighten awareness and seek social change" (Lather, 2007, p 165), giving voice to the voiceless and advocating to assist the disadvantaged. The central tenet of critical theory is that dominant constructions exist and create inequalities; it follows that ideological critique is needed to question these constructions and analyze how they are maintained and changed (Lather, 2007; Buscher, 2013).

The post-structural postmodern paradigm focuses on deconstructing binaries. It takes generalizing categories traditionally used to explain society, such as 'class' or 'identity', and positions them as terms of political struggle that must be dissected to show the locally constitutive axes of power and domination. Sociological categories that once sufficed as explanations themselves become the sites for analysis (Lather & Clemens, 2011).

I position my research between the critical theory paradigm and the post-structural postmodern paradigm. Throughout my work, I try to harmonize insights from these two paradigms by taking theoretical and methodological orientations that seek to “construct a more just social order through the development of a human science that contributes to social change” (Lather, 1986, p. 66). My research design values and uses approaches to studying human action that go beyond the realm of measurable and discoverable facts characteristic of the positivist view. Instead, I use more holistic, relational, and “openly ideological” modes of analyses (Lather, 1986, p.86).

I believe that an ‘ideal’ objectivity is not realizable in research practice, and research practice is inescapably ‘value-laden’ because it is always situated and politically engaged (Lather, 2007; Lather & Clemens 2008; Clarke & Star, 2007). I believe that scientific practice is like any other social practice—awash in political and ideological agendas that greatly shape research outcomes and knowledge claims (Clarke, 2005; Fujimura, 1992; Clarke, 2009). In this light, I as a researcher am not a neutral observer and reporter of the world, but rather an actor/author (Lather, 2007) who generates products of research and co-constructs the situations he/she approaches empirically (Clarke, 2005).

5.2. Qualitative approach

I felt that a qualitative study design would best serve my objectives of studying SHBR as a complex state of affairs and exploring in depth its participants’ points of view. In the words of Denzin and Lincoln (2000):

Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recording and memos to the self. At this level, qualitative research involves an interpretive naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them. (p.3)

This view of qualitative research was well suited to my project. I wanted to see what 'conservation' looked like 'on the ground', using SHBR as my model, so I used Denzin and Lincoln's interpretive tools to describe SHBR. My description draws primarily from the conversations I had with people in their homes or at their worksites, and supplementary from field notes, memos, and extant documents. I treated my interviewees as experts on their own life experiences; from those 'expert accounts', I constructed a description of SHBR and an analysis of its actors' individual and collective perspectives.

Grounded theorist Julia Corbin (2008) writes that qualitative research, unlike quantitative research, allows the inquirer to access the inner experience of participants, to determine how meanings are formed, and to discover—rather than test—variables (p.12). I wanted to gain a deep and proximal understanding of the SHBR participants' experiences and points of view. An advantage of using a often mentioned in the literature is that a qualitative inquiry is that it allows the researcher to adopt the original language of the research participants in the process of analysis and the development of outcomes (Maxwell, 2013). Since the research site was in Mexico, I anticipated communicating through local language and idioms. While my ability to speak with informants in their own language increased my confidence that a qualitative approach could get me most closely in touch with their appreciations of SHBR, during my fieldwork experience I encounter several challenges regarding my ability to fully understand local community inhabitant's accounts. This challenges speak to the fact that what is planned in theory when developing a research design, turns into a quite different process when conducting research in the field.

The design of my research was by necessity flexible and open, since—as Maxwell (2013) describes— “design in qualitative research is an ongoing process that involves 'tacking' back and forth between the different components of the design, assessing the implication of goals, theories, research questions, methods, and validity threats for one another” (p.3).

5.3. Situational Analysis

Situational Analysis is a variation of the Grounded Theory (GT) approach (Glaser & Strauss, 1967; Clarke, 2003). GT originally developed by sociologists Barney Glaser and Anselm Strauss is probably the most commonly used method in qualitative research (Creswell, 2009; Bryant & Charmaz, 2009). However, the development of this method did not stop with its original authors but has been taken on by their students who—through the continuous revision of the work of their mentors—have proposed several refinements to the original methodology. The latest innovation to date is Adele Clarke’s Situational Analysis (SA) (Clarke, 2005).

Clarke’s approach to qualitative analysis employs two of the defining components of the GT method, which I used in my study:

1) Simultaneous involvement in data collection and analysis which means that “coding begins immediately after there is data” (Clarke, 2005 p.XXXI).

3) Theoretical sampling, which Clarke (2005) describes in the following terms, “sampling is not driven necessarily (or not only) by attempts to be “representative” of some body or population or its heterogeneities, but especially and explicitly by *theoretical* concerns that have emerged by the provisional analysis to date” (p. XXXI).

Clarke supplements basic grounded theory methods with a situation-centered approach influenced, she explains, by postmodernism; this approach emphasizes partialities, positionalities, and contradictions that portray the complex nature of the social world (Clarke, 2005).

The central step Clarke took to bring the postmodern paradigm into GT was to extend the sociological method of Glaser and Strauss (1967) from social units of analysis to a broader ‘situation’, encompassing more elements of varied character. In GT, human action is central. The social process being analyzed is typically named in gerund form to emphasize action, such as *living* with chronic illness (Charmaz 1990), *crafting* scientific work (Fujimura 1992), or *classifying* and its consequences (Bowker & Star, 1999). SA supplements GT’s focus on human-centered action with an ecological

metaphor that includes non-humans (flora and fauna, technologies, climates, etc) and discourses in what Clarke calls “the situation”.

Another step Clarke took was to change the traditional interest of GT in developing what Lather (2007) calls “formal universals” (p. 158), namely theories or one-size-fits-all explanations of social life. Clarke shifted the focus from developing substantive and formal theories to grounded theorizing as a continuing, dynamic, inter-animating conversation, arguing that researchers must consider the situated nature of any study and its contingent social arrangements. Instead of providing theories, the outcomes of situational analyses “should be ‘thick analyses’ paralleling Geertz’s (1973) ‘thick descriptions’” (Clarke, 2005 p.554). In brief, Geertz’s analyses of culture and social life were done in terms of the actions, rituals, and artefacts that concur at specific points in time and place. The resultant enriched reading of culture and society was a “multilayered description” of the diverse yet synchronous elements that interface to create any cultural context (Willette, 2011).

A further step for pushing GT around the postmodern concerns a “focus on normative/homogeneity versus differences/complexities/heterogeneities” (Clarke, 2005 p. 23). Clarke is clear in some of her assumptions regarding social justice and her assertions that researchers must pursue certain topics in relation to that (Allen, 2009; Clarke, 2005). For example, Clarke (2005) insists on analyzing the kinds of “difference” (p. 37), which affect the outcomes of negotiations and conflicts as they affect the power differentials among actors interacting regardless of whether or not they emerge. This, she asserts, signal “micro-politics of power” (Clarke, 2003 p. 557).

Clarke (2005) explains her reference to the term ‘difference’ in the following terms,

My usage has its origins in feminist theory, which from the outset took up issues of sex/gender difference but very quickly expanded to include differences among women—within the “category” “women”—on the basis of race, ethnicity, class, sexuality, physical ability, and so on. Very quickly again, it became vividly clear that while there might be certain differences on the basis of any of these and other related identity politics categories, extending far beyond feminism to postcolonial sites and beyond, there are also extensive and serious within-category differences and many other

kinds of differences as well. That is, the categories of “received theory” do not suffice for taking differences into account”

The goal with situational analyses is to enhance the empirical study of differences, which are more easily encountered in situations featuring conflict and controversy.

The postmodern turn in GT is also evident in Clarke’s acknowledgement of the researcher as an active constructor of the empirical situation researched. In her words, “we as researchers delimit our stories to those that we can tell coherently” (Clarke, 2005, p. 111).

This specific approach to qualitative research corresponded with my interest in developing a coherent ‘story’ of a holistic understanding of the Sierra de Huautla conservation collaboration. Clarke’s approach addressed my concern about understanding the whole rather than the analysis of, treatment of, or dissection into parts of the SHBR situation. Situational Analysis’ maps allowed multiple positions, contradictions and differences among individuals comprised in my study of SHBR to be fully articulated and subject of my analysis.

SA also allowed me to see ‘conservation of nature’ within the Sierra de Huautla partnership as an ‘assemblage’ (Latour, 2005) of facts, theories, artefacts, and procedures that were the product of collective processes always under construction. Additionally, it helped me explore the Sierra de Huautla partnership as an historical and local situation framed within larger institutional guiding narratives of ‘conservation’ instead of portraying it as a clear-cut, already defined and ‘given’ unit of analysis.

5.4. Situational Analytic tools

As noted, SA draws on many of the methodological tools of GT (coding, constructing categories, diagraming, theoretical sampling, etc.), but it replaces some of the underlying assumptions of GT--mainly around human action and the elaboration of the “basic social process”--with a more “ecological” approach to studying phenomena. Instead of action at the center, the situation itself is the major unit of analysis. For

achieving this kind of analysis, Situational analysis's central reflexive tool is the use of three types of maps, diagrams that address the phenomenon in different contexts and at different levels of analysis. Clarke suggests laying out the major elements in the research 'situation' under inquiry, and to use them to provoke analysis of relations between and among them (Clarke, 2005 par. 19). This is done through the construction of maps and diagrams to analyse—or 'follow'—a wide range of data.

Clarke proposes three main "cartographic" (Clarke, 2005 p XXII) exercises—each with a relational analysis—as analytical devices that seek to incorporate the range and variety of conditions and elements that constitute the situation under analysis:

- 1) *Situational maps* that include human, non-humans, materialities, technologies, political orders and all the elements that seem relevant to/ operative in the situation under study. This kind of map has the purpose of identifying relations among the elements and it is used to "open-up" the data. The further purpose of such maps is to make explicit the "messy complexities" (Clarke, 2005 p. 89) of the situation under study. In my study, I used situational maps for two purposes, first, to design my interview protocols (Figure A.1) and as means to analyze the data regarding the genesis of SHBR (Figure 6.1).
- 2) *Social worlds/arenas maps*, which represent the social, collective realm of situations. Here the focus is to explore the negotiations, controversies and organizational activities of individual and collective actors. These maps as described by Clarke (2003) "offered meso-level interpretations of the situation engaging collective action and its social and organizational dimensions" (p.560). The SWA maps were used in my study for the purpose of analyzing data from interviews and fieldwork observations and, textual materials (government and academic reports) about local inhabitant's participation in SHBR conservation projects (Figure 7.2).
- 3) *Positional maps* which represent the positions which appear on the data (articulated by humans, found in texts) regarding specific issues and controversies surrounding the situation under analysis. They include multiple positions and contradictions taken by the actors represented in the map. I used positional maps to analyze positions found in my data regarding community perspectives (Figure 7.4) and, to analyze the positions of scientists conducting research in SHBR (Figure 8.1).

In integrating postmodern insights, then, Clarke uses 'mapping' to allow the representation of multiple and simultaneous perspectives on the 'situation' under analysis. Related to this is her attempt to articulate that which is not expressed/found in

the data---what she calls the 'sites of silence' (Clarke, 2005 p. 85). These sites of silence refer, for example, to what researchers or informants or policies or documents suppose or assume is there, but are not found in the actual data of a given study. Positional maps, in particular, allow these silences to speak and thereby to provoke analyses.

Clarke's rationale for the use of these three kinds of maps is that they change the traditional ways of working for researchers, and help generate new and fresh insights. For instance, they create a visual representation of the complexity she argues exist in all situations and they make visible the multiplicity, heterogeneity and 'messiness' of the data.

Examples of the maps and details about their use in my study will be treated in depth in Chapters, 7, 8 and, 9 that are devoted to the presentation of findings and the answering of the research questions.

5.5. Situational Analysis Theoretical Approaches and Perspectives

SA provided a theoretical and methodological infrastructure that enabled and supported my analysis of the several and varied elements that constitute the situation of the SHBR conservation initiative. Next, I offer further detailing of that infrastructure.

5.5.1. Social Worlds and Arenas Framework

The Social World Arenas (SWA) framework is a root metaphor or conceptual infrastructure for SA. The SWA framework is a form of analysis used mostly in Science and Technology Studies (STS). The social world arenas framework is rooted in symbolic interactionism (Clarke 2005) and is influenced by some of its foundations:

- 1) humans construct meanings through social interaction;
- 2) theory should be clearly grounded in empirical research;
- 3) analysis of qualitative data should seriously attempt to be faithful to the understandings, interpretations, intentions and perspectives of people

studied on their own terms as expressed through their actions as well as their words (Clarke, 2005 p.3);

- 4) silenced actors are important objects of study (Vasconcelos, et al., 2012 p.123).

A fundamental assumption within the symbolic interactionist perspective is that it is inadequate to study sociality in terms predefined by the researcher (Masemann, 1982). The task becomes, instead, a quest to uncover the workings of social systems, institutions and organizations in terms of the meanings these institutions have for their participants or the “tacit understandings underlying daily social interactions as these are negotiated by people in their daily lives” (Masemann, 1982 p. 5).

The SWA framework operates within these assumptions and defines social worlds as “groups with shared commitments to certain activities, sharing resources of many kinds to achieve their goals, and building shared ideologies about how to go about building their business (Clarke, 1991, p. 131).

Examples of different social worlds could be groups of educators, students and administrators that coexist in an educational institution, embracing different ideologies over the usefulness of assessments and evaluation mechanisms and expressing them through different professional and non-professional activities, languages and modes of relation (Outer, Handley & Price, 2012). Similarly, the different collective groups that have a stake in conservation practice, such as ecologists, taxonomists, and ethno-botanists who are members of various scientific disciplines, specialties, and research traditions are examples of a Social World. Social Worlds are composed of individual agents who also bring personal agendas and commitments to action (Clarke, 2005).

In a broader sense, “society can be conceptualized as interplay of social worlds” (Clarke, 2003 p. 45). From this perspective, any group or collective work collective encompasses a variety of visions arising from different social worlds intersecting and also participating in the construction of particular enterprises.

I used the SWA framework as a theoretical/methodological approach to address research question 2 and 3 concerning the work activities and perspective of scientists

working on SHBR. I also used the SWA when analyzing local community participation in projects in SHBR.

A SWA approach seemed pertinent for the case of my analysis of scientists' work in SHBR (question 2) for several reasons. For instance, this framework has been widely used in other similar science and technology studies (STS) (Clarke, 1997; Fujimura, 1986; Gerson, 1983; Tuunainen, 2005; Amsterdamska, 2007). This body of work (STS) conceives of scientific disciplines, specialties, and research traditions as social worlds that interact in a social ecology composed by humans and non-humans (Tuunainen, 2005). Moreover, within this body of scholarship, scientific social worlds are seen as "primarily production worlds in which the product is knowledge and it's actual or potential applications" (Clarke, 1997 p. 71).

These potential applications refer specifically to studies that focus on the place of science and technology in society and the ways through which the production of science and technology become interlaced with social norms and hierarchies (Jasanoff, 2004). In particular, some scholars employing the SWA framework have been interested in the study of "scientific practice, what scientists actually do, and the associated move toward studying scientific culture, meaning the field of resources that practice operates in and on" (Pickering, 1992 p.2). Amsterdamska (2007) describes the focus on practice-oriented approaches to the studies of science,

The focus on practice signalled a interest in patterned activities rather than rules, in speech rather than language as a structure, in questions about the use of instruments or ideas in a particular location and situation rather than in universal knowledge, in production and intervention rather than representation, and in science as a mode of working and doing things in and to the world (p.206)

An important part of the analysis of social worlds and arenas is 'boundary delimitation' (Clarke, 2005), this refer to the exploration of the ways particular social worlds—such as in my case of SHBR scientists and other stakeholders—conduct their work, what activities they prioritize or even what codes are used to create membership or non-membership to certain groups. In the case of SHBR scientists, I focused my analysis on the perspectives on conservation that scientists prioritized and on how their commitment to those perspectives shaped the work they carried out, affecting in turn

scientists' social worlds themselves. The analysis was thus, 'salient' to the dynamic character of organizational change.

The notion of 'arena' within the SWA framework refers to the site of encounter between and among various social worlds,

Over time, social worlds typically segment into multiple worlds, intersect with other worlds with which they share substantive/topical interests and commitments, and merge. If and when the number of social worlds becomes large and crisscrossed with conflicts, different sorts of careers, viewpoints, funding sources, and so on, the whole is analyzed as an arena. An arena, then, is composed of multiple worlds organized ecologically around issues of mutual concern and commitment to action" (Clarke and Star, 2007 p.113).

Arenas are in essence fluid, with fluid contexts of action, characterised by dynamic interactions among groups" (Vasconcelos et al., 2012).

A key element in the SWA framework in regards to arenas is that it concerns social action within a space where collectives interact and negotiate. The task of analyzing arenas is to elucidate the different actors', whether collective or individual, that come to an arena, and why they do so (Clarke, 2005).

My study of local inhabitants' participation (research question 2), was approached with a focus on arenas as "sites of action" (Clarke, 2005 p. 113), that is, in my own case, spaces where local inhabitants in SHBR established working arrangements with non-local actors.

The arenas analysis approach had several advantages. Instead of concentrating on each one of the groups or collectives involved, I was able to account for the interaction among different organizations but still concentrated the analysis on the arena as a site of co-participation of local inhabitants, rather than trying to deal with all aspects of all collectives involved (governmental and non-governmental staff, scientists).

Another advantage was that my exploration of arenas as sites of participation allowed a greater scope of analysis without restricting my focus to determination of social worlds. I did not consider a social world analysis for the case of local inhabitants'

participation for two reasons. First, it was problematic to consider local communities as an homogeneous social world with shared commitments and activities (Clarke, 2009). Local communities involved in the study were complex entities in themselves and considering all of these as a singular social world would have been an over-simplification. This multi-faceted theoretical approach allowed me to account for a view of SHBR local community as a complex, heterogeneous entity. The second reason not to conduct an analysis of particular social worlds was that my research question was directed at exploring ‘spaces of interactive participation’ within conservation activities and thus an arena analysis seemed more appropriate.

From an interactionist perspective, the arenas analysis allowed me to explore issues of difference (gender, scientific training, level of schooling) as factors reproducing unequal access to resources, decision making, distribution of benefits (Schwalbe, 2000; Clarke, 2005). In the case of local community participation arenas, I looked at the codes and modes of identification, members of different groups used for boundary delimitation. For instance, education—one members being members of an educated group, while other were un-educated and rudimentary—or the language (scientific or non-scientific) which facilitated or obstructed communication among groups.

This refers to what people were able to accomplish in relation to the resources and tools they had at hand and to the ideas they have about each other because ultimately, this enables (or prevents) their individual and joint action. Attention to difference therefore, allowed me to make visible the processes, ideas, relations that produce and perpetuated uneven interactions and access to decision-making among stakeholders in SHBR (Shwalbe et al, 2000).

Following Clarke (2005) questions of power entered strongly in my analysis of arenas as sites of action. She writes,

Quite specifically, I have sought to make silences speak through explicit project design and data gathering activities, including strong use of theoretical sampling.... Silences are complex strategies of power, very common analytically and they can be analyzed. Any and all “elephants in the room” need to be made to speak---to account for themselves (Zerubavel, 2002). (Clarke, 2005 par.3)

In my analysis of arenas of participation, I sought to explicitly account for the silences found in my data regarding local community participation as seen by local actors.

I used positional maps as a methodological intervention through which to interrogate more fully the silences in my data regarding local actors. While positional maps according to Clarke (2005) are developed with the purpose of making visible where silences appear in the data, she does not provide further guidance regarding how to analyze the silences as data *per se* (Friese, 2007). To address this, I used several theoretical notions. I used the notion of “implicated actors” (Clarke, 2005 p. 46) to refer to the local community inhabitants and understand what kind of “participation” their work in SHBR entailed. Implicated actors are defined as: “those who are physically present but are generally silenced/ignored/invisible by those in power in the social world or the arena” (Clarke, 2005 p. 47).

I also used the notions of “tactics” and “strategies” as proposed by de Certeau (2005). De Certeau refers to how, in their practices, ordinary individuals adopt ‘tactics’ that enable them to reclaim autonomy from the all-pervasive forces upon them (de Certeau, 2005). Tactics are what everyday people without authority use/borrow/steal, etc to intervene or assume authoritative positions that would otherwise not be theirs. Those (already) in power, those with symbolic titles, linguistic power, institutional certifications, etc are able to mobilize ‘strategies’, in contrast to tactics. The conceptual distinction de Certeau (2000) makes between strategies and tactics is that strategy presumes control while tactics are an adaptation to the controlled environment, which has been created by the strategies of the powerful (Goff, 2010). The inherent contradiction of strategic control is that the control is never perfect and the situation upon which the strategy was constructed is always changing, which constantly makes aspects of the strategy obsolete.

de Certeau’s approach searches to uncover “the clandestine forms that are taken by the dispersed, tactical, creativity of people who are already caught in the nets of discipline” (Lankshear & Knobel, 2002, par. 3). More optimistically, De Certeau speaks of the resistance of the everyday to the conformity of strategic direction. His idea of resistance does not necessarily involve active opposition, such as the case of local

inhabitants who may rarely resist, or oppose, conservation projects, but how these local actors—in their everyday encounters with non-local strategic actors—define ways to make those projects conform better to their own interests.

5.5.2. Actor Network Theory

In a distinctively postmodern analytic move that de-centers knowing subjects, Clarke suggests that situational analysis must take into account nonhuman elements that pervade social life, such as institutional systems, technologies and life forms, when doing research.

Clarke's inclusion of non-humans is inspired by the work of Actor Network Theorists, especially, Latour, Callon, Law and, Akrich (Clarke, 2005, p. 61). Briefly explained, Actor Network Theory is an approach that seeks explanations about 'social' phenomena that are distinct from traditional linear and hierarchical perspectives. ANT is distinguished from other network theories in that an actor-network contains not only humans, but objects, materialities and non-humans as co-constitutive of 'social' arrangements.

ANT therefore allows for analysis directed to reveal and trace the many connections, associations and relations among a variety of elements (human, non-human, material, discursive) to more fully describe 'the social' in a more nuanced mode.

Moreover, ANT's central directive is to focus the analyses on the concrete practices of actors, because is at this level that we can best grasp the constant circulations and flows of social agency in networks and associations. In Latour's words, "we have to bring into our texts a little bit of the practice of the people we study" (Latour, cited in Barron 2003, p. 81). This type of analysis requires a whole novel approach to understand and explain what the 'social' is made of. It understands the social as a contingent 'assemblage' (Latour, 2005).

An imperative directive to include non-humans in Situational Analysis is that they have to be considered 'symmetrical' in terms of their analytical value (Clare, 2005; Friese, 2007) because according to Clarke, humans and non-human elements can have similar weight and importance in shaping situations (Clarke, 2005). This relentlessly

ecological perspective on studying social arrangements problematizes the taken for granted view that only relations among people constitute the social, and recognizes that both human and non human actors modify the state of affairs in a given situation.

I used Situational Analyses methods in this study, within an Actor Network approach, to pursue question 1 of my dissertation, which concerned the establishment, and origins of SHBR. I used ANT elements as a way to state more precisely the associative character of the situation happening at the time SHBR was created. Actor Network Theory was useful here because my purpose was to trace the many connections, associations and relations among a variety of elements (human, non-human, material, narrative) and describe how these connections allow particular actors, processes and events to become stable enough to make the SHBR situation the way it was (Bosco, 2006).

Relying on the value of associations—or sudden concurrences of people and things always traceable and graspable, ANT central methodological directive is to “follow” the actors (Latour, 2005, p. 12) or the elements in a situation and map out their many complex connections.

Just as ANT directive of ‘following the actors’, Situational Analysis suggests to layout the major elements in the research situation of inquiry and to provoke analysis of relations among them (Clarke, 2005 par. 19). This is done through situational analysis mappings, which help analyze or ‘follow’ a wide range of data. Situational Analysis enacted the theoretical tenets of actor-network-theory as a formal methodology and as a form to lay out the complex networks in topographic, non-totalizing and entirely provisional figures of SHBR establishment.

In Clarke’s (2005) premise for a situational analysis, there is no such thing as context or background; rather, “the conditional elements of the situation need to be specified in the analysis of the situation itself as they are constitutive of it, not merely surrounding it or framing it or contributing to it. They are it.” (p. 71). On this premise, the creation of SHBR becomes a “relational achievement” (Whatmore, 2002, p. 35) comprised of a wide array of human and non-human actors (Latour, 2005; Whatmore, 2002; Jepson, Barua & Bockingham, 2009).

The description offered here of the establishment of SHBR resulted from an analysis in which both humans and non-humans (e.g. ecosystems, scientists, and inscriptions) had been integrated into the same conceptual framework and assigned equal analytical relevance. This symmetrical approach helped me appreciate the need to undertake detailed and (aspirationally) impartial description of the constitutive elements of SHBR as a 'situation' in conservation. It is an attempt to set out clearly and usefully the 'infrastructure' of SHBR as an "actor-network" (Latour, 2005 p. 133) in terms of its forms and its functions.

5.6. Why Situational Analysis

As reviewed in Chapter 4 of this dissertation, many others working in the field of political ecology have explored the complex social arrangements of conservation stakeholders in natural protected areas from a variety of perspectives. These studies concern varied themes and topics. Among them are:

1) Analyses of the 'virtual' character of natural protection initiatives. Researchers have used ethnographic and case study designs to explore how extra-local ideas and guiding narratives of nature and nature protection are transferred/conveyed to places where conservation initiatives are implemented (Carrier, 1998; West et al., 2006; Carrier & West, 2009; Blondet, 2010);

2) The science underlying conservation initiatives. Researchers have explored how the social and political realms shape both the formulation of scientific explanations of environmental problems and the solutions proposed to reduce them (Cairns, 2011; Forsyth, 2003; Forsyth, 2011; Walters & Vayda, 2009);

3) Citizen participation in environmental and conservation projects. Political ecology researchers have used ethnographic designs to study participation in the context of conservation and have devise participation typologies. (Agarwal, 2005; Maskey, 2005) Others have critically analyzed the forms of participation that occurred within stringent conservation projects designs (Buscher, 2013; Kuymulu, 2011; Gomez, et al, 2009; Empinotti, 2007).

From a methodological point of view, I considered Situational Analysis to be the most appropriate tool for answering the research questions I wanted to investigate and to contribute to the work in the field of political ecology.

The selection of Situational Analysis for conducting my research was based on the following factors. Firstly, Situational analysis is a method that can bring together many types of data about a situation: ethnographic fieldwork notes, interviews, and narrative, visual, and historical materials. This methodology appeared suitable for my research design as I could use varied data sources accessible from Canada (databases, online documents) as well as data accessible in my visits to Mexico (interviews, fieldwork).

I intended to analyze Sierra de Huautla Biosphere Reserve-- as experienced by the actors involved in this contingent rather casual situation. This necessarily entailed the generation 'from the ground up', of categories and broader themes derived from empirical formulations and interpretations of this particular set of data rather than deductions from a priori theories and models.

SA as a variation of the grounded theory method, afforded me with useful methodological guidelines. For example, it allowed me to have a rigorous set of directives for data gathering and analysis while not attempting to develop a generic theory. My analysis of this site-specific case was not intended as an analysis to inform broad generalizations or the formulation of theory. In my study, the construction of theories did not appear adequate to capture my intended purposes. The goal of my situational analysis was to generate descriptions, and provocative yet provisional grounded theorizations about SHBR conservation case.

Situational Analysis offered me a way to understand the intricate, non-linear interactions among physical, ecological, and social systems in conservation through the use of mapping tools designed to represent and analyze data with similar weight. Situational maps allowed me to include humans and non-humans, political orders, and historical situated practices of conservation actors, which appear relevant for the SHBR. This method of data analysis helped me tackle this conservation initiative in all its complexity and join an active body of literature that proposes new ways of studying, and

understanding conservation in natural protected areas as interactive arrangements between humans and non-humans (Nimo, 2011; Sundberg, 2011; Lorimer, 2007; Bosco; 2011; Jepson, et al., 2011).

For these reasons, SA appeared best suited to study SHBR. SA, allowed me to employ grounded theory tools and methods, but in a more cautious, exploratory and provisional way. With the purpose of sensitizing, suggesting and illustrating, I hope to be able to significantly advance a 'grounded' understanding of conservation in practice. — with a bit less than the production of a full-blown theory,

5.7. Ethical Issues

As historically and temporally located individuals, researchers are at constant risk of becoming another form of knowledge legitimation whose authoritative voice permeates our accounts of everyday life while silencing other voices. Bowker and Star (1999) write that when we choose a category, we are valorizing “some point of view and silencing another. This is not inherently a bad thing – indeed it is inescapable. But it is an ethical choice, and as such it is dangerous – not bad, but dangerous” (p. 7). This quote speaks about the choices we make and the significant implications these decisions have on our work.

Acknowledging the inevitability of the researcher standpoint has implications that extend far beyond reflections around methods for data collection and analysis; to focus attention on ethical issues concerning the significant responsibility researchers have in the constitution and legitimation of moral and political frameworks and assumptions. Accordingly, researchers are expected to provide information about their beliefs and biases, as well as detailed documentation of their research processes and decisions (engagement with research participants, development of research data collection methods, decisions on analytical choices) so that the reader is better able to consider how all of these aspects influence the research outcomes.

5.7.1. Issues of validity and reliability

One important aspect that helped me approach my project with a more critically reflective perspective is the fact that my research design was in large part the result of extensive conversations with professionals of very different backgrounds. Of crucial significance is the supervision of my project by a scholar outside the field of natural conservation and from overseas. Her ongoing observations about my project forced me to confront important features of my research design. For example, the first analytical exercise carried out very early in my research was the construction of the first situational map (Appendix A). My purpose in constructing this initial situational map was to lay out the main elements that were involved in the ‘situation’—the variety of elements of human and non-human character, acting in SHBR. Since I had myself been working in the research center for several years, I was familiar with the partnership and I could “move around” the data comfortably (Clarke, 2003). The situational map that I initially worked on was helpful in the beginning to identify the main players or ‘interactants’ in the context of my study. This exercise helped me become explicitly aware of the elements I considered relevant within the situation and to find stories to pursue. However, my supervisor pointed to the empty spaces or silences among elements as aspects that were especially valuable to explore. I had been overlooking significant aspects of the collaboration that seemed obvious to me, based on my assumptions about the collectives involved in the conservation project and the implications of operative perspectives in conservation. By suggesting that I should write continuous memos during my analytical exercises and discuss those with my supervisor, she helped me note areas where I did not have enough data and then devise interview questions on those specific silences.

Conversations with colleagues trained in other disciplines (geography, mathematics education and biology) allowed me to open my analysis to alternative hypotheses for the possible results of my study. For instance, during my analysis and writing of findings, I presented my work to my colleagues and they helped me read my data from different perspectives and with different purposes. These exercises became working groups for my data analysis and allowed me to integrate my colleague’s reflections and ideas. This process was particularly useful for my analysis of community

inhabitants' participation as rhetoric, which my colleagues constantly challenged on the basis of their own experiences in the design of conservation projects.

With regards to the interviews, one validity threat that I reflected upon during the course of my study was the fact that people that I interviewed had been colleagues of mine when I worked in the research center. This prior knowledge directly influenced the information I could draw from the interviews, and therefore posed risks for both the extent and kind of information informants might share with me, and thus for the validity of my interpretations.

One way to address this issue was to 'defamiliarize' my data by exploring the interviews with a new lens. To that end, I employed a sociological theory of language, which has its roots in "language motives" as approached by Mills (1940). I had collected both the literal responses from interviewees as well as the verbalized responses to my own specific questions regarding conceptions and practices of conservation. Mills' theory of 'language motives' enabled me to look further than informants' literal accounts and responses to my own questions. The strategy was to try to discern the particular intentions of individuals and connect them to the normative frameworks of motive operative in the study's specific located time and context. Rather than interpreting actions and language as external constructions independent of their social context, I attempted to understand informants' communications as "vocabularies of motive" that are related to particular types of action within frameworks of socially situated and contextual normative regulation. I thus endeavoured to explain the relationship between verbalizations (actual answers/statements of the interviews) and link them with the normative cultural/contextual "motives" about conservation work (research centre institutional mandate; governmental institutional mission statements). I saw this approach as a concrete mechanism for complicating—through languages of motive—an old binary: process and structure. For example, I studied numerous documents describing the mission and purpose of SHBR research center (annual reports, University research programs), which I consider structural/institutional frameworks shaping researcher's activities. I also had the actual answers from individuals and furthermore, their activities in the research center—situated practices/processes of work. I was able to contrast data (verbalizations) and how problematic it was for researchers to provide concrete examples of their commitment to include social aspects in their research.

In the later stages of my research, I also made use of procedures widely used in qualitative research to assure—in the ways possible—a degree of validity for the findings (Maxwell, 2013). I shared my formulations of their accounts with the interviewees. I tried to pay particularly close attention to feedback from the research center staff members, as I had already become aware of my biases towards their accounts.

The Chapters 6, 7 and, 8 include a detailed description of the decisions I took in the process of analysis. During that process of analysis and development of codes for my data, I read and reread interviews, field notes, documents and memos several times, revisiting my sets of codes in the process.

5.8. Research ethics and participant consent

In Mexico, measures to help protect the rights of research subjects are only implemented for research on health matters. Ethics committees do not regulate any other social research practice. This creates a situation in which not only the welfare of research subjects is not protected; but also, varieties of scientific misconduct might be occurring. In this context, most of the participants of my research were unfamiliar with the ethics process (i.e. signing of informed consent and being informed of details about their rights as research subjects).

Once I explained the ethics process, all participants were assured confidentiality and advised that their participation was voluntary. Participants were given the opportunity to refuse to answer any of my questions, or withdraw from my study at any time. Pseudonyms were used, however, participants were informed that in some cases descriptors of participants' positions (e.g., director of the research center) that were relevant for the purpose of the study might compromise assurances of anonymity. Those participants (directors and government authorities) were advised that they could be personally identifiable. All interviewees agreed to be contacted during the development of the study.

Participants were informed that the information collected was going to be used for research purposes only and that the outcomes of the research were going to be

disseminated through presentations at scientific conferences and publications in journals and through presentations at community gatherings when possible.

5.9. Research Process

As mentioned, I worked in the SHBR research centre for eight years, and this experience helped me approach the organizations from which I could draw informants. For this study, I made a total of three trips to México (August 2010 and April 2011); on each trip of two to three weeks, I conducted interviews, made field observations, and visited the governmental offices and research centre located in Cuernavaca City.

Early in my research process, I contacted the director of the SHBR research centre and he agreed to participate in my study. I also set up an interview with the regional director of the governmental agency in charge of NPAs in central Mexico.

Before I began collecting data in the field, I constructed a situational map (Clarke 2005) laying out the main elements involved in SHBR, in order to clarify my initial ideas about what was happening there (Appendix 1). As noted, this map was re-elaborated several times following discussions with my supervisor, who consistently invited me to make explicit things that I might have ignored, overlooked, or taken for granted given my previous involvement with SHBR. These initial maps helped me design interview protocols for the SHBR participants.

Later in the research process, I contacted the former director and promoter of SHBR, and SHBR scientists. The SHBR promoter was interviewed in subsequent stages of the research process and each time an interview protocol was design in order to obtain further information. I also contacted by phone one of the local members who acted as chief of the biological station and whom I personally knew. He helped me find participants from the communities of Quilamula, Ajuchitlán, and El Limon. The criterion for local community participants was that they had to have participated or be currently participating in conservation projects with external agencies. I personally contacted the NGO staff members while I was conducting interviews in the field in Quilamula.

Once I had completed fieldwork and data collection, I maintained continuous contact with research participants through email, Skype, and other forms of communication; this was very useful during the process of additional data collection and data analysis.

I interviewed participants from each of the three groups that established working arrangements in Sierra de Huautla: 1) SHBR research centre, 2) external agencies (governmental agency & Proselba NGO), and 3) local inhabitants.

The interview protocols were divided into three sections: 1) perspectives on conservation, exploring the theoretical position interviewees assumed in their conservation work (strict protection or people-oriented); 2) personal/professional background in Sierra de Huautla; and 3) collaborations, which addressed the perceptions of the partners regarding the collaboration undertaken together. The general interview protocols, which contain illustrative questions, are appended (Appendix 2). I conducted the interviews in person. The interviews followed a semi-structured format consisting of open-ended questions. Further questions were asked in response to individual accounts as salient topics arose. All interviews were audio-recorded.

The interviews with research centre staff members were conducted in the centre's offices. The interviews with governmental agency staff members were conducted in their offices, and the interviews with NGO members from ProSelba were conducted in a vehicle and while in project development. The interviews with local inhabitants were conducted in their homes, their workplaces, and the community park; interviews with participants from El Limon were conducted over the phone. Whereas the interviews with staff members and scientists lasted more than one hour, the interviews with community inhabitants were around 45 minutes each. I perceived that the latter did not feel relaxed with a structured approach, so I shifted the interviews to a more conversational realm. Most interviews conducted in the home were followed by a get-together with the immediate family, and it was in these spaces where I obtained valuable information on the inhabitant's perspectives and opinions about conservation work.

5.10. Analysis and Reporting

All interviews were transcribed in translated format. The segments were uploaded into NVivo, a qualitative data analysis computer software package.

I analyzed the interviews using methods consistent with Grounded Theory supplemented with Situational Analysis maps (Clarke, 2005). I first conducted a general analysis of respondents' interviews in order to identify broad areas of interest. I then performed open coding interview-by-interview in order to identify similarities and differences and to draw focus themes from the data (Corbin & Strauss, 1990; Clarke, 2005). This initial analysis of interviews and documents informed further data collection, in my application of theoretical sampling (Glaser & Strauss, 1967; Clarke, 2005).

I compared and contrasted the participants' responses within each of the three main sections of the interview protocol, then conducted a more detailed analysis to identify themes within that section. Whenever respondents referred differently to the same event or concept on more than one occasion within a section, I paid special attention to inconsistencies between their accounts in order to identify examples of "difference" and make them explicit in the analysis (Schwalbe, 2000; Clarke, 2005).

The data consisting of documents and textual materials were uploaded as PDF files into NVivo whenever possible since the program posed restrictions for other file types. The NVivo platform provided a way to link codes and assigned colors to instances of themes across data sources—documents and interviews; these were also analyzed in Microsoft Excel.

In presenting my overall thematic analysis, I first describe the core themes derived from the data; the analytical procedure will be treated in depth in the next chapters devoted to presenting the findings and answering the research questions. During my research process, the core themes served to refine and re-articulate the research questions until I arrived at their final form—which was presented in Chapter 3. It is important to note that many diverse issues, concerns, and perspectives surfaced during the interviews—far too many to be analyzed and reported in detail in one dissertation. The issues presented in my findings are those that better addressed my research questions and could be triangulated with other primary or secondary data.

1) Genesis of Sierra de Huautla Biosphere Reserve (Chapter 6)

My first research question concerned the local and historical conditions of the establishment of SHBR. This first theme comprises the account of a focal actor, the founder who established Sierra de Huautla as a protected area in the 1990s. This actor was directly involved in the advocacy process with political authorities of the time. Using the actor-network (Latour, 2005) approach, I followed the various connections referred to by this actor in his role as initiator and promoter of SHBR. I added references made by other respondents and data I collected (mainly documents and public resources) regarding the historical and political landscape of conservation in Mexico at the time SHBR was established.

2) Lived experiences of local inhabitants participating in conservation projects (Chapter 7)

In this theme I grouped information for my second research question concerning how local inhabitants were included in the SHBR collaboration. I included references to how conservation tasks and activities were decided upon and allocated within the community, and how local inhabitants were included in the overall working relationship. For example, I included codes referring to the inclusion of local needs or ideas when deciding conservation projects and codes referring to the various participatory arrangements described by local inhabitants. I also included documents such as the management plan and other relevant texts. In these texts, local inclusion was frequently referenced with regard to participatory decision-making processes, and this allowed me to triangulate the textual information with the interview data.

3) Scientists' perspectives and positions (Chapter 8)

My third research question concerned the role of science and scientific practice in SHBR. In this theme I explored the personal and professional lives of the scientists working in the research centre committed to SHBR. I synthesized the scientists' references to negotiations, requirements, perspectives, types of work, and commitments. I added a corresponding analysis of the researchers' scientific products using data from reports, academic databases, and research articles.

Chapter 6. Constitutive Elements of Sierra de Huautla Biosphere Establishment

This chapter concerns the genesis of the SHBR, and takes up the first research question of this dissertation: how was SHBR established as a protected area? In approaching this question, I asked what actors, bio-physical elements, and other local and extra-local political conditions appeared to influence the creation of this enterprise? Under what circumstances and on what grounds was this region promoted as requiring conservation action?

The purpose of this chapter, then, is to identify the many and various actors (both human and non-human), symbolic acts and decrees, actor status markers, and media interventions that contributed to constituting or “assembling” the SHBR as a ‘natural space.’ For this purpose, I contacted the promoter of SHBR research center, who played an important role in the creation of SHBR as a protected area. Additionally, I consulted a number of documents providing information regarding Mexican policy on higher education and conservation, as well as the international development of tropical dry forest as priority regions for conservation. Situational Analysis (Clarke, 2005) provided both the framework and the methodology to analyse these constituting situations, and Actor Network Theory (Latour, 2005) served to frame the interplay between human and non-human elements in the establishment of this protected area.

6.1. Data Collection and Analysis

I collected data from interviews, academic databases, and texts concerned with (national and international environmental policies concerning the protection of TDF) These are listed in Appendix B. I first interviewed the individual who led and promoted the SHBR project. That first interview consisted of three sections that inquired into: (1) his perspectives on conservation; (2) his personal and professional background in the

BR; and (3) his collaborations, intellectual synergies, and professional relationships with conservationists in and outside Mexico.

My analysis of the interview began with open coding of the transcribed translated version of the conversation with SHBR promoter. Open coding involved labelling segments of the interview with a word or phrase to describe its central idea or topic. This resulted in a total of 59 codes. Upon review, I disregarded coded data that referred to themes such as taxonomy and classification of biological species, history of conservation perspectives, conditions of work or publication record. These data were disregarded because did not offer information related with SHBR's genesis and were later used in the analysis of local participation in conservation projects and scientists work. The codes having direct reference to the SHBR establishment were then merged into a set of ten categories. Table 6.1 includes a brief description of the ten categories.

Table 6.1. Categories of elements in SHBR creation, as identified from interviewing its promoter

Category	Description
1. Promoter's academic graduate training	Historical and political conditions under which he attended graduate school
2. Promoter's academic credentials	Advantages of holding a foreign degree Access to political actors and media
3. Tropical Dry Forest (TDF) as an endangered ecosystem	References to the urgent need for TDF conservation, including frameworks and supporting documents
4. Inspiring ideas for SHBR	References to the ideas that inspired and guided his work in SHBR, and to key academics in and outside Mexico
5. Position of authority and power	Authority and power conferred by his foreign degree and international connections
6. Scientists influencing decision about the environment	Ideas about academics as influential actors able to access public spheres
7. International connections	The collaborations established in and outside Mexico during the promotion and establishment of SHBR
8. Campaigning for SHBR	The politics of conservation Strategies and public relations
9. Contemporary research in TDF	References to other scientists working in TDF research
10. Legal devices for SHBR establishment	The legal apparatus mobilized to establish SHBR References to management plans, inventories, and classification devices for natural areas

Following Clarke (2005), I developed a situational map of SHBR creation (Figure 6.1) featuring the above ten categories as well as additional elements that had “the capacity to condition interactions within the situation” (Clarke, 2005 p. 87). The additional elements emerged from questions such as: What political circumstances were involved? What non-human elements were required for establishing SHBR? What other institutions were important?

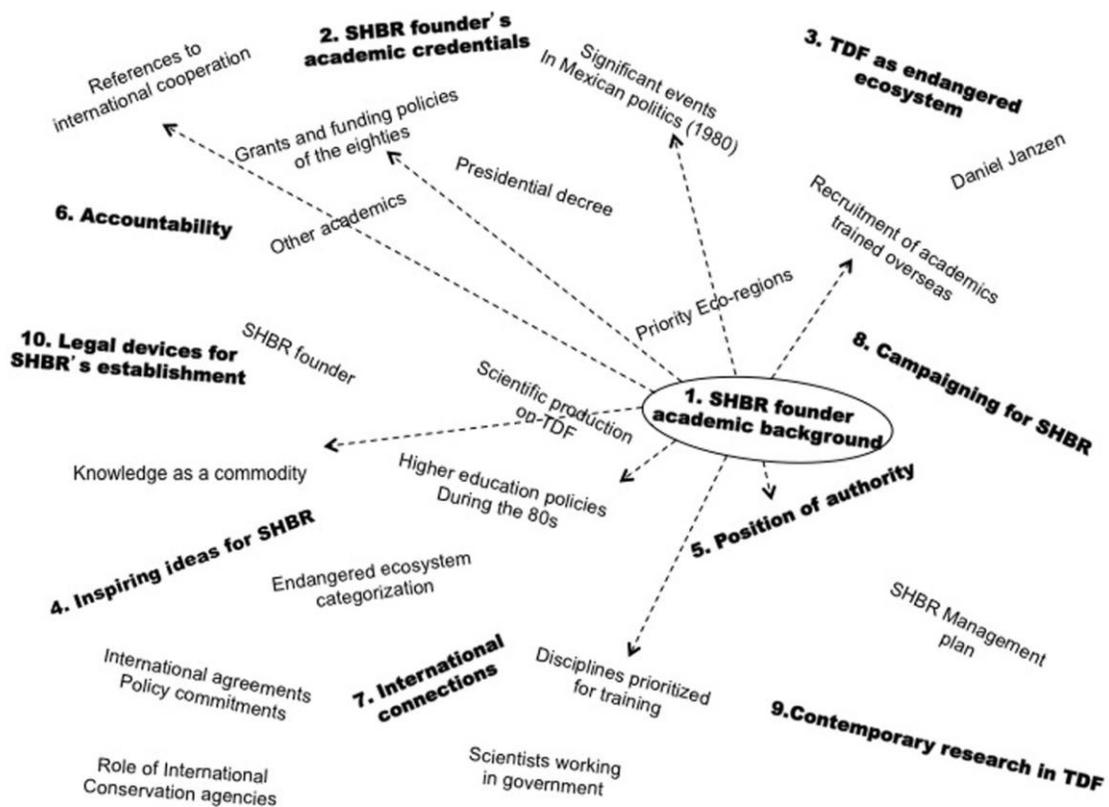


Figure 6.1. Situational map of SHBR creation, as developed from interviewing the promoter

I then used the map for relational analysis, which consisted of specifying the relationships among elements and asking questions about these relationships to identify the relevant broader conditions (Clarke, 2005). These questions guided my selection of textual materials for the next stage of data collection (Table 6.2).

Table 6.2. Questions arising from relational analysis and the sources consulted for corresponding answers

Categories/Themes and Questions	Data Sources
<p>1. Promoter's Academic environment</p> <ul style="list-style-type: none"> ▪What was the state of higher education in Mexico when the SHBR promoter pursued graduate education in the U.S.? ▪Were many students granted scholarships and fellowships to study in the U.S. in the 1980s? 	<p>Sources with information on the number of higher-education graduates in Mexico</p> <p>Government documents and reports on Education</p> <p>Reports on postgraduate training (1980-2000)</p>
<p>2. Promoter's Academic credentials</p> <ul style="list-style-type: none"> ▪Were professionals with foreign graduate degrees favored in Mexican universities? ▪How did the SHBR promoter's academic credentials support the promotion and creation of SHBR? 	<p>Reports on postgraduate training Mexico (1980-2000)</p> <p>Further interview questions</p>
<p>3. TDF as an endangered ecosystem</p> <ul style="list-style-type: none"> ▪Who characterized TDF as endangered, and on what grounds? ▪Was TDF always considered critically endangered in Mexico? ▪Who is the audience for TDF conservation calls? 	<p>Reports from major conservation agencies</p> <p>Reports on natural protected areas in Mexico</p> <p>Conservation literature</p> <p>Science-focused databases</p>
<p>4. Inspiring ideas for SHBR</p> <ul style="list-style-type: none"> ▪Who inspired SHBR creation? ▪Were there other authors that inspired him? ▪Did the SHBR promoter know other academics promoting BRs? 	<p>Management plans from other NPA's protecting TDF.</p> <p>Further interview questions</p>
<p>5. Position of authority and power</p> <ul style="list-style-type: none"> ▪In what ways did universities favor academics trained overseas? ▪How many PHDs were part of the Morelos State University ▪How did the SHBR promoter contact political authorities 	<p>Reports of Morelos State University academic staff</p> <p>Further interview with SHBR promoter</p>
<p>6. Role of media</p> <ul style="list-style-type: none"> ▪How SHBR promoter accessed media ▪Was the SHBR promoter involved in other conservation projects in Morelos state? 	<p>Media reports. Newspaper, TV and radio interviews to SHBR promoter during 1998.</p> <p>Further interview</p>
<ul style="list-style-type: none"> ▪7. International connections 	

Categories/Themes and Questions	Data Sources
<ul style="list-style-type: none"> ▪What international institutions participated in the SHBR establishment and in what ways? ▪What references are there to international support in the SHBR establishment documents? 	SHBR management plan Government reports on SHBR
8. Campaigning for SHBR	
<ul style="list-style-type: none"> ▪What were other references to political authorities in documents concerning SHBR? ▪Who did the SHBR promoter talk to when he was promoting his work? 	Decree documents, media reports on the decree of SHBR. Further interview
9. Contemporary research in TDF	
<ul style="list-style-type: none"> ▪What other significant articles concerning TDF in Latin America influence the SHBR establishment? ▪What other academics were researching TDF in Mexico? What were their connections with SHBR promoter? 	Scientific databases, Government reports, SHBR management plan
10. Contemporary conservation, legal devices and narratives for conservation underlying SHBR	
<ul style="list-style-type: none"> ▪What types of research were carried out before the SHBR was established? ▪What other institutions were involved in the legal establishment of SHBR? 	Further interview Natural protected area reports. Listings and inventories of SH previous to SHBR

Once I had gathered the additional materials, I conducted two follow up interviews with the SHBR promoter. These two follow-up interviews were more structured and direct, inquiring into: (1) details of his academic training; 2) examples of how his academic credentials benefited his advocacy for the establishment of SHBR; and (3) examples of his collaborations with academics in and outside Mexico.

Following an actor-network theory perspective (Latour, 1999; Nimo, 2011), I considered these textual sources to be “inscriptions” or “technologies of translation and mediation, or mobilizations of the world” (Latour, 1999 p. 99), rather than reports on ‘reality’. Thus, I analyzed them as “enactments of reality” (Nimo, 2011 p. 114)—means by which some things (ecosystems, views of nature and knowledge) were made present so that SHBR was set to work. This means that the tropical dry forest landscape, for instance, was ‘telling a story’ through the specific configurations of this ecosystem’s “vegetation, soil types, and myriad other traces that were interpreted and represented

through various scientific practices and translations” (Sundberg, 2011 p. 322) by scientists all around the world. Mobilizing this notion of ‘traces’ offered a way to “de-center the attention to knowing subjects” (Clarke, 2005 p. 3) and transcend anthropocentric understandings of “talk and text as the only mechanisms through which interactions or politics are configured” (Sundberg, 2011 p. 322).

I consulted four types of textual sources: (1) Mexican government reports; (2) citation databases (Google Scholar, Thomson Reuters Web of Science), (3) scientific articles on tropical dry forests; and (4) conservation reports and guidelines published by two major conservation agencies (World Wildlife Fund and World Resources Institute).

I examined Mexican government reports on higher education to find out what training programs were prioritized and why. Because the SHBR promoter attended graduate school in the U.S. during the late 1980s, I searched in particular for government expenditures on grants and fellowships offered to Mexican students.

I used citation databases to trace when and how tropical dry forests came to the attention of the scientific community. I searched Thomson Reuters Web of Science on the topic “tropical dry forest” and noted the number of published articles from 1967 to 2000, on the premise that publication volume is an indicator of scientific work on the TDF ecosystem.

I searched Google Scholar for the topic ‘tropical dry forest *conservation*’; I added the word *conservation* to select for scientific work related to TDF conservation rather than work focused on studying the ecosystem. From the search results, I identified the leading reference—that is, the one which appeared to be the most relevant based on number of citations—and looked up information about its author. I then looked for this reference in other documents to determine its impact on conservation literature.

I analyzed the 10 most-cited articles about Mexican TDF conservation in Thomson Reuters Web of Science, as well as reports published by Mexico’s Ministry of Environment in the years (1990-2000) spanning the legal establishment of SHBR, in order to answer two questions: (1) How were these references portraying Mexican TDF as ‘endangered’?, and (2) How did the narrative of TDFs as ‘endangered’ also have an impact on the country’s environmental policy realm?

I analyzed two reports published during the late 1990's from major conservation agencies which had labelled TDFs as endangered: (1) *The Global 200 Priority Eco-regions for Global Conservation*, published by the World Wildlife Fund, and (2) *Keeping Options Alive: The Scientific Basis for Conserving Biodiversity*, published by the World Resources Institute. These documents provide the central framework followed by environmental policy makers in Mexico, as evident from government reports. *The Global 200 Priority Eco-regions*, for instance, was cited in the SHBR management plan (Comision Nacional de Areas Naturales Protegidas, 2005 p. 13) and in the Proposal for SHBR protection document (Dorado, 2001 p.3).

I examined the reports' message for three pieces of information: (1) target audience (e.g., policy makers, funding agencies); (2) stated purpose (e.g., "Global 200 Eco-regions are primarily intended to spotlight regions of exceptional importance for strategic decision-making"); and (3) references to key authors and cited articles. I particularly looked for authors and references I had previously identified through my data base searches. The frequency and placement of references would indicate their degree of contribution to the report's content. For instance, an author who is identified in the acknowledgements as a reviewer or consultant has probably contributed more to the report than an author whose work is cited in the bibliography.

From the above data and analyses, I compiled two sections that provide a comprehensive description of the elements that appeared constitutive in the establishment of SHBR. They included people, ideas, scientific apparatuses, historical events, and political conditions.

6.1.1. A position of authority enabled by a foreign degree

In this first section, I describe the higher education policies fostered by the Mexican Government during the late 1900s (1980-1990), and how this relates to the SHBR promoter's personal academic story. I then describe how having academic credentials such as an overseas doctoral degree and connections with American institutions conferred on him a position of authority that facilitated his promotion of SHBR among political groups who endorsed the establishment of Sierra de Huautla Biosphere Reserve.

6.1.2. Tropical dry forests as ‘endangered ecosystems’.

This section concerns tropical dry forest. The view of TDF as endangered ecosystem was pre-requisite for SHBR to be promoted and later established as a Biosphere Reserve. The view of TDF as an endangered ecosystem could be traced back to the late 1900s when various academic and non-academic actors in and outside Mexico portrayed TDFs as “critically endangered” —via scientific reports, academic articles, conservation guidelines and categorization instruments. The TDF ecosystem itself and the instruments that enabled its categorization as ‘endangered’ were central actors for SHBR establishment to occur.

6.2. Findings

6.2.1. A position of authority enabled by a foreign degree

Fostering international training in the late 1990s

In the 1990s, global trends in politics, economics, and social culture gradually permeated policies in most Latin American countries (Licea de Arenas, 2003; Zazur-Miranda, 2008), partly due to their recent membership in organizations such as the Organization for Economic Cooperation and Development or the World Trade Organization (Pisanty-Levi, 2001). Member states were encouraged to adopt similar economic, social, and environmental policies with the aim of global competitiveness. (Pisanty-Levi, 2001; Zazur-Miranda, 2008). These international agreements profoundly changed the education system in Mexico (Licea de Arenas et al., 2003; Zazur-Miranda, 2008). Policies to internationalize higher education and emphasize international cooperation formed a strategy to confront the challenges resulting from international agreements and to complement the capacities of universities (Zazur-Miranda, 2008).

The new policies prioritized the training of professionals at the doctoral level (Zazur-Miranda, 2008). Doctoral training was considered one way to build the human capital required to make Mexico competitive in the emerging “new knowledge societies which relied on knowledge and high level training as a main driver of growth” (The World

Bank, 2002 p. 7). Mexican government officials especially valued producing highly trained professionals in science and technology (Alcantara, Malo & Fortes, 2011).

Knowledge became a commodity, a marketable item that could be exchanged and improved in order to fulfill the needs of an emergent market-oriented neoliberal economy in Mexico (Zazur-Miranda, 2008). In the General Agreement signed by Mexico as part of its commitments to the World Trade Organization, education was one of 12 “tradable services” (Zazur-Miranda, 2008 p. 177), a classification driving subsequent policies of the Mexican government. With ‘competition as the ultimate driver of higher education’, government reports called for entrepreneurial dynamism among universities around the world and greater international mobility of knowledge and students.

Government funding reflected the priority given to higher education mobility programs; higher education spending was little affected by 1980s economic crisis in Mexico (Instituto Nacional de Estadística Geografía e Informática, 2009; Centeno, 2003, Licea de Arenas, Castanos-Lomnitz; Gonzalez & Arenas Licea, 2001; Licea de Arenas, Santillán, Arenas & Valles, 2003). The government financed initiatives to strengthen professional development in science and technology, such as consolidating the National Council for Science and Technology and consolidating the Mexican Academy of Sciences, (Alcantara et al., 2011). The Ministry of Education gained a new secretariat dedicated to promoting graduate training and scientific research in Mexican universities (Alcantara, et al., 2011; Escobar Latapi & Gonzalez de la Rocha, 1995; Fourcade-Gourinchas & Babb, 2002).

The government implemented various measures to train specialized professionals at the graduate level (Centeno, 1997). Thousands of Mexicans were awarded scholarships within bilateral collaboration programs; there were 50 such programs in 1999 (Licea de Arenas et al., 2001, p 115). Numerous fellowships and grants aimed to develop human capital in research and technology. According to Licea de Arenas et al. (2001), “the Mexican Government—through the National Science Council (CONACYT)—awarded 24,000 foreign study fellowships between 1971 and 1995; of these, 9,800 were fellowships leading to the PhD degree in the period 1980–1998” (p.116). The number of scholarships to study abroad escalated in the 1980s thanks to flexible government requirements. “[A]ccess to money for a PhD in the United

States was considered relatively easy” (Centeno, 1997, p. 152). Financial aid that began in the late seventies boosted the enrolment of Mexican students in programs overseas, mostly in the United States (Alcantara, et al., 2011; Licea de Arenas et al., 2001).

Training of the SHBR promoter in the United States

Within this higher education-policy circumstance the promoter of SHBR received a grant to pursue graduate studies in biology at Claremont Graduate School in Los Angeles California in 1986. After completing his studies in 1994, he returned to Mexico and was appointed a Science faculty member at UAEM. As he recalls:

I was the first PhD graduated in USA that came to work at this university. Back at that time the university had only ten professors appointed as researchers with doctoral degrees. Having a degree overseas was considered better than having a degree from a national institution and that placed me in a better position relative to those who also had a doctoral degree.

The SHBR promoter was among a large number of graduates who returned to Mexico from overseas training in the late 1990s. Mexico welcomed many returning graduates with PhD degrees from American universities, mostly in the natural and health sciences (Alcantara, et al., 2011; Licea de Arenas et. al., 2001); between 1980 and 1998, 1,678 Mexican citizens obtained PhDs from the United States (Licea de Arenas et al., p. 117).

To avoid “brain drain” (Zazur-Miranda, 2008), Mexican universities increasingly favoured the appointment of foreign-trained academics in the 1990s (Licea de Arenas, et al 2002; Licea de Arenas et al, 2003; Alcantara, et al., 2011). In the words of Licea de Arenas et al. (2001), “Competitive positions opened, especially in academic and government research centres, and a reverse brain drain project [was] initiated to attract Mexican PhDs back from abroad to work and conduct research in Mexico” (p 116).

According to Alcantara, Malo & Fortes (2011), favouring foreign-trained academics supported the goal of “creating mechanisms to increase their influence on Mexico’s development” (p. 4). Foreign-trained academics were also valued for their research-oriented mindset and their access to external scientific networks and financial resources that could advance Mexico’s science and technology sectors (Alcantara, et al.,

2011; Clements & Alcantara, 2005; Zuzar-Miranda, 2008). Licea de Arenas et al. (2001) believed that “science policies in Mexico imply that the only worthwhile scientific activity lies far to the north” (p. 118).

Priorities for Mexican science and technology

The growing numbers of foreign-trained doctorates in university faculty positions significantly influenced Mexico’s science and technology agenda (Centeno, 1997; Alcantara, et al., 2011; Alcantara & Clements, 2009). They embarked on large research projects that received considerable government subsidies; these are known in the literature as the Mexican “Big Science” projects (Alcantara, et al., 2011 p. 6). These projects relied on international collaboration agreements and networks already established by the foreign-trained scientists, which enabled several Mexican institutions to set up laboratories, facilities, and other infrastructure (Alcantara, et al., 2011).

As a result of academic and financial ties with foreign institutions, projects became prioritized on the basis of international relevance (Licea de Arenas, et al 2003; Alcantara, et al.,2011). This was especially true for natural-science projects involving collaborations between Mexican and American institutions (Licea de Arenas, et al 2001), which are considered the forerunner of Mexico’s current research programs (Zazur-Miranda, 2008).

The SHBR project was one such collaboration between the Mexico and United States, as is evident from records of SHBR’s initial research activities (Dorado, 1997a; Dorado, 1997b). The floristic inventory—listing plants found in the area—frequently refers to collaborations with American institutions, as seen in this excerpt from the acknowledgements:

To help in the identification of the plants collected, a number of specimens had been sent to our team of collaborators located outside Mexico working at institutions such as: Rancho Santa Ana Botanic Garden, Oregon State University, Arizona State University, Michigan State University, U. S. National Arboretum and Fairchild Tropical Garden (Dorado, 1997b p. 4).

Initial SHBR research activities also received financial and academic support from institutions such as Kansas University and Cornell University, as acknowledged in decree documents from the Ministry of Environment (Dorado, 1997a p.61).

The value of academic credentials and international connections

Besides the academic prestige and financial advantages afforded by his foreign degree, the SHBR promoter's affiliations with American institutions gave him access to other realms. He explains:

The project in Sierra de Huautla was supported by Rancho Santa Anna Botanic Garden in California and I initiated it while still completing my doctoral degree when the state protected area was decreed. When I came back to Mexico, I promoted the decree as a Biosphere Reserve.

Since I came as a well-trained professional with strong academic ties and with the support of the American institution, it was easier to get support from the dean of the University and the Governor of Morelos. I had a good image and even the media was interviewing me as an important voice for many other issues related with the environment in Morelos.

Vested with academic and political authority, the SHBR promoter began promoting his conservation agenda, which led to the establishment of SHBR. He recounts:

I realized that this perception of the people around me who perceived me as someone respectable and powerful because of the PhD and my external connections could allow me to enter into a sector of politics. I realized the possibility of promoting Sierra de Huautla's conservation and thought that it was possible to use this political presence in establishing this area under protection. The political presence opened many doors for me. Several other academics had suggested that the area in Sierra de Huautla, specifically in "El Limon" which is a smaller geographical area, needed to be protected. But not all other people were listened to. Unlike them, I had the support of the American institution, I approached more politicians and so this became a powerful snowball of political forces and I used this power to conserve the area.

Sierra de Huautla was established as a Morelos State Protected Area in 1993 after a "remarkably short time of two years" thanks principally to "dialogues with Morelos' political figures" (Chitwood, 1996 p. 21). It was later established as a Biosphere Reserve by presidential decree in 1998. In his speech during the declaratory ceremony, then-

President Ernesto Zedillo acknowledged that several political authorities had endorsed the declaration. The Mexican President's remarks confirmed the SHBR promoter's influence with political figures and decision makers in Morelos State, based on this excerpt:

The decree of Sierra de Huautla that we are doing this day marks the culmination of a long effort of many people, an effort and enthusiasm. Particularly special is the work of the Morelos state government and the authorities of several municipalities in the state. And of course, I have to single out the effort, work, vocation, and devotion that [the SHBR promoter] has put towards this project for many years (President's speech).

6.2.2. Tropical dry forest contested characterization and its label as an 'endangered' ecosystem

Tropical dry forest and its contested characterization

The definition of a Tropical Dry Forest (TDF) is a contested one. Overall, the scientific literature presents tropical dry forests as the most "diverse" forests in the world with major occurrences in southern Mexico and Bolivia (Sanchez-Azofeifa, 2012). This diversity refers specifically to the variety of ecosystems co-existing within tropical dry regions. TDFs are thus, not homogeneous ecosystems with clear-cut, easily identifiable biological features but rather a complex entanglement of biophysical features.

This ecosystem has been defined in "many different ways based on different scientific criteria" (Sanchez-Azofeifa, 2010 p. 145). For instance, Trejo (1998) described tropical dry forests as a vegetation type typically dominated by deciduous trees. Pennington et al. (2000) includes many diverse vegetation formations in his characterization of dry forests such as grasslands, shrublands and savanna ecosystems. More recently, Sánchez-Azofeifa et al. (2005) considers "savannas, gallery forests, coastlines and mangroves among other types of vegetation among the associated vegetation types that can occur within the matrix of tropical dry forests" (p. 145).



Figure 6.2. Sierra de Huautla vegetation. Author: O.D. 2012.

The complexity of tropical dry forests in Mexico has also been acknowledged (Redowsky, 1978; Trejo, 1998; Trejo & Dirzo, 2002). Among the many explanations for the large biological diversity of Mexico is its strategic location in a transitional zone between the Neo-artic and Neo-tropical bio-geographical areas⁶ (Ceballos, 2006; Rendowsky, 1986). This bio-geographical location particular to the Mexican tropical forests creates climatic soil, environmental and hydrological conditions that allow for a complex mosaic of vegetations to co-exist such as: pine and oak forest, oak wood land, xerophytes, other drought-tolerant vegetation types such as dry deciduous trees (Trejo, 1998; Trejo & Hernandez, 1996). Trejo (1998), in an article featuring the structural characteristics of the tropical dry forest particular to Morelos states that setting precise geographical boundaries of TDF is not always straightforward. She writes that “the co-existence of varied vegetation types in the landscape often make it very difficult to distinguish “typical” tropical dry forest vegetation from other forms of vegetation in the landscape” (p. 49).

⁶ This contact-related explanation has been subject of criticism in the light of recent historical bio-geographical analyses. For instance, it has been argued that rather than biodiversity being a product of two distinct bio-geographical areas, Mexico’s seasonally tropical flora (particularly that of dry forests) was the result of the existence of a Pan-American Realm that can be traced back at least as far as 20 million years before present (Perez Garcia & Meave, 2012).

Despite the debate over the characterization of tropical dry forest, and the classification attempts by the scientific community, most outreach documents describing SHBR, such as newsletters, magazine articles and video materials, presented a more straightforward description: in summary, that the natural protected area covered by tropical dry forest is an ecosystem composed of “deciduous trees” characterised by “short canopy trees with long leafless periods occurring in the dry season” (See e.g. Dorado, 2002 p. 24; Martinez Garza, 2011 p.1). This description does not accurately capture the complexity of biological features existing in this natural system and presents a simplified view of the ‘natural’ characteristics of the tropical dry forest conserved in SHBR.

However, the simplified view of TDF in SHBR as a homogeneous entity facilitated in great part the promotion of this site as a natural protected area. Official classification of vegetation types as intrinsic of particular ecosystems is a tactic that allows for the characterization of certain vegetation types as endangered sites. This simplified and unproblematic view of tropical dry forest was central to the consolidation of SHBR into Mexico as a natural protected area. This classification, as we will see in the next section, endows certain places with a symbolic meaning which, ultimately, drives legal regulated protection measures in the form of decrees, speech tactics and other forms of stabilization.

Scientific attention to tropical dry forests, key actors, scientific agendas and the promoter

Unlike humid tropical forests, tropical dry forests received very little scientific attention before the 1990s (Janzen, 1998; Sanchez Azofeifa 2011; Barranco, 2005). Subsequently, TDFs began to attract unprecedented attention from scientists as indicated by publication volume on the topic of TDFs between 1986 and 1998 (Figure 6.3).

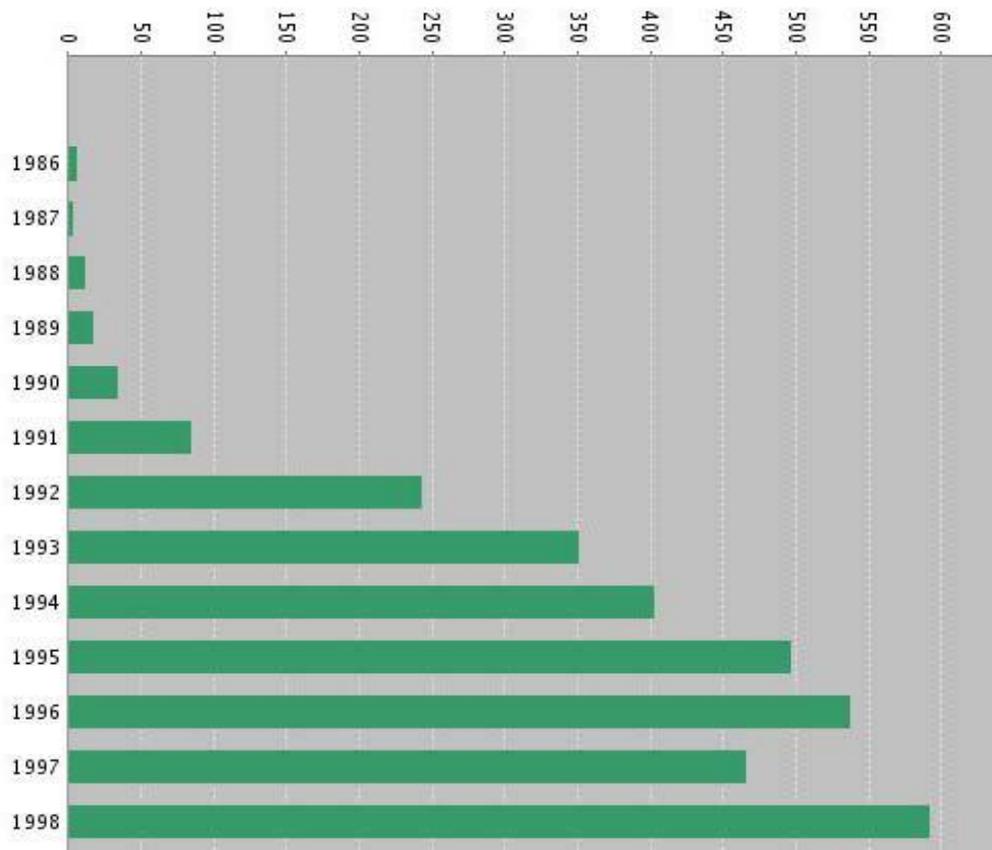


Figure 6.3. *The number of citations for “tropical dry forest”. Adapted from Thomson Reuters Web of Science for the years 1986 to 1998.*

The most cited document—revealed by a Google Scholar search—was a book chapter by Daniel Janzen entitled “Tropical Dry Forests, the most endangered tropical ecosystem” (1988). This article argued for making TDFs a research and conservation priority at a time when rainforests were the priority ecosystem among scientists and conservationists (Janzen, 1988). Citing “multiple and complex threats” (p. 133) that were causing increasing loss of biodiversity, Janzen explicitly asked academics, policy makers and governments to prioritize conservation efforts in tropical dry forested regions (p. 137).

Most of Janzen’s work was conducted in TDF regions of Latin America where he had established a strong reputation. Janzen is considered “one of the most decorated and respected biologists of our time” (Fraser, 2009, p. 303) and “the dean of tropical biologists” (Lessem, 1986 para. 4). By 1985, he had published more than 250 scientific

articles and had edited the tome *Costa Rican Natural History* (Fraser, 2009). Besides his academic influence, he used strong skills in public relations to advance his conservation agenda and his particular interest to protect TDF. According to Fraser (2009), Janzen is perhaps “the only biologist in the history of science gifted as a salesperson” (p. 310). He gave frequent academic lectures (Lessem, 1986; BBVA Foundation, 2012; Cincinnati Magazine, 1997); the SHBR promoter heard Janzen’s 1989 lecture in California and cites this encounter as his first inspiration for starting the SHBR project:

I started to be involved in this kind of work after I attended a presentation by Daniel Janzen. I heard Janzen and it was inspiring for me. I base my work in his experience in conservation. Janzen is a researcher and I heard him in 1989, he was looking for funding for his projects in Costa Rica and he attended the university in USA where I was studying. That impacted my life. He talked about the responsibility of a researcher and about his experience finding himself faced to a crossroad when he realized that researching species was not affecting the conservation of the site he had been studying. Janzen explain that only working in conservation as a researcher was selfish, because the work only impacts oneself. Instead, he advocated for a strong promotion of protection of natural spaces.

Contemporary to Janzen’s work, in the 1980s, the United States Man and Biosphere Program Directorate on Tropical and Subtropical Forests released “People and the tropical forest, a research report from the United States Man and Biosphere Program”, which also asked policy makers and regional governments to direct conservation efforts towards TDFs (Lugo, Ewel, Hetch, Murphy, Padock, Schmink & Stone, 1987). Drawing greatly from Janzen’s pioneering research in basic and applied TDF ecology, the U.S. Man and Biosphere Program commissioned a team of researchers to study TDF regions in three continents. By the end of the 1990s, most of the findings were released in the form of papers, conference proceedings, and dissertations (Murphy & Lugo, 1986).

The endangered tropical dry forest enters the policy realm

Shortly thereafter, these documents were cited in various reports by international conservation agencies as scientific support for conserving TDF areas. Various international organizations released policy guidelines and frameworks which echoed the characterization of TDFs as endangered ecosystems (Reid & Miller, 1989; Olson & Dinerstein, 1998; IUCN, 1991); specifically, they called for more protected areas to be

established in TDF regions and discussed the financial requirements of such initiatives. The 1990s movement to protect TDFs was crucially motivated by a growing sense of urgency among conservationists. They feared that ecosystems and large patches of biodiversity would soon become extinct and would not exist for future generations unless preserved as natural protected sites (Halfter, 2011).

In 1998, the World Resources Institute—a policy consultancy agency for resource allocation to environmental initiatives—published “Keeping Options Alive: the scientific basis for conserving biodiversity”. This “how to” publication (Reid & Miller, 1998 p.2) guided policy makers in identifying threats to biodiversity, evaluating conservation tools, and creating successful strategies to manage the global environmental crisis (Reid & Miller, 1998). The report categorized TDFs as the “most threatened forest type” (Reid & Miller, 1998 p. 49) and urged governments to promote TDF conservation measures.

Also in 1998, the WWF assessed the conservation status and distribution of the world’s eco-regions, one of which was tropical and subtropical dry forests. Based on four variables—habitat loss, size and number of larger habitat blocks, degree of habitat fragmentation, degree of protection—the WWF assigned a conservation status to each eco-region: critical or endangered, vulnerable, or relatively stable or intact (Miles, et al 2006). TDFs were categorized as one of the most “critically endangered” ecosystems (Olson & Dinsertein, 1998 p. 504) and added to the Global 200 priority regions.

Mexican policy actors take up the call for conservation of TDF

The Global 200 list is analogous to the endangered species list developed by the IUCN, but it focuses on ecosystems rather than particular species (Miles, et al 2006). It is the reference most often consulted by policy makers and conservation agencies when allocating funds and resources to conservation projects. The Global 200 list specified a “need to expand the protected area network of TDF in South, Central and North America” (Miles et al 2006, p. 502), and prominent Latin American institutions took up the call and undertook scientific research on TDF’s.

Particularly in Mexico, the government and the academic community responded in the late 1990s with various courses of action towards TDF conservation as found in the most relevant articles concerning Mexican TDF. Besides the research interest on

Mexican TDFs, these were endorsed as eco-regional priorities following two workshops coordinated by WWF and the Mexican Ministry of Environment between 1996 and 1999. In these workshops, “65 experts from 37 institutions” assessed the conservation status of Mexican regions according to the Global 200 variables and named TDFs as a conservation priority (Arriaga, 2009 p. 132). The Mexican TDF region includes the Balsas Basin area where SHBR is located (WWF, 2012). The inclusion of TDFs in the WWF eco-regional priority list had—and still has—important implications for environmental policy in Mexico. For instance, in the most up-to-date report on the status of conservation initiatives in Mexico, eco-regional priority areas are cited as central “instruments of planning for public institutions and non-governmental organizations engaged in conservation to support new proposals for declaration of protected areas” (Arriaga, 2009 p. 442).

The Mexican green agenda

One of the key arguments used as leverage to convince the Mexican government to endorse founding the SHBR and to transform the region into a natural protected area corresponded with the policy shift in the Mexican NPA management strategy: places subject protection required strong involvement of local communities inhabiting the area.

By the time Sierra de Huautla was identified as requiring protection, the Mexican government had already explicitly established this requirement for collaboration in planning and implementation between local and regional actors from civil society organisations, non-governmental organisations, academics and governmental agencies (Blauert & Dietz, 2004).

As highlighted in the previous background section on Mexican environmental policy, the Mexican ‘green agenda’ advanced during the 1990s was characterized by an emphasis on collaborative strategies and participation of regional actors (Blauert & Dietz, 2004). The purpose was to consolidate a more decentralized approach to management and planning in conservation initiatives. During the following decades a well-established participatory agenda in conservation was consolidated into Mexican environmental policy.

Sierra de Huautla was established as a state protected area during this distinct environmental political context in Mexico, and thus its promotion for protection was suitable for the overall environmental agenda of the country. For instance, the fact that the proposal for protection was advanced by a public state university assured that the project would have significant input of scientists and academics. Additionally, the area was inhabited by a large number of local communities and this offered the possibility of including them as collaborating conservation actors.

Throughout the period of establishment of the area as a protected one, the inclusion of local communities as co-responsible actors in conservation was a factor that was extensively heralded in the declaratory documents such as the Natural Protected area decree and the reports for the Mexican government. The following quote from the president's speech during the declaratory ceremony of SHBR serves as an example:

Above all, what has really made it possible to get to this point of establishment of SHBR, has been the acceptance of the project and the wholehearted participation of the inhabitants of about 30 communities located in the Sierra. You, the people of this Sierra privileged today, are the real stars and the first beneficiaries are announcing the decree. You know that this declaration does not alter the land. The work will start immediately to define the management program for SHBR with your participation. This document will take into account your initiatives and will not be completed until you accept it. The voice of the communities will be crucial to identify ways to work on ecological protection of Sierra de Huautla. (Sistema Internet de la Presidencia, 1999)

The decree of Sierra de Huautla Biosphere Reserve

In mid-1998, the SHBR promoter started working with staff at the Ministry of Environment and Resources on the technical supporting documents and the final proposal to declare Sierra de Huautla a Biosphere Reserve. These requirements for the official declaration of a natural protected area were completed and published in 1997; in 1999, the President of Mexico accompanied by the Ministry of Environment, Julia Carabias Lillo decree the Sierra de Huautla Biosphere Reserve in an official ceremony.

Between 1998 and 1999, the academic literature often contained statements underscoring the crisis facing Mexican TDFs and the urgent need to conserve them, as seen in this excerpt referring directly to SHBR,

The deterioration of dry forests in Morelos [state] calls for the application of urgent measures for its conservation and restoration, as well as the planning of management programs for protected areas. The forthcoming establishment of the Sierra de Huautla Biosphere Reserve and the implementation of its management plan will be important steps in that direction (Trejo & Dirzo, 1999 p. 145).

Currently, there are two Biosphere Reserves protecting Mexican TDFs: SHBR, and the Chamela-Cuixmala Biosphere Reserve located in Jalisco and created in 1993 (Ceballos, Szekely, Garcia, Rodriguez & Noguera, 1999). The legal documents for these reserves cite the 'urgent need to protect an endangered ecosystem' already assigned critical status by international conservation agencies, as shown in this excerpt from the SHBR management plan:

Special interest in the conservation of tropical dry forest has increased in recent years among conservation actors such as the National Commission for the Use and Knowledge of Biodiversity, the United States Agency for International Development, the World Wildlife Fund and The Nature Conservancy. These agencies have identified several regions with tropical dry forests as priorities for biodiversity conservation. The decree of Sierra de Huautla Biosphere Reserve ensures the conservation of an important part of the tropical dry forest of central Mexico, primarily within the Balsas Basin. (Dorado, et al. 2005 p. 59)

6.3. Chapter Summary and Conclusions

The purpose of this analysis was to explore how SHBR was established as a protected area and what were the actors, bio-physical elements, and other local and extra-local political orders that appeared to influence the creation of this conservation enterprise in Mexico.

Although I have accounted for a number of elements involved in the creation of SHBR from the standpoint of one focal actor, the genesis this Biosphere Reserve cannot be understood in all its complexity by acknowledging only the situated actions of its promoter. Looking beyond this actor, I examined the complex political circumstances in which he developed his career and brought SHBR into existence. The overall political agenda in Mexico—that fostered a priority for international training at higher education and the science and technology agenda at the time he studied—were essential

conditions for this individual to promote the establishment of SHBR. Having a foreign doctorate and connections with American institutions gave him a position of authority and earned his cause support among political groups. These circumstances help us understand how he was able to involve other political and non-academic actors in the process of creating of SHBR as a protected area.

In this chapter I elaborated on the international circumstances under which TDF was declared 'endangered ecosystem': an element central to the creation of SHBR. The view of TDFs as "endangered" or "at risk ecosystems" gradually permeated the Latin American conservation literature and ultimately gave rise to a crisis narrative: TDFs in the world and particularly in SHBR were in jeopardy. Which ecosystem counts as endangered is critically important internationally, as this characterization mobilizes a complex public and legal apparatus to support conservation through designating natural protected areas—in this case, the SHBR. I traced the evolution of this crisis narrative for SHBR by studying key scientific articles and conservation reports as well as the human actors who authored them, and I have described how this narrative itself is constitutive of the situation that is the creation of SHBR. My examination of the history of the establishment of Sierra de Huautla as a Biosphere Reserve not only describes who specifically intervened in the designation of this site as endangered and requiring a protection status, but also shows how international and Mexican policies played constitutive roles in this process.

The genesis of Sierra de Huautla is thus an example of 'virtualism'. The previous description of the genesis of this particular conservation case serves as an instance of the construction of BRs from virtual symbols and ideas. The focal actor's symbolic-institutional authority, his relations to other human actors, the local Mexican media, and non/governmental institutions (also, the focal actor's public relations work), as well as the agency of other contemporary professional and non-professional discourses (e.g., discourses with particular rhetorical visions of 'nature' and with corresponding value-systems embedded therein), allowed the construction of a space for the biosphere to emerge materially and symbolically (as socio-natural phenomenon).

Chapter 7. Mapping Lived Experiences of Community Participation

This chapter answers the following research questions: What are the experiences and activities of local inhabitants participating in conservation projects carried out in collaboration with extra-local actors in SHBR? This broader question included aspects such as the reasons for, the scope/ extent and the description of actual activities carried out by local community inhabitants participating in conservation projects in SHBR. Here I also look at the positions local community inhabitants assumed regarding their participation.

To answer these questions, I used the SWA framework to analyze the sites of participation of local inhabitants in conservation projects and to capture the lived experiences of inhabitants of SHBR as embedded in arenas of participation in projects for conservation carried out collaboratively with the three extra-local organizations: CONANP (The National Commission of Natural Protected Areas) governmental agency, SHBR research center and, the local NGO, PROSELBA (Proyectos y Estudios en la Selva Baja). The chapter presents an analysis of data drawn from interviews, documents and field observations to map the ways participation was negotiated amongst various actors concurring in SHBR.

7.1. Conservation projects in which local inhabitants participate

Local inhabitants of SHBR participate in three types of projects in coordination with extra-local organizations: 1) Projects carried out by local inhabitants as part of the government conservation programs, 2) Projects carried out by local inhabitants in coordination with the local NGO; Proyectos y Estudios en la Selva Baja (PROSELBA),

and 3) Projects carried out by local inhabitants in coordination with SHBR research center scientists.

7.1.1. Governmental Projects where local inhabitants participate

Local inhabitants in SHBR work together in projects that are part of two federal programs applied nation-wide in Mexican NPAs: the Program for Conservation for Sustainable Development (PROCOCODES) and the Program for Temporary Employment (PET).

The PROCOCODES program—originally called Program for Rural Sustainable Development—was the first program of its kind, which drastically differed from previous centralized environmental programs in Mexico (Garcia-Frapolli, et al., 2009; Blauert & Dietz, 2004; Stairs, 2007). Sustainability—in the context of the ‘green economy’ agenda prioritized by the Ministry of Environment—was understood as combining economic growth with environmental health, as well as eliminating poverty and social inequalities (Stairs, 2007). Described as a program “founded on the principles of participation, decentralisation and integrated development” (Blauert and Dietz, 2004 p.1), the PROCOCODES program consisted of providing funds for projects that emanated at the local level. The focus was on the protection, restoration and management of natural resources. PROCOCODES de-centralized approach explicitly focused on co-participation between local communities and regional governmental offices involved in the management of NPAs. The idea underlying the program was to bring “all stakeholders to the same table, with equal voice” (Blauert & Dietz, 2004 p.35) in the development and implementation of projects directed to conserving the natural state and to improve the local conditions of local people within NPAs.

The PROCOCODES program applied in SHBR is described as one that offers financial support for projects in the following three areas,

1. Technical Studies: Assessments of the status of biodiversity within NPAs, elaboration of listing of animal or plant species.
2. Community Projects: Construction of greenhouses, construction of community roads, facilities for ecotourism

3. Capacity Building Workshops: Environmental education, management of local species.

(Diario Oficial de la Federacion, 2013 p. 9)

The Program for Temporal Employment (PET) initiated in 1995, when Mexico underwent a serious economic crisis (Martinez-Lopez, 2011). As a reaction to the economic crisis, the Mexican government launched programs designed to promote employment among the most vulnerable groups in society and the newly unemployed. The program is still in effect in 2013, and consists in funding projects that employ local workers, aged 16 and older, in activities that relate to areas such as health promotion, preserving cultural heritage sites, building local infrastructure, alleviating natural disasters, conserving nature and promoting local development. The Ministry of Environment coordinates the PET for environmental activities. The scheme covers the salaries of the workers – set at 99 % of the local minimum wage – for a maximum of 132 days a year, as well as the necessary materials, tools and machines for environmental projects.

In SHBR the Program for Temporary Employment (PET) is run by the Ministry of Environment and Natural Resources (Martinez Lopez, 2011; Honkanen, 2012). In the context of environmental policy, the PET projects “aim at promoting the participation of local community inhabitants” in conservation activities (SEMARNAT, 2011 p. 13). PET projects are granted to “participatory committees” composed by local inhabitants who receive and implement the projects. According to the PET operational norms, the fact that local committees—composed by inhabitants—are the direct recipients of funds, assures that projects are bottom up initiatives that benefit local inhabitants (Hevia, Lope & Landa, 2011).

The PET program offered funds for employment of local inhabitants carrying out activities within three broad areas:

1. Activities supporting Conservation of natural resources: construction of firebreaks, cleaning of water bodies, construction of stone walls.
2. Activities of promotion of Communication and Environmental Education: developing interpretation trails, promoting clean environmental practices.
3. Activities of recovery in Natural Disasters: re-construction of dams, reforestation and restoration of forest.

In the context of work on conservation within NPAs, the PET program is considered “a supplementary program of PROCODES” (CONANP, 2012 p. 14) because it provides payment for individuals employed temporarily as workers in PROCODES projects. This synchronization of funds assures a ‘conservation economy’: an initiative of the ‘green agenda’ advanced in Mexico since the late 1980’s which attempts to provide long term economic benefits for communities and long term economic benefits for conservation (Stairs, 2007; Blauert & Dietz, 2004).

The operating rules and terms of reference of the PROCODES and PET programs are designed by the federal Ministry of Environment and Natural Resources and are released every year (CONEVAL, 2011) through a call for proposals open to all NPA inhabitants within the country. These operating rules and terms of reference for both programs include very detailed information regarding the amount of subsidy allocated for each project, the eligibility criteria for participation in projects, and the terms and conditions for the allocation of grants. It also includes detailed examples of projects subject to support (SEMARNAT, 2011).

The Ministry of Environment included in PROCODES and PET programs strategies to enhance women’s participation in projects for conservation in the late 1990s (Pagan & Sanchez, 2000). Particularly, since 2004, the guidelines for both projects included specific mechanisms to help achieve equal representation of women, such as having at least 50% of women participants in each project (CONANP, 2011; SEMARNAT, 2011). These mechanisms were included with the purpose of benefiting female inhabitants.

7.1.2. Projects carried out by local inhabitants in coordination with PROSELBA NGO

PROSELBA is a non-governmental organization that offers consultancy services for local communities within SHBR for the development of wildlife management units (UMAS). PROSELBA organization is composed of full time technicians trained in areas such as biology, forestry and engineering. PROSELBA staff developed UMA plans and invited local community inhabitants to apply as UMA managers. PROSELBA staff helped in various phases of UMA’s design and implementation. At the time this study was

conducted, PROSELBA NGO staff coordinated two certified UMAs for the management of white-tail deer in the Ajuchitlan and Quilamula communities.

UMAs require a management plan upon which to base the development of wildlife management activities. The plan has to be approved by the office responsible for wildlife management, which is part of the Ministry of Environment and Natural Resources. The UMA plan describes the physical and biological conditions of the area, the objectives of the UMA (hunting, breeding), and the activities planned to achieve the stated goals (e.g., vigilance, enforcement, contingency plans, habitat management).

PROSELBA NGO staff and local UMA managers periodically report activities to the supervising governmental office.

7.1.3. Projects carried out by local inhabitants in coordination with scientists,

CIBYC research centre operated two biological research stations located in El Limon and Quilamula. Scientific staff conducted research in these facilities while in the field. Local inhabitants participated in research projects as guides or local para-taxonomists, work which consisted of assisting researchers identifying plants and animals for classification purposes and serving as guides for researchers in the field.

7.2. Data collection

Three types of data were used in the study of local community participation in SHBR: interviews (Table 7.1), document analysis and observation (Table 7.2).

Table 7.1. Data Interviews

Collective	Description	Activity	No.
CONANP Government Office	Regional Office Director	Responsible for supervising all NPAs in the central region of Mexico	1
	Regional Office staff member	In charge of supervising operation of government projects in SHBR	1
	Regional Office staff member	In charge of supervising operation of projects and funding resources	1
Local inhabitants from Quilamula, Ajuchitlan and El Limon communities	Community liaisons with extra-local organizations working in conservation of SHBR	Participants in projects of conservation	10
Members of SHBR research center	Scientists	Have research projects in the area and collaborate with local inhabitants	3
PROSELBA NGO	Field technicians	Responsible for field projects and on-site supervision	2

The main source of information for the analysis of local community participation, however, was the data obtained from local community inhabitants' interviews. Data from individual members of the three extra-local organizations were employed as supplementary data.

Table 7.2. Data Documents and Field Observations

Type	Source	No.
Documents	Government Reports (Terms of reference and Normative regulations of the Program for Temporary Employment (PET) of the years 2006-2011)	5
	PROCOCODES Beneficiaries datasets	5
	PET Beneficiaries datasets	5
	PROSELBA Academic report about UMAS	1
	Research center annual reports	4
Field Observations	UMAS Workshop meeting	1
	Visit to UMA	2

7.2.1. Background information on local communities and demographics of local community inhabitants interviewed

Ajuchitlan, Quilamula and El Limon, are located in the north-eastern part of SHBR. Quilamula and Ajuchitlan are part of the municipality of Tlaquiltenango. El Limon community belongs to the municipality of Tepalcingo. These three communities were selected for the study provided their easy access and their continuous reference of government reports as beneficiaries of projects.

In these communities, most inhabitants live under conditions of poverty and extreme marginalization (Consejo Nacional de Poblacion, 2011); most inhabitants' housing lacks piped water, sewage, and electricity. Most of the male population are agricultural workers, *ejidatarios* or farmers. Most women work in their homes and those who have activities outside their homes are schoolteachers, merchants, or sellers (Rodriguez, 2006). There is no water irrigation infrastructure so farmers depend exclusively on annual rainfall, which in TDF occurs only a few months of the year. The level of income in these communities permits only day-to-day economic survival (INEGI, 2010). Inhabitants however, have not abandoned their land because many receive remittances from relatives who have migrated to the US (Rodriguez, 2006).

Morelos holds one of the highest numbers of male inhabitants migrating to the US in search of better living conditions (Garcia Barrios, 2009). This social phenomena, translates into women stepping to vacated positions in the organization of conservation projects. With regards to the conditions of women, like most rural communities in Morelos, Mexico, women in the two municipalities, experience significant gender disparity. For example, in the two municipalities where these communities are located, the average number of school years attended by men is 6.2 (which is equivalent to having completed primary school and a fraction more), while women have an average of 5.9 years of education (INEGI, 2010). Of the overall illiterate population, most are women. Regarding educational opportunities, gender has been a discriminating variable for a long time (Rodriguez, 2006).

Table 7.3 presents data from the latest population census (2010) conducted (Mexican Institute of Statistics and Demographics, 2012) in these three communities.

Table 7.3. Data from census

Community	Total inhabitants	Males	Females
El Limon	129	63	66
Ajuchitlan	218	110	108
Quilamula	703	346	357

Semi-structured interviews were conducted with individuals participating in projects conducted in SHBR, including local inhabitants, research centre scientists, CONANP governmental agency staff and local NGO staff members. I contacted local community inhabitants who participated in the study during a field stay in Quilamula. While in the community, I contacted a local inhabitant that I knew from my previous work in SHBR. He helped me contact male participants involved in conservation projects. Subsequently, these participants directed me to other interviewees (mostly, their wives and friends). The interviews with local inhabitants of Quilamula and Ajuchitlan were conducted in their own homes and in the sites where projects were implemented (greenhouses, deer farms, workshop meeting places). The interviews with inhabitants at El Limon were conducted by phone later in the research.

All local inhabitants' interviewed were presented with short descriptive questions around three topics: 1) Involvement in projects, 2) Activities and tasks, 3) Planning and implementation. All questions were asked in a non-leading, open way. Probes were used to encourage interviewees to expand and elaborate on examples and to express their own personal experiences with working on projects. Table 7.4 presents information on their interviewees' community membership, their gender and background and the specific projects in which they participated.

Table 7.4. Background of participants

Community	Gender/Background	Projects
Ajuchitlan	Male previous community authority	Participant in PROCODES projects: greenhouse.
	Male previous community authority	Para-taxonomist in scientists' projects. PET & PROCODES participant. UMA manager (deer management units)
	Female Shopkeeper.	Participant in PET: home garden project, stonewall project, and firebreak project

Community	Gender/Background	Projects
Quilamula	Female Housewife	Participant in PROCODES greenhouses, home gardens, and re-construction of water infrastructure. Participant in PET: stonewall project, and firebreak project
	Male Previous community authority	Participant in PET firebreaks project, stonewall project Participant as local guide in scientists' projects Participant in PROCODES project reconstruction of water infrastructure. UMA manager (deer management unit)
	Male Previous community authority	Participant in PET water dam cleaning, stone wall projects. Participant in PROCODES program: greenhouse worker
El Limon	Female Housewife Community teacher	Participant in PET: Greenhouse staff, and as medicinal plant workshop attendant. Participant in PROCODES Community infrastructure Participant as local guide in scientists' projects
	Male Previous community authority	Participant in stone wall construction and construction of infrastructure for Eco-tourism. Local guide in scientists' projects.
	Male	Participant in PET projects: stone wall construction and water dam cleaner and fire break construction
	Female	Housewife Participant in PET projects: stonewalls building and firebreaks construction

The interview with the local NGO staff member was conducted in the field during his time supervising a deer farm project, while scientists' interviews were conducted in their offices at the research centre, located in the city of Cuernavaca. Interviews with non-local community respondents included open-ended questions regarding collaborative undertakings with local communities in SHBR.

7.2.2. Documentary sources

I collected documentary data once I completed the coding of interviews to account for details about projects conducted in collaboration with local people. Information regarding the participation of local inhabitants in PROCODES and PET projects was obtained from governmental reports and research center annual reports.

Information about PET beneficiaries was obtained from the Centre for Information about the Program for Temporary Employment website (www.cipet.gob.mx). This

website is maintained by the Mexican government and contains information exclusively related to PET projects. Upon careful review of data I disregarded the information provided about the PET 2009 because the information about the El Limon community was erroneous; the names of individuals were repeated and the number of participants reported as beneficiaries in the website (345) was higher than the number of total inhabitants for that community reported by the latest population census (129).

The information on participation of SHBR local communities in PROCODES programs was obtained from CONANP website. Complete information about local community participation for the years 2006-2009 was lacking and the only complete reports for PROCODES programs participants was offered regarding the years 2010 and 2011.

The SHBR research center annual reports also provided general information regarding beneficiaries of PET and PROCODES programs implemented in SHBR and this information helped to expand data regarding project promotion and dates.

7.2.3. Observational data

Observational data was collected during my field work in Quilamula, Ajuchitlan and El Limon in December 2010 and April 2011. My field work in these three communities could be described as participant observation (DeWalt & DeWalt, 2002) given that it enabled me to learn about the activities of the people engaged in conservation projects in the natural setting where they usually worked (Figure 7.1). I observed and participated in those activities (collecting tomatoes in the greenhouses, fixing broken water hoses, clearing areas for planting various weeds).



Figure 7.1. Plant nursery project facilities in Ajuchitlan

During these days, I attended meetings and informal gatherings with local inhabitants. I wrote field notes during or after these observations. While I did not use any observation protocols, I did look for information regarding the type of participatory activities local inhabitants had during the meetings and gatherings with extra-local agents such as: 1) the frequency of active participation in meetings (asking questions, suggesting ideas), 2) whether local inhabitants remain in the community hall talking with extra-locals after the meetings were carried out and, 3) whether women attended meetings with extra-local agents.

7.3. Analysis and findings

I used the Nvivo qualitative data analysis package to accomplish a thorough classification of the texts obtained from the interviews. The software was very useful and helped sorting, categorizing and searching for material that had been input. Following the interview protocol, I grouped information referred by locals regarding the three sections: 1) Involvement in projects, 2) Activities and tasks, 3) Planning and

implementation (see Table 7.5). These categories were labelled as ‘generic categories’ because examples applied for all participants.

Table 7.5. Initial categories for local inhabitants

Interview sections	Generic categories	Examples
1) Reasons for participation	Dealing with poverty	-need to have additional economic options - accommodating conservation projects outside their farming's seasonal labour demands and of their regular activities.
2) Activities and tasks	Job conditions	-outspoken references to poor payments and lack of adequate job conditions -lack of knowledge about particulars of the projects -poor description of project deliverables
3) Role in planning and implementation	Ideas not listened	-references to suggestions for projects ignored -references to the need to have ‘points of passage’ in order to have something done in the community
	Mistrust in science by locals	-unfulfilled expectations about science in SHBR -ideas about things being the same before/after SHBR establishment
	Learning	- learning scientific names and later using for other projects and with other agencies -expanding communication channels with other agencies -learning bureaucracy

Once I had completed stage of analysis, I re worked in the categories in order to make a distinction between data examples drawn from female and male interviewees and to compare their experiences in terms of participation and involvement (Table 7.6). This was facilitated by the software which enables the researcher to assign colors for codes and categories (nodes).

Subsequently, I gathered additional documents (government and research centre annual reports) in order to enrich my data about project regulations, templates and frameworks. Excel software was used to organize and graphically present the information on community beneficiaries of SHBR as reported by the governmental agencies between the years 2006-2011.

Table 7.6. Gender-specific examples

Female interviewees	Male interviewees
Mostly family members of other individuals enrolled	Previous community authority position
Participation entailed extra work: commuting times taking care of children and household activities	Active role in design and implementation of Management Units
Preference to work with females	

In order to enrich the analysis and to expand on the information provided by local inhabitants, I used additional data from interviews conducted with members of the other three organizations involved: governmental staff members, local NGO staff members and scientists.

Following Clarke (2005), I developed a social world arenas map to lay out the arenas where local inhabitants participated (Figure 7.2). Looking at Figure 7.2, we see three arenas representing the sites of participation for local inhabitants:

1) Arena of participation Government-LC. The focus of this arena analysis was to interpret local inhabitants' experiences of participation within PROCODES and PET projects. The arena analysis included information drawn from governmental reports, research center annual report references to these governmental projects. I included data from interviews with the three staff members.

2) Arena of participation PROSELBA -LC. The focus of analysis in this arena was to integrate, local inhabitants experiences of participation in the units for environmental management (UMA) of white tailed deer, located in Ajuchitlan and Quilamula coordinated by PROSELBA NGO. I included in here, PROSELBA academic reports and data from the PROSELBA staff members interviews.

3) Arena of participation Scientists-LC. The focus of this arena analysis was to analyze the experiences of participation of local inhabitants as local guides or parataxonomists in scientists' work. I included in here data from seven scientists and information from the CIBYC annual reports.

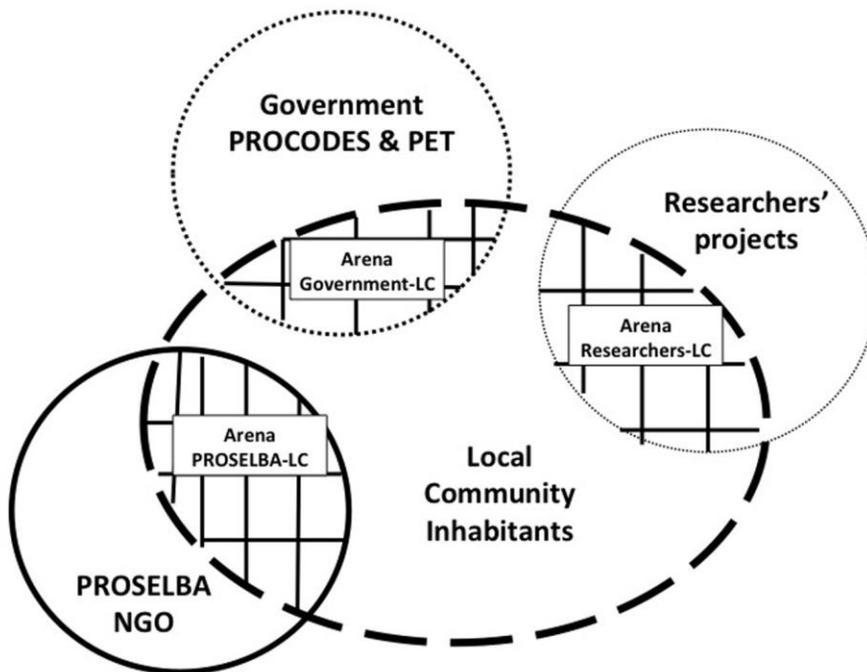


Figure 7.2. Arenas of participation

7.4. Participation Government projects and local inhabitants

Figure 7.3 shows the numbers of men and women participating in PET and PROCODEs programs in the three communities for the years 2006-2011 according to the government reports included in my analysis.

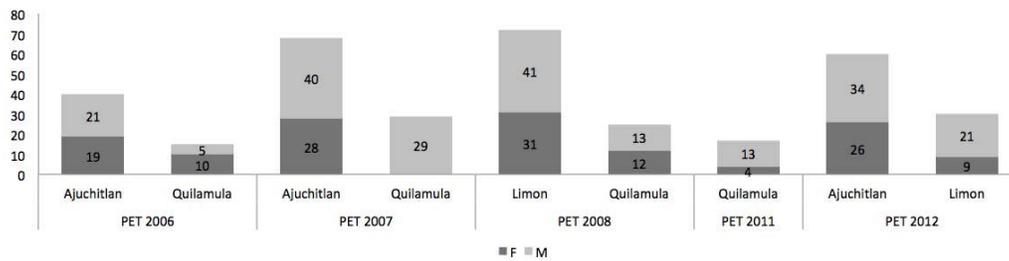


Figure 7.3. Participation in PET by gender
(in PROCODES and PET programs years 2006-2011)

According to Figure 7.3, men participated more than women in both PROCODES and PET programs. Overall, official reports show that Quilamula local inhabitants participated in both programs more than the other two communities I included in my study.

7.4.1. Reasons for involvement in PROCODES and PET projects

Five male participants interviewed mentioned that they had previously held an authority position within the community and that provided them access to participation in PROCODES and PET projects. Being a local community authority allowed them first hand information and contact with the agencies working in the area. Most of the participants explained that once they had started participating in projects, they kept working in coordination with agencies as a full time job.

I was appointed *ejido* authority and because of my position, many governmental personnel and researchers approached me to develop projects in the community. I started working in the greenhouse at that time and I am still working there

Male participants mentioned that they were reluctant to participate in PROCODES and PET projects with agencies and researchers when the Biosphere Reserve was established; however, they changed their minds mostly due to the possibility of accessing additional economic options,

At the beginning, when they started the Biosphere [reserve] I did not want to be involved. All the agencies and the university came at the same time and told us not to cut the trees. I did not want to be

involved in those projects. But the projects, they bring help me get extra money during the dry season.

For the case of women participating in PROCODES and PET, most indicated that they started being involved in projects because their husbands or other male family members invited them to participate in order for them to get temporary jobs and access additional income for their families. The following two quotes from female participants serve as examples,

My husband asked me to get the temporary jobs in order to increase the family income and I participated in the stone wall project. It was hard because I did not know exactly what the project was about. I just worked there moving stones from one side to another.

My brother invited me because he was an appointed authority and he knew the government wanted to have women in the projects

This was consistent with the interviews with male participants, who recall inviting their female partners and relatives to participate in projects. The government staff member from CONANP also recalled the increase in female participation in PET and PROCODEs because the terms of reference and operational rules for projects explicitly required female participation as part of the new gender agenda. It's worth noting that both male and female participants were mostly the better off community members, holding positions of local authority or being related to those holding such positions.

The female interviewees further explain that once they had access to the projects and contact with agency staff members, they had more chances to participate in other projects. Two of the female interviewees mentioned that they had organized teams after inviting their female friends. They were, at the time I conducted the interviews, applying for other projects. The fact that they gradually were familiarized with the bureaucratic requirements for projects applications helped them access more funds from other governmental agencies.

I started a sheep farm project with the Ministry of X because I invited my friends and sisters. With that project, I built the extra room that we have in our house and I bought two window frames. I also invited my friends and we applied for two more grants offered by the government. We want to have a barn so we can keep seeds and food for the livestock near the house. I hope they approve the project.

Female interviewees indicated that they preferred working with female staff when participating in PROCODES and PET projects. The fact that women were coordinating the projects and were conducting the workshops and supervisions provided confidence in the female participants who then, approached the female staff to suggest other projects.

I liked that during those years, there were B and G coordinating the projects and organizing the meetings. They listened to our ideas more than when it was a male organizing them. I remembered that we suggested working with *guaco* (local name of a medicinal plant) because it cures scorpion bites and we need to have medicine for that.

This was consistent with the interview with the female staff member who coordinated PET and PROCODES projects. She mentioned that in her work, it was important to talk to local women and invite them to participate in projects such as training in medicinal plant gardens, pottery workshops and small-scale animal husbandry. Women better accepted these projects because they did not pose difficulties in terms of mobility or time invested. For example, the medicinal workshops, conducted in women's houses or the home gardens located near their houses, did not involved having to walk long distances away from home and children, and they were not time consuming,

Working with the plants here at home is better because I do not have to walk all the way to the forest. The thing is that I did not stop my regular household activities, I still take care of my kids and I cook. I have to work in these projects to get some money so it is better if they don't take much time

During my day, I wake up, I sweep my house, I cook for my husband, I wash clothes and I can help in the garden too because it is near my house

7.4.2. Scope and extent of participation in PROCODES and PET projects

The interviews provided detailed information about the scope and extent of participation that local inhabitants had in these projects. For instance, when asked about their participation in the design of projects, most participants mentioned that the projects were already designed and that they had to choose among pre-planned projects offered as part of the PET and PROCODES programs. Their role in the projects mainly concerned putting projects into effect, or implementing existing plans.

“The government offers projects like stonewalls, or cleaning the dam or the forest. They come at the beginning of the year and they offer those projects to us. We do not plan the activities. They explain everything in meetings or sometimes they just make announcements through the speakers that are located in the community building”

As reviewed in the governmental reports, non-local actors working in the Ministry of Environment planned the projects’ operating rules and regulatory documents. Local inhabitants only participate in the implementation stage. Additionally, the administration of funds and the monitoring of projects were carried out by the CONANP staff member, who explained in his interview:

“I honestly cannot tell you much about that [how many people attended forest fire information meetings] because it has been a long time since I have gone to Huautla; I mostly coordinate work from my office.”

He further explained that his work was mostly done from an office located in the city of Cuernavaca, and that his knowledge about the work carried out in SHBR was based on the reports and data saved in his computer. This explanation seemed to me a clear example of *virtualism* which I elucidated in the introductory chapters as the attempt by policy-makers to make conservation conform to abstract models and non-local views of the environment (which have little input from local actors, and may not reflect actual realities, as articulated by local inhabitants). In SHBR, the planning process for PROCODES and PET projects were *virtual* in the sense that—as this participant explained—little actual knowledge of the place itself was required to keep conservation initiatives working. The planning process was alienated from SHBR, and virtual paradigms in turn exerted material effects upon and within SHBR.

This was consistent with the information provided by the CONANP regional authority staff, who directed me to the maps and files of SHBR in order to answer some of the questions I had planned to ask him in the interview.

Local inhabitants explained that their participation in PET and PROCODES projects at the very first stages of projects was limited to handing out documents and personal information and filling out forms. During the interviews, I specifically asked local inhabitants to define ‘what a project was’, and most participants described a process of

gathering, filling in documents and handing out lists of equipment. The following quote from one interviewee who was coordinating the greenhouse in his community serves as an example:

The project is when you have to hand out various documents: my identification, my proof of address, documents about the land tenure. That is a project. Then, usually the personnel from the government help us make a list of materials and equipment. We have to be very careful in including everything because if you forget one little thing, the project is stopped and you have to figure out how to get that missing piece from other offices or agencies.

The previous description offered by the local inhabitants reveal that the contribution of local inhabitants in the initial stage of project design was experienced by local SHBR stakeholders as a bureaucratic process with little value as a participatory exercise or as a process in which local stakeholders provided genuine input.

7.4.3. Activities performed by local inhabitants in PROCODES and PET projects

Most activities mentioned as example of local community participation in PROCODES and PET projects exclusively involved manual labour activities and did not require local community inhabitants to contribute any knowledge or particular skills. The actual activities mentioned by local community inhabitants as part of their participation in PROCODES and PET projects included: cultivation, weeding and planting in greenhouses and gardens, taking weeds out of dams and water wells; gathering stones and building stone walls; building fences for farms, feeding livestock.

The following quotes capture the idea that most interviewees had regarding their participation in PROCODES and PET projects,

That is how things work in these projects, they put the money and we put the hard work, no ideas, and no suggestions; just the work. We receive and follow instructions provided by agency staff or provided in the guidelines and documents

Activities in temporary jobs consist of doing hard work. For example, I had to take the weeds out of the water dam; sometimes I had to clean the forest. I work hard in those projects.

Local Inhabitants also shared their concerns regarding the conditions of their participation. For instance the lack of health and safety considerations for their work, as the next quote exemplifies. Waiting for payment was also a concern.

I carry stones up the hill and it is dangerous because there are scorpions and other bugs that can put you in the hospital

The work conditions in projects are bad and often we are not provided with safety equipment. Sometimes the money for payments comes late and that is not good for us mainly because we participate to get extra income.

7.5. Participation PROSELBA NGO –LC

Interviewed inhabitants participated in two UMAs for white-tailed deer located in Quilamula and Ajuchitlan. Exclusively male participants working together with PROSELBA staff members composed this arena.

7.5.1. Reasons for involvement of local inhabitants in UMAs

According to the interviews, a crucial reason to participate in UMAs projects was that technicians were independent consultants not affiliated with the government.

I heard from my friend that the technicians visited communities and promoted the deer management units. They did not come from the government and we thought we could try working with them. On that year, we did not work with the governmental agencies because there was a problem with them not paying us in time.

UMA participants explained that friends and relatives from nearby communities referred to positive experiences and successful working relations with PROSELBA technicians. Further reasons for participation with PROSELBA UMAs were related with the fact that PROSELBA staff members had a continuous presence in the community. For instance, rather than just instructing local inhabitants about their work, the NGO staff members spent long periods of time working together with local inhabitants and were respectful of the communities' culture. The following quote capture these ideas,

"It is different to work with NGO personnel because they spend more time here working with us. They come on time when they invite us to

a meeting and they stay in the community meetings even though they are long. That did not happen with the government or the researchers because they usually just come to do their work and they leave”

The PROSELBA staff member explained in his interview that he was born in Tepalcingo municipality. He explained that he was familiar with the customs of local inhabitants and that his familiarity with local costumes and experiences in the field granted him easy access to local community groups.

7.5.2. Scope/extent of participation in UMAs

The UMAs were pre-planned projects designed and suggested to local inhabitants by PROSELBA staff members who visited local communities in search of interested partners. Local inhabitants did not participate in the design of UMAs. However, the management of the UMA and the development of reports required greater participation by local inhabitants. For instance, the PROSELBA staff member explained that the capability of the land to support deer was influenced largely by vegetation types and soil conditions. Thus, the management units comprise several aspects that needed to be considered in order to maintain the deer population. For these reasons, the work performed by local inhabitants required training and close coordination with PROSELBA staff member,

We need to work together with locals and in coordination. We show them management strategies through workshops and talks. We do this because ultimately, we are here just for a while and they can keep the projects going”

NGO projects went beyond the government models of delivering instructions and supervising work. The activities that were part of the projects that I visited were conducted outside of formal or conventional formats. This allowed NGOs to reach a broader range of participants, and achieve a higher level of interest from local inhabitants. PROSELBA staff member seemed more flexible and open to change or supplementation of their original plans by integrating local inhabitants’ input.

This acknowledgement fostered an active engagement of locals in decisions regarding how to manage the deer based on their knowledge. The following quotes from two interviewees capture this idea,

I know some things about the environment and about the deer so I tell the technicians about the things I know.

I share my experience regarding the deer. For example, that I think that they need more space or things I know about deer's 'personality'. We know that deer is easily overwhelmed. It is very nervous and it gets angry. It acts exactly like the cow when she does not have water. She will get angry and she will stay and won't move, and then she starts shaking and she can even die

Local inhabitants working on deer management units mentioned the common challenges they faced when working together with other local community members. While NGO staff members were involved in the deer units, these non-local actors were not involved in some decisions which had to be arranged exclusively by the community. For instance there were conflicts that arose when various local inhabitants made decisions regarding deer units such as prices for deer hunting activities. The following quote from a local inhabitant explaining challenges following a meeting provides a good example,

Sometimes working together is challenging because there are a lot of participants and they do not agree on simple things. For example, the project for hunting is managed by many *ejidatarios*, all with the same rights. If a hunter wants to pay for a deer and we don't agree on a price, the hunter leaves because the work is not well organized. It is just a matter of having so many people agreeing on a price.

The information provided by this local stakeholder suggested to me that unlike government led projects, UMAS provided local inhabitants a broader space of participation; a space that was not infringed by non-locals (NGO staff members). Furthermore, in these spaces, local inhabitants were equally positioned and had equal access to decision making.

7.5.3. Activities performed by local inhabitants in deer management units

Overall local community inhabitants' description of their activities in the deer management units included: 1) attending workshops, 2) participation in the development of trails, 3) suggesting management advice.

During my attendance at the two deer management workshops I observed attendees actively participating and engaged in the activities. They asked questions regarding the type of antlers that were shown during the talk and about the general guidelines to build fenced areas. Participants seemed interested and were actively engaged in the talk and the demonstration of deer antlers.

Most interaction among PROSELBA staff members and local inhabitants occurred after the formal part of the workshop was concluded. Local inhabitants approached PROSELBA staff to ask further questions or talk about details of the activities they were carrying out. PROSELBA staff stayed in the community hall a considerable time after the meeting was officially concluded. These observations were consistent with the information provided by local inhabitants with respect to the presence of NGO staff members in the community and with their accessibility.

7.6. Participation scientist-LC.

7.6.1. Reasons for participation in scientists' work in the field

Most local inhabitants participating as local guides mentioned that the reason why they participated in researchers' work was that they had been contacted by researchers during their appointments as community authorities.

The university researchers were conducting a study on forest species and at that time, I was a community authority. The researchers had to approach me in order to get a permit to work and I was very close to their work and learned a lot. I helped them and showed them where the trees were and I learned how they study and I kept the information because I knew it was useful.

The participation of local inhabitants as local guides or para-taxonomists was not formally stated through a contract; therefore participants did not receive monetary payment when helping scientists. However, according to the interviews, there was always some kind of compensation from scientists to locals, such as technical advice for managing their crops or donation of items such as clothes or medicines.

We need to help them because the poverty is very evident. We asked her [community member] if she was offended if we donated clothes to her and her family. We gave her clothes

A very common view expressed by scientists regarding the reasons to work with local inhabitants was the need to teach them about the natural resources found in the area. The aim of these educational efforts was to involve local actors in wider conservation agendas.

“We need to teach them about the resources and show them why these resources are so important. I mean, it is a Biosphere Reserve precisely because it is important for the world.”

However, this intended teaching had challenges. For example, it was difficult to instruct the local inhabitants because they did not ‘speak the same language’ as the scientists. Also, the scientists needed to overcome perceived differences based on one group being from “rural, poor communities” and the other group being from urban environments with greater access to educational resources. Examples of this found in the data are captured in the following quotes from the research scientists:

“They like working with us. They feel like they are like us, we are the same. We make them feel that way, that we are no different”

“We, as scientists, have our own language and if we are here, in the research center, we talk to everyone in the same language. But when we go to the communities and we talk to them, we need to make our language easier to understand.”

“You need to be humble when you are working with local communities and that helps to maintain a better relationship with them. That makes them feel that there is no difference between us and them.”

In my data, there were continuous references to ‘differences’, particularly differences between scientists and the other stakeholders. For example, the scientists’ citations in the previous paragraphs refer to the codes which differentiate them from local inhabitants: being educated, using particular languages, or their efforts to show similarity (being humble).

7.6.2. Activities performed by local inhabitants in scientists work

The actual activities performed by local inhabitants in their participation in research projects were to provide information about location of species and help in the classification of plants and flowers. They also helped scientists maintain their research equipment while in the field, as one local inhabitant explained,

I helped them place the cameras in the community and later I informed my neighbours about the ongoing research work so then nobody take the cameras away...

The director of the CIBYC research center explained the participation of local inhabitants in research projects. From his point of view, local knowledge, for example experiential knowledge about plants and animals was useful for scientists because it was the starting point for a system of scientific knowledge. He described that local 'experiential' knowledge that local inhabitants had regarding plants or elements of the environment such as changes in the climate was rustic or rudimentary. The value of this knowledge, however, from his perspective, was that it can become the basis for further lines of research that could produce new scientific knowledge.

He explained that only through rigorous scientific methods was possible to know if there was 'truth' in the local community's perceptions. He elaborated,

For example, if community members know that one plant species heals a physical condition, then, probably, there is something true or "strictly real" in this plant, such as an active component. Then, with research, you can know if that is the case.

Let me give you an example: local communities and '*campesinos*', have agricultural activities that follow patterns in the natural settings, and this has been the case for long periods of time. '*Campesinos*', take information from the natural setting and this information determines their agricultural activities. They use for example, modification in the state of plants or specific trees as a sign to start their agricultural cycle, or some other activity. This type of observation, is telling us that there is something, perhaps an eco-physiological phenomenon occurring in that plant, so it can suggest a line of research"

The explanation provided by this scientist led me to think that there were examples of research lines he had followed after a conversation with local inhabitants. However, he explained that the example he provided was not precisely from his work in

SHBR. He explained that most of his research lines were derived from his literature reviews and from conversations with other scientists in the center.

7.7. Positions found in data regarding participation of local inhabitants

Given that my purpose in this section of the analysis was to explore the experiences of the first-hand actors from the local communities participating in Sierra de Huautla Biosphere Reserve collaborative undertakings, I reflected that in my analysis, the position of local inhabitants had been usually silenced.

The other three collectives analyzed (CONANP, CIBYC and PROSELBA) had documents and ample textual references (published materials of different kinds, journal articles, and regulatory documents) directly generated by them which stated the relevance and significance of local community participation in conservation of SHBR. Including the explicit regulatory documents and operational rules for community projects—roles assigned to—locals (projects, programs), there were no stated references about local community participation, nor direct citations from local community participants that could be attributed to local inhabitants or which reflected their views, descriptions and/or opinions regarding their participation in conservation projects or planning sessions.

I developed a positional map as a way to visualize the positions stated in the data and to see where silences appeared (Figure 7.4).

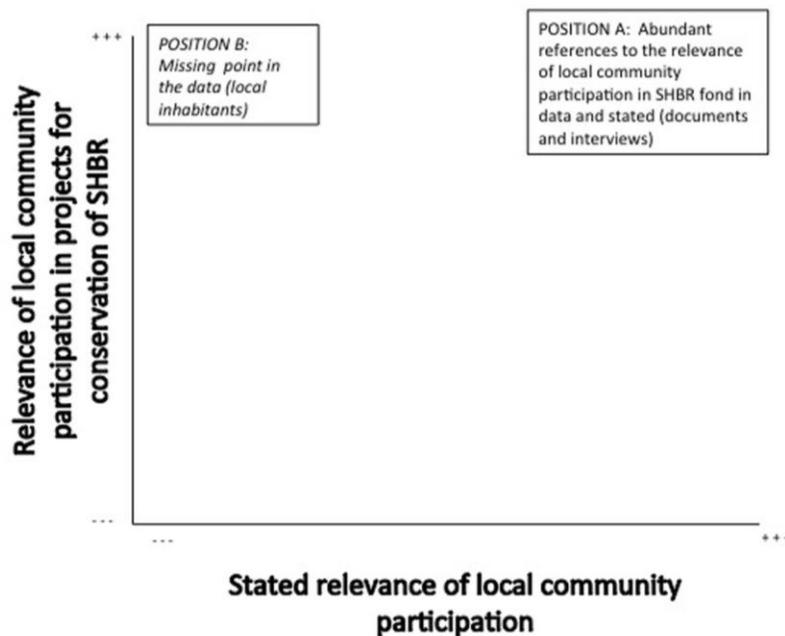


Figure 7.4. Positional map about relevance of local community participation

In Figure 7.4, we see two positions articulated through my data. The positions were articulated vis-à-vis references to local community participation used by the three collectives included in this analysis.

At the top right is the official position A: that local participation is often referred to as a central objective of the SHBR conservation project. In the analysis of the interviews and while analyzing additional data sources (positional maps, interview data, textual documents), I found that data from members of the three collectives (governmental agency, research centre and non-governmental agency) would be easily placed in the 'explicit position' regarding the relevance of local participation in conservation work.

Evidence of this was available through a basic word frequency count (Weber, 1990) of the word 'participation' in the PET and PROCODES Operation Manuals for the years 2011. The document search showed that the term 'participation' was used around 25-30 times in the documents that were approximately 40 pages in length. This estimate shows how often the term was employed in the texts concerning programs applied in SHBR.

The relevance of community participation, as a strategic objective, was also articulated in the scientists' own interviews, texts, regulatory manuals and government reports. The following quotes (from an interview with a scientist, the CIBYC annual report for the year 2011 and, the SHBR Management Plan) serve as examples of how local community participation is, at least in principle, a guiding value:

[Local Participation] was an idea that we [conservation scientists] shared with the authorities at the time Sierra de Huautla was established. We shared the idea that local communities needed to be included in the conservation strategies that were being implemented in their surrounding locale. For that reason, since SHBR's establishment, several mechanisms of community participation have been applied (researcher)

We need to implement a series of comprehensive projects that addresses the needs of SHBR residents and allows them to be full participants in conservation projects. Among these projects (developed by researchers from CIBYC and whose development requires external funding) we can mention a few: the training of local community inhabitants to participate as community environmental promoters, garbage management projects, and the development of a SHBR Museum (CIBYC annual report)

In order to achieve the desired outcomes set in this plan, it is necessary to take steps to include the participation of local owners of the land. There is a need to make local owners appropriate this management plan. This will guarantee that all stakeholders comply with the rules and regulations that this document presents (SHBR Management Plan p. 88)

The word 'participation' in the Management Plan appeared 33 times (total of 207 pages). Direct references to examples of 'participation' in the Management plan however, were mentioned in the context of local inhabitants agreeing to use sites for field stations or agreeing in the setting of zones of protection.

I also found references within the interview data about how SHBR communities had strong traditions of community participation, primarily related with religious festivals and civic celebrations of various kinds. The hypothesis underlying many conservation and research projects was that the 'participatory culture' of the communities could be leveraged to implement such programs. The following quote from a scientist serves as an example:

Limon and Quilamula are what we call 'star' communities. Unlike other communities, these particular villages are very well organized. You can see this in the way they all participate in cultural and religious celebrations. We support their Christmas festivities every year and we know that this will reflect in their commitment for the conservation work in the area.

Yet, the missing element in the data (shown in position B, top left corner) was that there were no stated positions, evidence, or citations regarding community participation, as articulated through the data from interviews with local inhabitants.

That 'missing point in the map' was indeed a 'silence' that needed to be acknowledged, and explored, a loud absence or telling elision in its own right. This is not to say that this position (local participation) did not exist, but that it did not appear in any of my data.

While community participation was emphasized as a fundamental part of both strategic planning and implementation, contradictorily, there was a paucity of data on the record that would indicate active participation or critical involvement (outside of enrolment into training programs, service roles, or management projects).

The fact that the local community inhabitants interviewed did not take any documented position regarding their participation was quite interesting. In examining community inhabitant's experiences in the conservation project, I concluded that, perhaps, local residents did not articulate positions on these issues because they lived in the area and the idea that there was a 'need' to include them in conservation in Sierra de Huautla was not something locals even considered. It was a given that they 'were involved' in the area as primary inhabitants. Local inhabitant's participation, as seen by extra-local organizations, simply resulted from the establishment of SHBR as a protected site. The subsequent application and implementation of projects 'for conservation' was part of the novel conservation machinery brought to the SHBR region after its decree as BR. In this situation, perhaps, the mere thought of genuine/active participation by local community actors appeared incongruent or superfluous.

The relevance of local community participation in conservation in BRs is often difficult to study empirically because the notion of participation is generally assumed (since local residents are just there, within the protected areas). Paradoxically, actual

participation by local residents is very rarely documented or cited in the available data. However, bringing this paradox to light helps us better understand conservation and its complex and sometimes contradictory character. One such complex factor is the persistently disparate access, or even lack of access, to decision-making situations where definitions of conservation goals take place, and where projects are analysed and planned in practice.

Scientists, government and non-governmental actors have within their reach a wide variety of resources (financial, textual, technological, symbolic, and regulatory) which give them a 'voice' and grant them the capacity to act, define, decide and implement a certain view of both conservation and "local participation" in SHBR. Access to resources—such as management plans, project proposals, and scientific reports—are the means by which their agenda for local community integration is realized and legitimated. These trans-local processes are, however, shaped by expert systems (including individuals and textual devices), created elsewhere, which ultimately shape the everyday lives of local inhabitants in SHBR.

Conversely, local inhabitants did not have access to these mechanisms, resources, sites, devices and codes. They did not speak the legitimate/institutional languages, that is, the scientific 'speech genres' or academic/disciplinary languages required to make their voices heard, or hearable as 'legitimate' speech. And they did not operate within the symbolic spaces of conservation science and policy. Hence the local community inhabitants were not capable of representing themselves within the conservation narrative existing in SHBR. Put otherwise, local inhabitants may indeed speak or try to represent themselves, but their speech may be ignored or 're-captured' (de Certeau, 1998) by scientists and policy makers who can make 'better sense' for them. In this way local inhabitants may become "implicated actors" (Clarke, 2005 p. 46), that is, those that are present (and officially valued, in the abstract, as "community participants") but who are practically neglected, made invisible, or 'constructed' by the other credentialed actors who engage them within the arena. Furthermore, this analysis points to the process in which one particular notion of participation and its underlying rationales may ultimately, in practice, exclude the alternative perspectives, experiences, and involvement of local actors.

7.8. Contesting practices, challenging codes: Participation tactics

Once I had accounted for the silences found in my data, I went back to my interview codes and focused exclusively on identifying local community's accounts that could be descriptive of occasions of participation and/or disruptive narratives in the context of their work in collaboration with other (extra-local) stakeholders. I found plenty of references to experiences pointing at the ways locals 'borrowed from the experts' or accounts of instances (tactics) where locals disrupted the rigid templates of projects put their own ideas into practice.

7.8.1. Borrowing from the 'experts'

Local inhabitants mentioned that their participation in the research projects coordinated by scientists responded to their expectations about scientists' presence in the community,

I have convinced other members in the community to welcome researchers and help them in their work. I see this as a way to help each other. If we don't throw garbage (where?) and accept their work in the area then they can bring help to the community. Moreover, we learn from them.

The reference to 'learning' referred by locals was not only present, but persistent in scientists' accounts. For instance, scientists viewed local community participation in their research projects as an opportunity to teach local inhabitants about the biodiversity features of the BR in the expectation that this learning would change their 'negative behaviours towards the environment'. This reflects their sense of a serious need to provide 'knowledge' to local community inhabitants:

When local inhabitants work with us in the field, they usually help us locating places where we can find the bugs we study. They guide us. They come usually because they are curious about what we do in the field and we use that curiosity to teach them about the bugs. We teach them to identify insects and this will probably help them know which insects they do not have to harm.

Scientists had worked in the area for more than ten years and local inhabitants working as local guides and para-taxonomists were already familiar with the scientific terminology such as ‘endemic’ species’, ‘transects’ and, ‘forest richness’. In this context, the local community could talk to ‘the experts’, thus blurring roles between outside expert and local resident. They also used scientific names for plants, or they would use the technical name for animal traps and other artefacts used by ecologists in their research work.

Working with the university researchers is good for us. We work together and learn. For example, I know that if we [the Ajuchitlan community] try to conserve the forest and increase the number of endemic species we have, we might be able to get more help from the government. I know that currently, our community has 17% more endemic species than Quilamula [the neighbouring community] and I think that we should be able to conserve those; we could grow in that aspect”

Local inhabitants stated that the use of such terminology was useful for them as it allowed a better communication with other agencies and researchers working in the area. They used the information learned during their field-work participation and considered it functional and valuable to access other funding mechanisms provide by governmental organizations. Participation in this example worked more as a relationship where the local community borrowed and deployed expert knowledge to their own ends.

7.8.2. Disrupting templates

There were other examples of the local community as genuine participants in project designs. I found two instances of community-led initiatives: 1) the re-construction of water infrastructure in Quilamula and 2) the construction of water bodies in Ajuchitlan. Local inhabitants explained that in these cases, the projects were decided during informal gatherings with the CIBYC and CONANP staff. For example, community leaders who were authorities at the time invited government staff or high-ranking research centre staff to community festivities or informal gatherings. During these gatherings, local community inhabitants talked about their ideas and community needs. Most of these informal gatherings would result in help from external staff members to develop the projects. The following quote by local inhabitants provide examples of these cases,

I have participated in different projects and one of those we completed after years of knocking on doors. Fortunately, [the authority] helped us. We organized a large party and we invited all the staff from the government and the research centre. Then, the authorities talked with us in a more relaxed environment. After that gathering, we received PROCODES for project B. I think that when you need something or when you have a project in mind, it is just a matter of knocking on doors and talking to the right people.

I went to the office in the city because I needed the greenhouse. I went to the governmental offices and personally invited the director to my community. I organized a party, we talked about projects and we showed them our community. That facilitated the process of application for PROCODES funding.

These informal community-led initiatives in fact disrupted regular governmental and academic regulatory tasks. According to interviews with CIBYC and CONANP staff members, projects originated in this way were difficult to implement. The fact that the regulations and terms of reference were already established through centralized decisions and listed specific projects and activities posed constraints on developing and planning novel community-driven ideas. The following quotes by governmental staff and CIBYC staff speak to these challenges,

“I remember that we needed to make some projects ‘fit’ the PROCODES terms of reference because the re-construction of water infrastructure was not considered within the operating rules. I remember we held several meetings and spent a lot of time modifying the project proposal.”

“On many occasions, we don’t ask the local people because that is always problematic and poses challenges in project implementation. If we go to the people, then we realize that what they want is social benefits or money from projects to fix their community infrastructure, get better houses and better roads. That does not conform with our objectives as an institution”

The previous two examples provide evidence of community participation, however in very distinct forms and modes of operation than those framed by extra-local actors. The appropriation of scientific speech codes (endemic species, endemism) when suddenly available for appropriation, were useful for community inhabitants and used for advancing their interests and concerns. They identified these opportunities as tactics to take advantage of resources that were available to them.

My analysis presented here supports the view that it is critical to sort through the ways in which practices shift in response to both new challenges and new opportunities for those who have been silenced historically in conservation initiatives, such as in the case of SHBR.

7.9. Summary of Chapter

In this chapter, I analyze the actual experiences of participation that local inhabitants had in conservation projects conducted in collaboration with non-local actors in SHBR. Table 7.7 compiles the main findings of my analysis by integrating the information of participants in the projects

Table 7.7. Main findings from interviews

Main findings based on interviewed participants	Projects Government-LC (PROCODES and PET)	Projects PROSELBA-LC (UMAS)	Scientists research Projects (local guides or para-taxonomists)
Female inhabitants participate	yes	No	Yes
Local inhabitants have an active role in decision making and design of projects	no	No	No
Participation of local inhabitants is limited to operation, and manual labour under unsafe conditions	yes	No	No
Local inhabitants receive direct economic benefits	yes	Yes	No
Local inhabitants received other benefits such as: learning, donations, (increasing access to other projects)	yes	Yes	Yes

Overall, participation of local inhabitants in projects of conservation in SHBR is shaped by the extra-local agencies, which remain in charge of design of projects and spending priorities. Local inhabitant's participation—more often than not—is reduced to the process of programme implementation, which means carrying out hand labour activities often performed in inadequate conditions.

The strict and rigid format of project designs provided by the government projects in PROCODES and PET frames of reference, did not allow space for the ideas that come from local community inhabitants. The (rare) cases of community led initiatives were challenging, in the view of non-local actors, because these initiatives entailed more resources (time, money and work) invested in modifying the government regulations to make projects “fit”.

The management units organized by PROSELBA seemed to have forged good relations between non-government staff members and with local communities and, building on those personal relations, local community inhabitants seemed more engaged in UMA projects. Local inhabitants also seemed more knowledgeable about the operation of UMA projects. The integrative design attracted greater involvement and support from the community members, who describe a considerable ownership and responsibility for the project’s implementation.

Although I did not interview locals who were not participating in projects, the information gathered offers little but relevant information regarding aspects of internal power dynamics within the community. For instance, it was clear that those participants interviewed are members of the less-poor groups within the community (community authorities, storekeeper, and community teacher). This suggests that others within the community, who may be needier, probably find it difficult to participate in projects because the less poor groups already have taken those spaces.

7.9.1. Gender disparity

According to the data of this particular group of individuals and documents, my analysis revealed the significant impact that gender disparities have on the participation of women in conservation projects in SHBR. One such impact as seen in these particular groups of individuals is women’s lack of access to authority positions that limit their opportunities to enter conservation project-activities and to benefit from the additional economic resources these projects provide. Data from this particular group points out also that gender roles within the family appear to be a source of distinct gender barriers to participation parity in conservation projects. For example, caring for children or being responsible of household chores has considerable impact on the participation of women.

These factors point to a possible reason why the participation of women in conservation PROCODES and PET projects in SHBR does not match the official claims and intended goals to include women fairly and under similar conditions to men. However, a positive outcome found in the interview data is that the female participants interviewed gained access to decision-making processes and, when they participate in meetings, are able to organize them and enrol other women in collaborations.

My data showed that overall women do not appear to be central actors in conservation projects, despite the fact that men have been out-migrating. This finding suggests that while women have the potential to occupy vacated positions of males in conservation projects, there is little recognition of them as active conservation actors. According to data from the particular case in SHBR, this situation is enhanced by the fact that most professionals working in the field are often male and do not adequately recognize the conditions of women. For instance, they are less familiar with the specific needs and priorities of women, and might encounter difficulties in targeting them.

7.9.2. Codes of difference

I found that the numerous references to local inhabitants as being different (non-educated, rural, and 'rustic'), affected the scientist's perception of them as being genuine participants in projects for conservation and thus, served to generate and maintained an unequal access to participatory spaces. For instance, the perception of local inhabitants as being uneducated justifies scientists' attempts to educate them, and to teach them about their professional area of expertise (taxonomy, ecology). The decision to educate locals is thus based on an apparent idea of difference based on a differential access to normative educational frameworks (with an expectation to contribute directly to the conservation of SHBR through collaborative undertakings). However, the attempt to educate local actors might or might not be actually having any effect on the desired goal of collaboration, and ultimately on the conservation of the area. Scientists' teaching task exclusively reacted to the challenge identified by scientists as a result of this apparent difference.

Another example is provided by the researcher who described local knowledge as being rudimentary or rustic and therefore requiring to be 'tested' through a systematic

and rigorous scientific model. Scientist's ideas about conservation, guided exclusively by scientific narratives, thus potentially interfere with the possibility of give-and-take participation with local stakeholders; for example, in engaging research informed by both local and scientific knowledges.

These features of relationships in participatory arrangements between SHBR's stakeholders is drawn from "the arena in which those relationships are enacted" (Schwalbe 2002 p. 24); that being conservation science with its particular codes of membership, or based on exclusive scientific approaches and methods.

7.9.3. Silences

One of the central findings of this study is that there is much more evident enthusiasm for community participation among government staff members and researchers than it is among community residents. In this context, the earlier discussion about silenced actors revealed a persistently disparate access to decision-making and to the definition of conservation goals when projects are generated. While scientists, government and non-governmental actors produced a variety of resources (textual, and regulatory), which gave them the capacity to act, decide and implement a view of conservation and participation in SHBR, locals were denied an active place in decision-making and in the design of projects. Under these circumstances, thinking about, assessing or even talking about 'genuine' participation', 'authentic bottom up conservation' or multidirectional communication" appeared incongruous.

However, this is the value of findings that speak to the fact that local community actors did not merely reproduce the practices and forms of organizing imposed over them by extra-local staff members; instead they themselves became knowledgeable about how to 'make projects fit' and became wise users of scientific narratives for their own benefit. Furthermore, through their active engagement with extra-local actors, they often subtly questioned and contested the normative rigid templates for project designs and implementation.

Chapter 8. Scientists' Activities, Perspectives and Positions

This chapter addresses the third research question of this thesis: what were the activities of SHBR scientists? This question includes inquiring into their views, theoretical perspectives and positions regarding their work and how these in turn affect the overall administration of the conserved area? I analyze the scientists' research activity, their positions on best management approaches for conservation in SHBR, and their perspectives on the research centre's institutional culture, including the limitations and pressures that influenced their conservation actions.

In this chapter, Clarke's social world-arenas framework (SWA), helped me analyze the ideas and activities of scientists at CIBYC, including other social realms (academia, their families) which appeared to be powerful social domains that constrained and enabled the situated actions of scientists committed to the BR conservation. I analyzed the scientific practice of researchers as a collective that had shared commitments to conservation activities, and that experienced conflicting views regarding the best way to fulfil their conservation goals in SHBR.

8.1. The Social world of researchers at the SHBR Research Centre

The SHBR research centre is a division of the Public State University of Morelos (UAEM) and its offices are located in Cuernavaca City within the University Campus. Cuernavaca had attracted important research centers, in part because of its proximity (60 kilometers) to Mexico City's large and diversified research infrastructure. Cuernavaca is considered "the Mexican capital of knowledge" (Academia de Ciencias de Morelos, 2012) and accounts for the largest number of scientific research centres in the country.

Scientists at CIBYC were hired as tenure-track academic researchers. Just like other university professors, SHBR research scientists were assessed annually,

principally on the basis of published work; after three positive evaluations, they were hired as permanent academic staff (UAEM, 2011). The positive evaluation of researchers also gave them access to additional reward mechanisms such as the National System of Researchers (Sistema Nacional de Investigadores, SNI). This system of evaluation was created in 1984 by a group of academics who had the political connections to advance an initiative of this kind (Ibarrola, 2008). Its initial goal was to support scientists during the economic depression of the 80s (Ibarrola, 2008; Alcantara, et al., 2011). Briefly explained, the program awards extra economic incentives to scientists—three to 20 times minimum wage on top of their regular salary—depending on their measured performance (Alcantara, et al. 2011). As of 2011, 17,639 scientists were being rewarded by the SNI system (CONACYT, 2012) after receiving positive assessments of their scholarly production and academic collaborations. Thus, access to the system not only signified academic distinction in Mexico, but also—and more importantly—granted extra financial support. This created fierce competition among those who aspired to be included and immense pressure on those who were already included. Some see these traits as positive for Mexican scientific development arguing that the System has brought high standards and academic pressure for scientists (Loeza, 2005; Colomer, 2004). However, others including SNI proponents predicted potential problems with the new evaluation measures from the outset. Only recently have studies reported on the failures of the program (Aupetit & Gerard, 2011; Ibarra-Colado, 2009). Among them, that by relying on standardized, exclusively quantitative measures of scholarly production, SNI has created an academic elite, showing preferential treatment towards scientists who have degrees from international institutions (mostly American and European) and who find it easier to produce articles in foreign languages (Ibarra-Colado, 2009; Casal, 2003).

Although research is a central objective and an explicit mandate of BRs, most of the research by management-partner institutions is not a neutral activity alienated from many other institutional imperatives such as the awarding mechanism described above. The work of scientists in Mexican conservation efforts involves a complex constellation of actors who are embedded in diverging organizations and agendas. It is therefore crucial to understand the degree of consensus or divergence among scientists on core

scientific priorities, perceptions and strategies (Hagerman, Dowlatabadi, Satterfield & McDaniels, 2010; Sandbrook, Scales, Vira & Adams, 2011).

Several studies conducted in Mexican BRs have lamented the poor performance of research conducted in BRs (Durand & Jimenez, 2010; Gerritsen, 2002; Young, 1991), but only recently have scholars raised the question that the problematic gap between the integrative mandates of biosphere reserves –including a gap between conservation research and practice- may have something to do with failures in the underlying practices and experiences of conservation research itself (Ceballos, 2008; Durand & Vazquez, 2011).

8.2. Data collection

At the time of my study, the research centre was subdivided into three departments: two conducting research in natural aspects of the reserve: Evolutionary Ecology (EE) and Taxonomy and Systematics (TS), and one conducting research in the social aspects of the reserve: Resource and Environmental Management and Environmental Education (REMEE). Scientists who were member of the EE department focused their research on the evolutionary histories of species and the interactions between them, while scientists in the TS department focused their research on the identification and classification of organisms. Scientists working in the REMEE department focused their research on the integration of human and natural environments (Valenzuela, 2011). All scientists interviewed were trained in the natural sciences, including those working in those developing lines of research in the social aspects of the reserve. The SHBR research team consisted of 20 early-career scientists (35–45 years old) holding a master's or doctoral degree.

In the outset of my project, I contacted all twenty scientists working in the research centre, however only eight agree to be interviewed. During the recruitment process of participants for my study, I was confronted with the fact that researchers that I approached as potential candidates explained that they would be interested to participate in the interviews, but they did not consider themselves eligible or relevant for the study because their lines of research were not relevant for, or even carried out in, Sierra de Huautla.

Seven interviews were conducted in person at the scientists' offices and one interview was conducted over the phone. The background information of the interviewees is summarized in Table 8.1. Columns indicate the participants code, their department affiliation; details on their job positions and, their activity in relation with SHBR.

Table 8.1. Interview respondents

Participant	Details on their job positions	Activity	Department of affiliation
P1	Associate Professor Permanent Position Director of the Research Centre Member of SNI	1) Liaison between CONANP and CIBYC in the administration of the SHBR. 2) In charge of the management of SHBR (funding administration and follow up research activities) 3) Long term research in SHBR(Ecology of small mammals)	Evolutionary Ecology (EE)
P2	Assistant Professor Trial Position	1) Research in SHBR (Ecosystem functions, Eco-toxicology)	
P3	Associate Professor Permanent position Member of SNI	1) Long term research in SHBR (Taxonomy and Genetics)	Taxonomy and Systematics (TS)
P4	Assistant Professor Trial period	1) Long term research in SHBR (Entomology and Biogeography)	
P5	Assistant Professor Trial period Member of SNI	1) Long term research in SHBR (Entomology and Biogeography)	
P6	Associate Professor Permanent Position	1) Long term research in SHBR (Plant classification and Genetics)	
P7	Associate Professor Permanent Position	1) Environmental Policy 2) Long term research in SHBR (Ethnobotany and Environmental Education and Communication)	Resource and Environmental Management and Environmental Education (REMEE)
P8	Assistant Professor Trial Period	1) Long term research in SHBR (Ethnobotany, Environmental Policy)	

The interviews consisted of three sections. The interview questions are provided in Appendix 2. The first section asked about the participant's conservation perspective. I

explicitly solicited their views on the work of six prominent conservation scholars well known by all interviewees. Three scholars were proponents of rigorous “protectionist, natural science-based” approaches (John Terborgh, Kent Redford, Daniel Janzen) within conservation literature and three were proponents of “people-oriented” approaches whose work advocates for the inclusion of a social dimension in conservation research and practice (Victor Toledo, Julia Fraga, Janice Alcorn). I asked the eight interviewees to identify the scholars from the list whose work they considered important, inspiring, and/or similar to their own work in the BR. I also, asked them to describe their views on the value of nature vis-a-vis humans and their ethical arguments for conservation. The second section of the interview asked about the participant’s personal and professional background in the BR. The third section asked about collaborations, intellectual synergies, and professional relationships in order to determine the participant’s priorities and agendas.

The in-depth analysis of interviews then informed further data collection (Glaser & Strauss, 1967; Clarke, 2005) which mainly consisted of acquiring additional documents. The purpose of gathering more data responded to my interest in comparing the information given by interviewees (e.g. research activities vs products relevant for SHBR). This data gathering technique is suggested by Clarke in an attempt to trace actors’ “vocabularies of motive” (Clarke, 2005 p 22). The purpose of this sampling strategy is to directly explore the relationship between verbalizations (actual answers/statements) and the motives (normative cultural/contextual regulations) that frame those answers. In other words, I was seeking to account for what scientists ‘said they were doing’ and ‘what scientists were actually doing’.

I used Google scholar search engine to track down the lines of research and list of publications for each individual scientist as presented in the center’s reports. I looked specifically for information regarding the research site, for instance, whether the research was conducted in SHBR and, whether the research was published in English or Spanish.

I gathered three current government report evaluations concerning the National System of Researchers in order to have a full account of the origins of the program and the current performance of conservation scientists in Mexico.

8.3. Analysis

Consistent with Clarke’s (2005) situational analysis methods, I carried out initial open coding and produced over 34 codes for each interview. I compared the codes in order to identify similarities and differences, and to develop larger themes (Clarke, 2005; Corbin & Strauss, 1990). I created ten categories which, upon review, were merged into two main themes: 1) Conservation priorities and conservation for research in SHBR and 2) Factors hindering local involvement. Table 8.2 includes a brief description of the ten categories and the two broader themes.

Table 8.2. Description of themes and categories

Themes	Categories	Description
Conservation priorities and institutional factors	1) Conservation perspectives and expected outcomes of conservation research	Ideas related to the mission of conservation in BRs
	2) Value of scientific work informing SHBR’s overall management	Ideas related with the value of managing natural resources based on scientific input Ideas related to the difference between “scientific’ and ‘local/lay’ knowledge
	3) External/Institutional constraints for conservation	References to the National System of Researchers, awards and recognition among peers
	4) Products of research, audience and priority groups	Publishing in high ranked journals, Publish or perish, Global relevance of research outcomes
	5) Favours of external academic networks	Overseas connections, Research stays overseas Access to infrastructure and scientific literature
	6) Convenient research vs relevant research	Laboratory vs field work
	7) Researchers’ responsibility	Generating useful knowledge Replicating scientific methods
Factors hindering local involvement	8) References to SHBR tropical dry forest’s conditions and local communities	Pros and cons related with weather and natural conditions of field work Affordances offered by local community work
	9) Things that matter	References to their immediate priorities, their children and family economic needs

Themes	Categories	Description
	10) Relationships and collaborations within the center	References to colleagues and collaborations Examples of projects in collaboration Examples of co-authored articles

These two categories pointed to reasons why scientists' work in SHBR was challenging in practice and failed to achieve the integrative goal of SHBR.

8.4. Challenges to integrative goals for conservation

8.4.1. Scientists perspectives about conservation in SHBR

Regarding scientists perspectives on conservation, I followed Clarke's (2005) directive to study social worlds. Attending to one of the cues she provides to study social worlds I asked: What are the perspectives operating within the world? How do these perspectives guide what scientists consider significant to achieve their goals? Then I used the interview data to group each researcher by theoretical position and practical approach (Table 8.3). On this basis, I grouped informants' conservation-related perspectives on a continuum from protectionist to people-oriented.

Table 8.3. Conservation priorities: conservation- and science-related perspectives of researchers

Conservation and Science-related Positions (P = participant)		
	Protectionist approach	People-oriented approach
Conservation Positions	P1, P3, P4, P5, P2 There is an intrinsic value of nature. Local inhabitants' practices cause environmental degradation. Locals need to be educated.	P6, P7, P8 The improvement of people's lives is as important as conserving nature. Conservation includes the well-being of human inhabitants.
Science Positions	P1, P3, P4, P5, P6 Unlike the social sciences, the natural sciences are indispensable for conservation initiatives.	P5, P7, P8 There should be a balance between social-science and natural-science research to inform comprehensive projects.

The researchers who endorsed a protectionist approach for conservation (Table 8.3) argued that maintaining natural systems should be the priority. As one scientist stated,

So the thing here is that for us [scientists] the most important part is the environment, not the humans, and for them [local inhabitants] it's the opposite, they think nature is there for their benefit (P4).

Those who endorsed a people-oriented approach to conservation were more aligned with integrative conservation goals. They wanted local inhabitants to participate actively in conservation decisions, as expressed in this statement:

Thinking about conservation projects involves thinking about people. For example a project where local communities would participate and which concerns sanitation of water. In that way you have healthy water and that actually impacts the conservation of plants and nature (P8).

8.4.2. Scientists' positions

Among other modes of data analysis, I used positional maps to analyze the controversial positions of scientists working in the center. I used positional maps (Clarke, 2005) to better quantify the variety of scientific positions on conservation priorities. Figure 8.1 lays out these positions on a grid defined vertically by affiliation with a protectionist or people-oriented perspective and horizontally by priority assigned to natural- or social-science research. This positional map enabled me to visualize the 'heterogeneity of positions' (Clarke 2005, p. 126) inherent in the interview data and facilitated my analysis thereof.

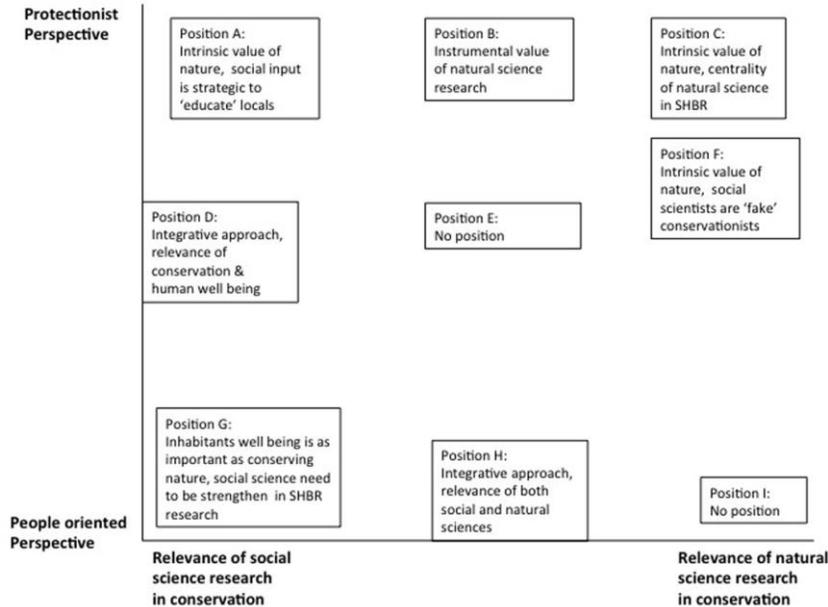


Figure 8.1. Positional Map

Positions A, B, C, F (Protectionist perspectives)

Overall, the participants who were aligned with a protectionist perspective also prioritized natural science-based research for conservation projects. However, their reasons for emphasizing the natural sciences were diverse. For instance, the research centre’s current director (P4), who expressed an intellectual affiliation with a protectionist approach, stated that the natural sciences were central to SHBR (Position C) and cited his administrative obligation and current administrative efforts to support the centre’s natural-science units. He explains his roles:

As the research centre’s director, I need to coordinate what is done collectively in this institution. I have to be sure that the work is good and that we comply with the perspectives and academic regulations of the whole university. My function within the centre is to make sure we have a good organizational performance and resources to achieve the mission of the centre *which is related to maintaining the biodiversity and the biological conditions in the BR* (P1).

Most participants endorsing a protectionist perspective emphasized in some way that the overall goal of conservation was to allow the biological processes of adaptation and evolution to continue without interference. This position was also expressed in their

scholarly work, in which they argued for stricter conservation measures to protect the species under study. Their arguments mostly referred to: 1) prioritizing the needs of life forms over the needs of local human populations; 2) highlighting the ‘conflicting relations’ between animals and humans. The following quotes of articles published by interviewed scientists holding a protectionist approach serve as examples,

Larger carnivores tend to occupy large home ranges, so protected areas should be big enough to secure these requirements

Loss of habitats, fragmentation and conversion of natural forests into urban, agricultural or livestock lands are the main causes of arthropod diversity decline...[]This study suggests that it is important to conserve natural forests in Mexico as important reservoirs of arthropod fauna.

Social science input was reported to be valuable to the protectionist perspective, however, only in terms of its use to ‘educate’ or ‘train’ local inhabitants about the value of nature. Thus social science had an instrumental value (Position A):

The interesting thing in Huautla is that when the reserve was decreed—with the purpose of preserving dry forest—it was planned that local communities will be included as a way to show them the richness of the resources so they would see how important they were and they would protect the environment. But at least in the communities I have been, there is still a lot to do in order to educate them (P4).

When asked about what type of research deserved priority in the BR, most participants named specific areas of biological research such as the status of ecosystems on the genetic, species, and system level. The work of social scientists was regarded not as a valuable pursuit in itself but as a supplementary and even an optional contribution to conservation. Some participants even expressed open mistrust towards conservation projects that were directed by social scientists (Position F), as illustrated here:

These people have good intentions and, ostensibly, would know how to manage conservation, but they really do not know anything. They are not experts, they are anthropologists or sociologists and so they do not know anything about conservation. Nothing! They are fake conservationists.

This participant, who strongly endorsed a protectionist perspective, explained that natural-science research is valuable insofar as it is employed to convince politicians and other agencies to support conservation actions (Position B). Natural-science knowledge, this informant said, is instrumental in securing funding and support for conservation projects; however, the production of knowledge itself is not relevant for conservation, as exemplified here:

There is no need to link research outcomes with conservation in the same time scale. For example if I discover plant species and I add it to the list of protected species, I am not conserving. That is a fact. However, alongside my research on that plant, I can carry out other activities that help conserve the place in the short term and for that, I need funding and that is when research supports your fund searching.

Position G (People-oriented perspectives)

The scientists who were more aligned with a people-oriented approach to conservation were actively participating in collaborative research projects in the social aspects of the reserve (environmental education; traditional medicine). These collaborations aimed to develop community needs assessments and to design productive activities with the local communities, such as home gardens, greenhouses, crafting workshops and ecotourism.

One participant had been working in the BR for more than ten years and held a permanent position at the centre. She described how difficult it was to convince other researchers with training in biological sciences of the importance of an integrative approach to conservation and biodiversity management:

This is an everyday effort, from a small chat in the hallway to a serious discussion in an academic committee. I have to stand up for my work in the face of other collaborators who, even now, believe that integrating local people in conservation is not a priority. My work is not considered 'scientifically' relevant within the center even though I am a biologist.

Positions D & H (Integrative model of conservation)

I did find positions that emphasized that social-science and natural-science research must be integrated in order to devise comprehensive conservation strategies that assured the protection of SHBR-specific life forms as well as the well-being of local

inhabitants. Such positions, however, were found in documents such as the SHBR management plan, the research centre's annual reports, government papers, and newspapers and thus the position remained inert, as it was only stated in regulatory documents, and alien to actual practices of most scientists.

8.4.3. Institutional factors

I examined the content of the latest four research center annual reports (2008-2012) looking for two pieces of information: (1) type of information presented (e.g., what research production was reported and in what ways was presented); (2) information about work conditions, specifically looking at resources and funds allocated to each department within the center. I also explored the research center's website to expand my information regarding scientists' work.

The research centre's annual reports showed a strong emphasis on the natural sciences in its programs, resources, and scientific staff. For instance, out of 20 researchers, only two were trained in the social sciences (Anthropology and History) and even the departments responsible for attending to the 'social dimension' of the BR were composed of scientists trained in the natural sciences. On average, over 90% of the centre's funding and infrastructure were allocated to natural-science research, with only a very small amount reserved for the social-science department. Figure 8.2 presents a snapshot of the 2009 annual report. The information concerns funding allocation for research projects on that year.

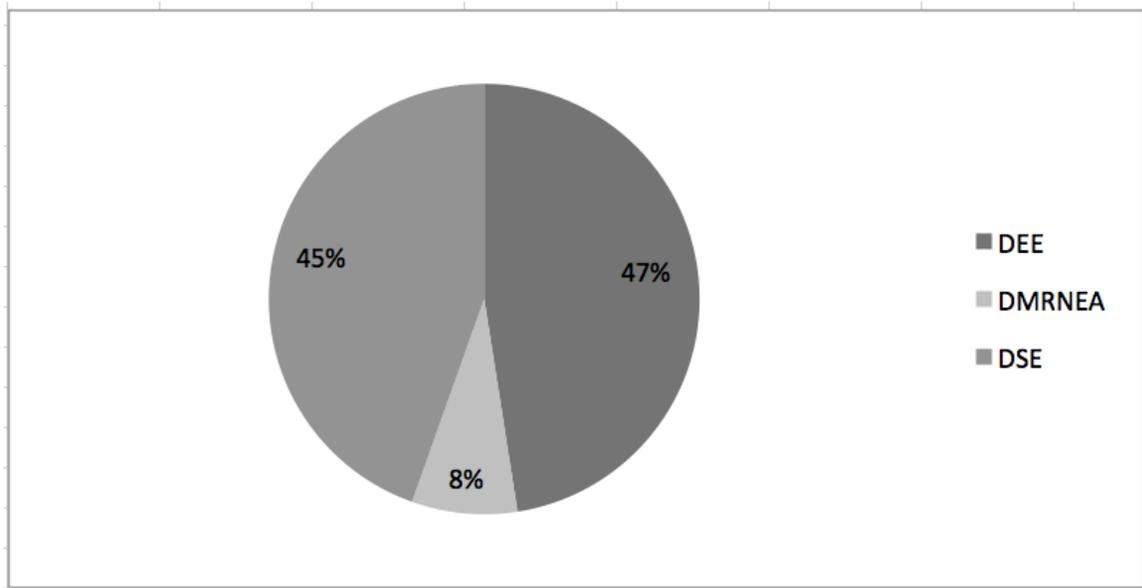


Figure 8.2. Resource allocation of funds for research. Adapted from Annual report by Valenzuela, 2008.

As shown in Figure 8.2, the REMEE department (DMRNEA, for its name in Spanish) accounted for only 8% of funds for research on the year 2009.

According to the annual reports, the infrastructure (described as computers and equipment) assigned for each department was significantly less for the REMEE department. Figure 8.2 presents information of the research center annual report. The information concerns the infrastructure assigned to each department for the year 2008.

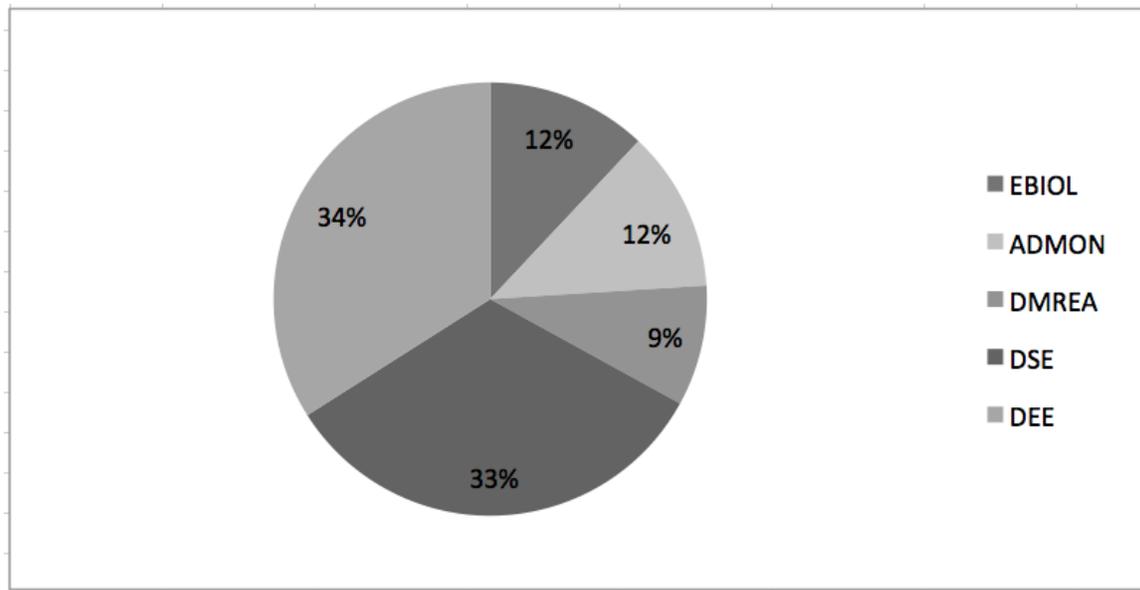


Figure 8.3. Available infrastructure for each department. Adapted from annual report by Valenzuela 2008.

Note. Research infrastructure for REMEE 2008.

As shown in Figure 8.3, the REMEE accounted for only 9% of the total infrastructure of the center (computers, field material, and software for research). The percentage of total infrastructure in the two consecutive years 2009 and 2010 did not change as reported in the annual documents reviewed. The latest report does (2012) not provide information regarding available infrastructure for each department. However the information of projects financed during the year indicated a lower number for projects focused in social aspects of research in SHBR.

In linking these findings, I concluded that apparently initiatives and efforts toward multidisciplinary approaches were typically marginalized in the research center in terms of resource support, infrastructure and opportunities for larger collaborations. The participants interviewed were members from different organizational levels and sub-units of the research centre, from administration (director) at the centre of authority to implementing research staff at the periphery. They had different access to decision-making and agenda-setting regarding the strategic priorities, research management and resource administration of the center. The direct interviews and triangulation indicated that those scientists who were involved in multidisciplinary work held less influential roles in the research center, which potentially reproduced a further marginalization of

multidisciplinary approaches in competition for resources, influence and priorities in the center.

8.4.4. Publication records

The sections of the annual report that concerned the publication record of scientists and the overall research performance of the centre were similar for all the years 2008-2012. The publication record was displayed in terms of the journals where scientists had recently published, and information regarding their impact factor –which is the average number of citations received per paper published in a journal during a number of years, usually two. Figure 8.4 presents a snapshot of the annual report with information regarding the journals and the impact factor of the journal where scientists had recently published work.

Tabla 1.- Revista en las que los académicos del CIByC publicaron o enviaron artículos durante el periodo de informe.

Revista	Factor de Impacto	Revista	Factor de Impacto
Molecular Ecology	5.96	Zootaxa	0.891
Journal of Ecology	4.69	Journal of Helminthology	0.863
Conservation Biology	4.666	Annales de la Société Entomologique de France	0.6
Journal of Biogeography	4.087	Mammalia	0.526
Oikos	3.147	Revista Mexicana de Biodiversidad	0.327
Oecologia	3.126	Western North American Naturalist	0.305
BMC Cancer	3.08	Boletín de la Sociedad Botánica de México	0.24
Behavioral Ecology	2.981	Dugesiana	

Figure 8.4. Publication and research performance. Adapted from Annual Report by Valenzuela 2009.

No information was reported on the impact of the research work in the conservation goals for SHBR. Given that the research center's own annual reports did not offer details of the researcher's scientific output, I tracked down the lines of research and list of articles of each individual scientist through the center's website and Google Scholar.

I reviewed the research centre's website which displayed a list of articles published by each scientist. I noted its ongoing activities and I searched for the articles that were reported in order to determine whether the research projects published by staff scientists were conducted in the BR or concerned with life forms particular to this site. The information provided in the website comprised articles produced from 2008- 2010. During that two-year period, the researchers within the center published 39 articles, of which only 12 were situated in the BR or specific to the site's ecological matters.

To supplement these data, I searched Google Scholar for publications in the natural sciences dated 2008 to 2012 containing the phrase "Sierra de Huautla Biosphere Reserve". My search retrieved a total of 343 articles, 22 of which were authored by the centre's researchers. The centre's contribution to general knowledge in the natural sciences was globally significant, as assessed from scholarly citations, but references to its relevance for Sierra de Huautla were few. In sum, the research centre's annual reports represented scientific productivity solely by reference to the impact factors of journals in which its articles were published, dismissing published work which described the impact of scientific activities on SHBR conservation or the local community.

8.4.5. Factors hindering local engagement

Type of research prioritized

Despite the volume of biological research conducted in the centre there was a lack of connection and engagement with the local conservation needs of the BR. This was evident in the outset of the study when I recruited participants for the study and as mentioned, researchers were willing to participate in the interviews, but they did not consider themselves eligible for the study because their lines of research were not relevant to or even carried out in Sierra de Huautla.

The interview data provided information about scientist's beliefs regarding the apparent disconnect between relevant biological research of the BR and the type of research they engaged.

For instance, scientists explained that locally specific conservation research—such as forest and landscape restoration projects or monitoring needs, practices,

biodiversity, and population sizes—required scientists to engage in long-term field research projects over more years than laboratory-based research. Laboratory based research in many cases required scientists to work in the field only a few times in order to collect material and include less time to set up experiments and do tests inside the controlled environment. Thus work in the field, conducted in SHBR was not a preferred activity. The following two quotes serve as examples,

Now the ideas of traditions of field ecology and ecological processes of conservation are gone...The problem with those types of research is that you need a lot of years practically living in the field, collecting and analyzing data and currently, you need products faster (P2).

For example, to make a study in phenology of plants (how the flowers in a plant change in terms of the ecology of the site) you need a lot of time and monitoring. While this is very, very important for restoring a site and conserving it, it will take years to do that type of research and I need to publish soon (P3).

Moreover, one scientist talked about a broader move in the field of conservation in Mexico towards lab-based research rather than field based research as we see here,

Around the year of 2000, the Biology honours program at the Mexican National University was changed and most biologists currently working in Mexico come from this university. The new program clearly encouraged more work in the laboratory in fields like molecular ecology and, in general, fields that are mostly lab-focused. The work in the lab is much easier; you get your material, you study that material and that's it. I do not have to worry about asking for permits or going to collect, I just work with those collections and I can publish a lot (P2).

I searched for the current program for Bachelor of Sciences in the Autonomous University of Mexico and I learned that it in fact was modified in the year 1997 (Universidad Nacional Autonoma de Mexico, 2012). The current program had prioritized lab-based subjects and most 'conservation' related subjects were offered as "optional" subjects for the students. For instance, subjects required for the eight semesters which composed the bachelor degree included subjects such as Biotechnology and Molecular Biology, while subjects listed in as optional included subjects such as Human and the Environment, Environment and Society, and Ecological Restoration.

Another finding was that according to my interviewees, simple geographical and logistical barriers exacerbated the decline of applied research and local engagement at SHBR. The research centre is based in Cuernavaca city located three hours away from the BR. Several interviewees argued that having their offices closer to the BR would improve their involvement with the area's communities, as indicated here:

Conservation can be integral only when the information you are generating actually impacts in the community. For example: I do my research with only one specimen in the lab without dealing with community issues, because I am not there, I don't interact, I don't see them. But if I am involved with the local community, then I have a better idea on their needs and issues that are relevant to them. But, of course, that is a lot of extra work (P7).

However, when university authorities had suggested a re-location, scientists were reluctant to support moving the research centre closer to the biosphere's rural environs because they feared the impact on their lifestyle and family activities. The fact that other centres were located within the main city offered scientists more chances to establish the required academic connections for their work and made it less attractive for participants to move closer to the natural protected area. They also stressed that Cuernavaca was an important academic hub that offers considerable resources for carrying out scientific research and collaborations in the city; thus, Cuernavaca City draws scientists toward academic networks as opposed to local engagement and rural networks within the BR.

Scientists were reluctant to re-locate their work place, because such a move would impact their personal (family), and not just their scientific environment. The reference to the challenges of spending time in the field was also referred by two interviewed scientists who had developed long term research in the Biosphere Reserve. They described their commitment to locally relevant research and how they had to "give up" their families. This was clearly an example where the SWA analysis allowed seeing how social worlds collided (Clarke, 2005; Tunnainen, 2005). Scientists were also members of their more immediate collective (their family) and their membership to this collective posed a challenge for them in terms of fulfilling the SHBR research for conservation.

References to reward mechanisms

Across all participants, my data indicated a clear and pragmatic conduct of foundational biological research, growing further away from locally embedded projects. Scientists focused on developing short-term generalizable ecological research that offered a larger audience and publication access to higher ranked journals.

As the researchers explained, locally specific conservation research such as forest and landscape restoration projects, local monitoring needs and, assessments of population size or local species biodiversity required scientists to engage in long-term research projects. According to the interviewed participants, locally relevant projects required more years than laboratory research and could not guaranteed that they would result in publishable products in the end due to the higher number of factors involved in making locally applied research projects successful. This was particularly stressed by those researchers who continually depend on frequent academic assessments in order to renew their employment contracts, as the following excerpt illustrates:

Nowadays, being a researcher means publishing. You need to have products that are relevant for the broader field. If your products are not globally significant, you hardly publish in a high ranked journal. You can publish, but then your research results have only local impacts. The impact factor is low because is local. It seems that if the results are locally relevant, nobody will read that. And then you fail to comply with the university's evaluation requirements. That institution is the one that set the requirements. You need to publish in journals with a high impact factor. You have to decide where you want to play.

Scientists further elaborated that their main incentive and motivation for collaborative research projects was to boost their scholarly output, not the development of new research activities that could potentially be relevant for the area.

Realistically, our objective is to contribute to listings of biological species. We contribute to generate information about species at a national level. We mostly collaborate with researchers and museums outside Mexico. For instance, Museum of Los Angeles, University of Kansas and we assure quality research products.

Central non-humans

The temperature of tropical dry forest can reach 38°C during the dry season and the absence of precipitation during a prolonged portion of the year is what produces a

truly dry environment. Scientists often made references to these particular features of SHBR's ecosystem as reasons that added to their reluctance to carry out field work in SHBR. Although the tropical dry forest conserved in SHBR seemed ideal for the development of lines of research given its status as 'one of the most bio-diverse ecosystems in the tropics', the landscape itself posed challenges for the scientists conducting research in the area. The following quotes serve as examples,

If you want to work in the field, you have to be ready for the very difficult conditions of dry forest; it is tough to work there. You have to tell yourself: "Just be ready, ready for the sun and the sweat.

I remember a time when one of my students cried. We went on a field trip and we camped. The temperature and the dry environment were so dramatic that he started crying because the conditions were unbearable for him (P2).

Working in conservation can become a struggle and that is why not many people do it. The physical site is not welcoming; the forest is dry and very hot. If you work there, you have to leave your family. That is why many researchers do not want to move from the research center into the field even though they are supposed to. The other is a more comfortable research (P4).

The reference to the 'tough' and 'challenging' conditions that were argued as reasons 'not to conduct research in the area' seemed to me one concrete example of how 'conservation' in practice is constituted also by nonhumans, those being the climatic dry and rough conditions of the tropical dry forest of SHBR.

The encounters that scientists experienced in the field seemed more than anecdotal accounts provided by them and appeared to be acting as significant elements that shaped scientists decisions regarding their work. Moreover, the dry conditions and the high temperatures peculiar to tropical dry forests seemed like 'enemies' in the scientists' accounts which further encouraged a reluctance to work in the field. Non-humans thus were not merely 'the context' of scientists' work but, rather, active shapers of it. The dry conditions and roughness of tropical dry forest in SHBR made scientists abandon many species and organisms particular to dry forests. These organisms were left out of the reach of science and were unrepresented in scientists' research work.

8.5. Summary of Chapter

The analysis presented in this chapter was intended to answer the research questions: 1) What are the activities of SHBR scientists? 2) What are their views, theoretical perspectives and positions regarding their work and how do these in turn affect the overall administration of the conserved area?

The interviewed researchers indicated a strong prioritization of foundational biological research, embedded in a composition of scientists with protectionist ideas of conservation that emphasize the contributions of natural sciences over social science input. This is accompanied by the pressures of academic evaluation rigour that encourages efficient laboratory work and high-ranked scientific publications while discouraging long-term and in-depth engagement with local conservation needs.

Compared to the premises and needs of the integrative goals of the biosphere reserve as a conservation model, the Sierra de Huautla case displays a lack of social and multidisciplinary research. Research concerned with the integration of natural and human dimensions of conservation in the biosphere reserve; and local relevance even within the mostly natural science-based research that is being conducted is lacking. In short, the socio-natural interface that should be guiding conservation research in a biosphere reserve seemed absent in Sierra de Huautla. Moreover, the possibility of fostering social science or multidisciplinary research approaches in this BR is limited due to a lack of infrastructure, available funding, and human resources actively participating in conservation integrative research.

Chapter 9. Conclusions

The purpose of my research was to investigate the implementation of a biodiversity conservation initiative in practice by exploring the interplay of diverse elements and actors in the Sierra de Huautla Biosphere Reserve (SHBR) project. In previous chapters I have described what happens when a NPA ‘come to life’ through people’s individual and collective actions and through configurations and assemblages of rules, non-humans, and institutions. I examined the complex character of conservation activities by highlighting points of dissent, competing interests, and different approaches to conservation work ‘on the ground.’ My analysis included individual and organizations as well as the relational interfaces of human and non-human actors. This chapter concludes the dissertation with a brief reiteration of the main findings in my study in SHBR and situates my findings in the literature. By offering a picture of SHBR’s origins and its actors on the ground, my work responded to “the urgent need for conservationists to prioritise understandings and explorations of the specific ‘communities’—and all the complex socio-political factors they work in” (Waylen, et al., 2010, p. 20).

Drawing from the work of Adele Clarke, I conducted a ground level qualitative study and conceptualized the SHBR conservation initiative as a complex state of affairs or, in her terms, a complex situation (Clarke, 2003). My qualitative research provided a valuable and valid approach to matters critical to conservation research such as the lived experiences of conservation actors, which cannot be effectively researched in other way. In addition to the people involved, I accounted for the tools, documents, and ‘things’ that shaped how conservation was carried out in SHBR.

After considering SHBR as a complex ‘state of affairs’ with multiple elements, I explored three instances of the SHBR conservation case: an exploration of the genesis of SHBR, and an exploration of two of its collective central actors in order to provide a detail description of what SHBR looked like from a ground-level perspective.

Chapter 6 concerned the genesis of SHBR. In this chapter, I probed the history behind the establishment of SHBR in order to understand the conditions out of which it was formed. Drawing insights from Actor Network Theory (the associative character of sociality and the inclusion of non-humans) and using Situational Analytic tools (situational- relational maps), I compiled two sections: 1) A position of authority enabled by a foreign degree and 2) Tropical Dry Forest as endangered ecosystem. These sections provided a comprehensive description of the diverse constitutive elements encompassing people (the Sierra de Huautla focal actor), scientific ideas (attention to and research on tropical dry forest), academic apparatuses (priorities of Mexican science and technology, the value of academic credentials and Mexican connections), historical events (Priorities for international training in the late 1900's), and political conditions (Mexican environmental policy directed towards local inclusion agendas).

I identified how these various elements (human and non-human) 'assembled' in Latour's (2005) terms SHBR as 'protected natural space' through the association and enrolments of various symbolic acts and decrees (the president's speech), media interventions (the active participation of the promoter in the broader environmental policy realm in the state), and production of conservation literature (academic and popular). I also examined how local actors such as the Mexican tropical dry forest—whose occupancy of the geographic area preceded the designation of a biosphere zone—were incorporated, allotted formal functions (through naming, classifying, and decreeing), and rendered critical to the constitution of SHBR.

My study of SHBR's establishment contributes to the recent debate about how conservation projects are 'virtually' constructed (Blondet, 2009; Carrier & West, 2009; West et.al, 2009). For example, I showed one instance of how they are applied worldwide by looking at the SHBR establishment and, more importantly, which specific devices, processes, and tactics facilitate this virtualism to be made possible. For instance, the 'global' ideas and notions about TDF's relevance and the narrative that emphasized its jeopardized condition, which underlined SHBR, were projected as a worldwide agenda. This agenda transcended both national boundaries and local bio-physical realities in a variety of forms, such as through increasing collaborations among north and south states, a continued course of (mis) information, regulatory documents and scientific knowledge via specific people such as the SHBR promoter, and specific

processes of knowledge translation/'popularization'. These processes allowed the establishment of SHBR (a protected area) to be regarded globally as a prioritized region.

Chapter 7 presented an analysis of the lived experiences of local community inhabitants engaged in collaborative projects with other stakeholders in SHBR. As noted, previous work in political ecology suggest that natural protection, in the context of neoliberalism, has relied on 'mobilizing metaphors' (Buscher, 2010, p. 29) such as 'participation' and 'win-win scenarios' to acquire legitimacy. In light of this critical view, I analyzed the arena of participation as "sites of action" where various stakeholders are co-located and found that community participation in SHBR has been largely limited to rhetoric. Neoliberally inspired conservation programs such as PROCODES and PET have done little to benefit SHBR inhabitants beyond the short-term transfer of payments to poor landholders. These programs employ rhetoric of revaluing rural inclusion and ultimately exert greater government control of project activities and enforce stringent eligibility criteria. As a result, neo-liberally inspired conservation programs—implemented in SHBR—have been poorly fulfilling its double promise of serving livelihoods and conservation of nature.

The promise that decentralization mechanisms would create locally relevant policies and programs remains untested in the case of SHBR. My findings suggest that power in the hands of policymakers (central government agencies producing the operational rules and frames of reference for projects) and academics (scientists 'educating' locals) has prevented the creation of a respectful environment needed to foster community participation in SHBR. My arenas analysis went beyond providing a typology for the modes of participation occurring in SHBR; it revealed the complexities and marginalized or silenced voices of local inhabitants. I accounted for these silenced actors and questioned ingrained assumptions about 'participation' in neo-liberally inspired governmental conservation programs: PROCODES and PET. I offered insights into the complexity of conservation practice: the difficulty of applying and succeeding with mechanisms and regulations for local involvement in sites like NPAs which are better understood as virtual constructions of the world (West, et al., 2006). Specifically, extra-local organizations saw the local inhabitants' participation as a passive result of SHBR's establishment as a protected site. Projects 'for conservation' were part of the novel conservation machinery brought to the region after its decree as a BR, and the

idea of genuine participation from local community actors was incongruent or superfluous.

My analysis led to a more productive understanding of participation issues: I strove to open a critical space for discussion and found ways to acknowledge speech and speech-acts that did not conform to scientific paradigms or official/academic normative narratives. As a result, I exposed the paradoxical effects of power and knowledge on the everyday lives of subordinate people (local inhabitants) who nonetheless attempted to advance their interests and needs by contesting rigid operational regulations (for example, re-negotiating project templates to include their own ideas or appropriating and tactically deploying scientific language).

Chapter 8 presented the work of scientists in SHBR—perspectives, commitments, activities, priorities—through the lens of social worlds/arenas. Far from being ‘politically neutral’, the scientific practice underlying conservation strategies for this region was shaped by social and institutional factors, and this was crucial for understanding how scientific positions and perceptions affect conservation objectives. My analysis demonstrated that integrative conservation research is challenging in practice. SHBR scientists held polarizing views on the type of knowledge needed for successful conservation: those aligned with strict protectionism emphasized basic research in the natural sciences, whereas those drawn to the social sciences prioritized community development projects. Moreover, institutional pressures to uphold academic standards overrode the scientists’ avowed commitment to a local conservation agenda. By extending my analysis beyond the research centre to Mexico’s academic reward system, I found that the academic realm at large constituted a powerful domain that “potentially constrained and differentially enabled the situated actions” (Clarke, 2005, p. 117) of SHBR researchers, who were in many ways embedded in a larger social realm where research value and practice are dictated by institutional regulations, academic standards, and regulatory conditions. My SWA analysis also identified each scientist’s research values and vision and summarized the collective research in SHBR.

The scientists’ personal lives, specifically their families, also hindered their engagement in locally relevant research. The scientists enrolled non-humans in the construction of their work limits. Non-human elements, such as the extreme heat and

lack of humidity in TDFs, led scientists to avoid fieldwork and appeared to disrupt or even obstruct research ‘on the ground’. By asking ‘what’ is acting and ‘how’ it is acting (Latour, 2005), I showed that the non-human actors identified in my data indeed modified the SHBR situation. These non-humans were “colleagues in the process of producing knowledge that makes new knowledge possible” (Sundberg, 2011, p. 332), discouraging fieldwork at the very site the humans were meant to be studying. These ways in which humans and non-humans intimately co-constitute conservation practice form my contribution to recent post-humanist political ecology.

The collectives involved in SHBR conservation illustrate why the BR objective of human-environment integration is difficult to achieve. Chapter 8 demonstrated how the perspectives and positions of conservation scientists shape their work in the organizational setting. I contend that current research demands and output are unlikely to make a tangible difference in places with regional conservation goals. The true utility and efficacy of scientific research remains an underexplored aspect of conservation practice in Mexican BRs. As noted in the introductory chapters, conservation initiatives that have a laboratory or are associated with a research institute contribute significantly to natural science-based knowledge (CONABIO, 2012; Halffter, 2011; Urquiza-Hass, 2009). However, as I’ve shown, such knowledge by no means guarantees a positive conservation outcome or effective local decisions (Castillo & Toledo, 2000). A number of systemic problems within academic institutions may explain why research centres associated with specific Mexican BRs fail to fulfill the mandate of human-environment integration.

According to Garcia-Frapolli and colleagues (2011), Mexico’s conservation policy has benefited greatly from the government’s longstanding tradition of employing scientists—a practice thought to valorize scientific planning over political interests. My findings challenge this presumption and show various ways in which scientific priorities created by academia’s “publish-or-perish” imperative have political underpinnings on numerous levels. Scientists worldwide operate in a system rendered value-laden by power asymmetries, selection mechanisms, and career barriers, which creates fierce competition for resources, recognition, and scholarly publication. The possibility of a structural problem in Mexico’s system of BR-related research is consistent with recent criticism of academic requirements that force scientists to comply with regulations often

detrimental to interdisciplinary conservation research in Latin America (Ceballos, 2004 Galindo-Leal, 2000, Castillo & Toledo, 2002).

9.1. Recommendations for Sierra de Huautla Biosphere Reserve

The decentralized model characteristic of Mexico's environmental legislation offers possibilities for locally relevant NPA planning. The offices, non-governmental agencies, and local stakeholders responsible for conceiving and executing conservation projects in SHBR have certain independence to make decisions and are not stringently beholden to higher-level state ministries. Staff members and employees can revise the management plan for environmental protection to better adapt to SHBR conditions. As explained in the introductory chapter, Mexico's LGEEPA was one of the first comprehensive environmental protection laws to consider alternatives for economic and social development—rather characteristic of neoliberal policies implemented in Latin America during the late 1980s. Additionally, the decentralization motive of neoliberal policies gave Mexican environmental legislation an opportunity to design locally relevant regulations (Belausteguigoitia, 2001; Cartron, Ceballos & Felger, 2005).

In light of my research findings, this study provides significant implications for SHBR stakeholders. These implications can be addressed specifically, in the content of the SHBR Management Plan:

1) Applied research to support conservation projects is being neglected in favour of pure research in the biological sciences, which benefits the researchers' academic reputation considerably more than SHBR or its inhabitants. This was evident from my analysis of diverse research databases and the research centre's annual reports, and is among the reasons why SHBR failed to fulfill the central BR mandate of human-environment integration. The SHBR managers may address this challenge by adopting specific mechanisms to encourage collaborative research, among scientists from varied disciplines, towards complex issues such as community dynamics, agroforestry, ethnobotany, and livestock management.

2) Local inhabitants are not genuinely included in the design and implementation of conservation projects, and their role is confined to the level of project implementers. Additionally, there is a scarcity of descriptive information about the conditions and socio-political circumstances of the 31 local communities currently involved in SHBR conservation initiatives. I suggest elaborating comprehensive community profiles—with direct input from SHBR inhabitants—that include statistics, maps, and charts describing population features, employment estimates, current and planned land-use patterns, and migration patterns. These records would at least begin to capture the complexity of each community and the diversity of inhabitants outside the most publicly active or socially capable.

Mascia et. al., (2003) point out that “the real question for debate ... is not whether to integrate the social sciences into conservation but how to do so” (p. 649). My main way to do so is to parlay outcomes from conservation research into concrete educational initiatives for present or future conservation practitioners (Mascia, et al, 2003; Campbell, 2007; Campbell, 2010). However, making research findings accessible and relevant to conservation practitioners is not an easy task, as has been widely acknowledged by social scientists as well as biologists working in conservation (Durand & Vazquez, 2011; Cairns, 2011; Castillo & Toledo, 2000). Thus, one intended practical contribution of this research is to reach NPA management operators by disseminating the findings of my study in the form of curriculum design programs. Capacity-building programs have begun to educate students and practitioners on how and why social context is critical to conservation success (RESERVA, 2012). Initiatives of this kind offer a concrete avenue whereby my work in this study can make a practical contribution, an intention facilitated by my academic training in education.

9.2. Study Limitations

I acknowledge that the research participants of my study in SHBR are not representative of their entire communities, thus my findings are extendable to a limited group within one case of conservation in central Mexico. My study could not access heterogeneity and diversity to better capture the complexities of communities involved in conservation. My dataset from the local inhabitants excluded specificities such as class,

age, ethnicity, and other community-determined factors; these were left un-problematized despite their potential to affect community involvement in conservation projects.

Given the lack of documents produced by or about local communities in SHBR, I was unable to contrast their interview accounts against other information sources, as I did for the participant scientists with the aid of research databases and annual reports. I relied exclusively on my interviews of local inhabitants during my field trips alongside the management unit carrying out their regular activities. I was not able to attend or witness all of the conservation projects I included as examples of the local inhabitants' participation. A longer ethnographic design would have allowed me to document more thoroughly the participatory arrangements, actual engagement, and inter-relations of local and extra-local stakeholders.

Contrary to my previous field experience in other communities and my prior travels through SHBR, I was challenged with very limited access to communities within SHBR. Between 2006 and my data-collecting field trips during 2010 and 2011, violence had rapidly escalated in the Mexican state of Morelos. Military and drug-related groups were a common presence. Family and friends from Quilamula often advised me not to drive alone across SHBR communities, especially in the late afternoon, because the region housed a number of clandestine drug laboratories and was therefore patrolled by military surveillance teams. An encounter with any of these groups on my trips would have placed me in serious danger.

An analysis of the non-human actors in SHBR seemed apt given the centrality of biophysical elements in conservation, which I had predicted for SHBR from the outset of the project. In hindsight, however, my treatment of non-humans could have been more fully considered had I employed targeted methods such as images or other visual materials and pertinent questions in the interviews. Because my methods were limited in scope, the non-human elements were problematic to analyze and difficult to include as 'active modifiers of the situation.

In analyzing the scientists' work in SHBR, I did not reference the stated criteria of top-tier journals for acceptance or rejection of conservation-related research articles. I

had no sources with which to evaluate the scientists' accounts that 'more generalizable' conservation knowledge was more valued than locally relevant research. In order to present a stronger case for this issue, I needed to know whether high-ranking journals (cited or referenced in the research centre's annual reports or in the scientists' interview accounts) had ever published or rejected locally relevant articles (from SHBR or elsewhere), which led to important scientific generalizations.

The above limitations reveal opportunities for further research, which are treated next.

9.3. Implications for future research

The scientific community's conventional or 'mainstream' criteria for evaluating academic success (i.e., publications and grant income) have driven Mexico's research foci; the country's lack of scientific and technological engagement in local and regional concerns affects a wide range of issues critical to its needs (Alcocer, 2010; Aupetit & Gerard, 2011; Gonzalez-Maya & Cepeda, 2011; Jaso-Sanchez, 2008). The dearth of research on locally relevant species and ecosystems within natural protected areas is an urgent challenge for the future of conservation strategies and management in Mexico (Castillo & Toledo, 2000; Pino-del Carpio, Villarroya, Arino & Miranda, 2011).

Dominant narratives of performance and excellence perpetuate the construction of "ideal academics" (Lund, 2011, p. 219) in which scientific work is shifted towards getting published in high-quality journals and away from producing knowledge relevant for local realities and needs. My assessment of the SHBR researchers' work resonates with critiques of academia as an emergent institution of post-industrial, neoliberal societies. A vast literature reports how recent reforms in the academic labour market and higher education policy and management—largely informed by neoliberal ideologies and marketing discourses—affect the development of socially and locally relevant scholarship (Davies, Browne, Gannon, Honan, & Somerville, 2005; Glazer-Raymo, 2008; Morley, 2007; Van den Brink & Benschop, 2011). The dominant journal-ranking system undermines the very purpose of scientific research by basing merit solely on a large number of articles in a limited number of elite journals (Lund, 2012; Starbuck, 2005;

Willmot, 2011;). The relations generated by academic remain to be questioned, observed, and analyzed in Latin American research.

Given that conservation programs are increasingly implemented in challenging contexts such as war zones and armed-conflict areas, 'conflict- sensitive conservation' approaches have been created to help managers design and implement activities that will avoid or mitigate conflict (Martin, Rutagarama, Cascao, Gray & Chotray, 2011; Maekawa, Lanjow, Rutagarama & Sharp, 2013; International Institute for Sustainable Development, 2013). In these initiatives, community participation and local involvement are implemented based on the persistent though untested assumption that the communities themselves want to be involved in conservation programs. Another questionable assumption is that productive and genuine participation of local actors effectively conserves natural resources and fosters peace-building and welfare (Buscher, 2013; Martin, Rutagarama, Cascao, Gray & Chotray, 2011). A central finding of my SHBR study was that the government staff members' and scientists' evident enthusiasm for community participation was not shared by the community residents. It would be interesting to look further and with greater care into the perspectives of marginalized actors and silenced voices in conservation as personified by the local inhabitants 'participating' in conservation projects. While I am not the first to call for revisiting the working assumptions of participation, the arguments for ground-level qualitative work have clearly not produced the necessary case studies of integrative conservation. My work invites small-scale local research to assess the position of affected communities so as not to prejudge their disposition towards conservation programs.

This line of research is even more crucial in Mexico given the escalating violence (100,000 victims between 2006 and 2012) due to the so-called 'drug war' (Ackerman, 2011; Sandoval-Balesteros, 2013) which has already been linked with challenges for conservation initiatives (Breunig, 2006; Hernandez, 2012). Such research would add one more dimension to the issue of participation and highlight the specific non-conformity between the expectations of conservation advocates (based on perceived community organization) and the problematic realities of people on the ground.

While Mexico is emerging as a major centre for the formal recognition of indigenous and other forms of community-led conservation initiatives (Durand &

Robson, Briones-Salas, Barton Bray, & Berkes, 2012), its principal conservation strategy is the establishment and strengthening of a national network of federal government-led protected areas. In particular, the Biosphere Reserve model continues to be prioritized over other modes of protection, and Mexico currently ranks second in the world for number of biosphere reserves (41 in total covering nearly 6.5% of state territory) (Comisión Nacional de Áreas Naturales Protegidas, 2012). Recent integrative research on indigenous and community-conserved areas (ICCAs) in Mexico suggests that these types of environmental initiatives have important conservation benefits and legitimate community participation schemes (Waylen, et al. 2009; Berkes, 2009; Orozco & Berkes, 2010; Robson, 2007). Not necessarily based on conventional science-based/government-led approaches that could be effectively supported through multi-institutional structures, they instead require strong community organizations paired with traditional knowledge-based strategies. Given the potential they offer for biodiversity conservation, these alternative arrangements initiated by local communities could impart important lessons for government-led initiatives (Robson, 2007).

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Appendix A.

Sampling Strategies

Using situational maps for developing the interview protocol

The first analytical exercise carried out very early in my research was the construction of the first situational map. My purpose in constructing this initial situational map was to lay out the main elements that were involved in the ‘situation’—the variety of elements of human and non-human character, discourses along with humans acting in SHBR. As noted, I had myself been working in the research center for several years. The fact that I was familiar with my research site and interest also posed problems, including the risk of overlooking significant aspects of the collaboration that seemed obvious based on my assumptions. I developed the first situational map—in continuous discussions with my supervisor—with the purpose of clarifying my initial ideas regarding what was happening in SHBR and also to make explicit things that I might otherwise have ignored, overlooked or taken for granted. This situational map that I initially worked on was helpful in the beginning to identify the main players or ‘interactants’ in the context of my study (Figure A.1).

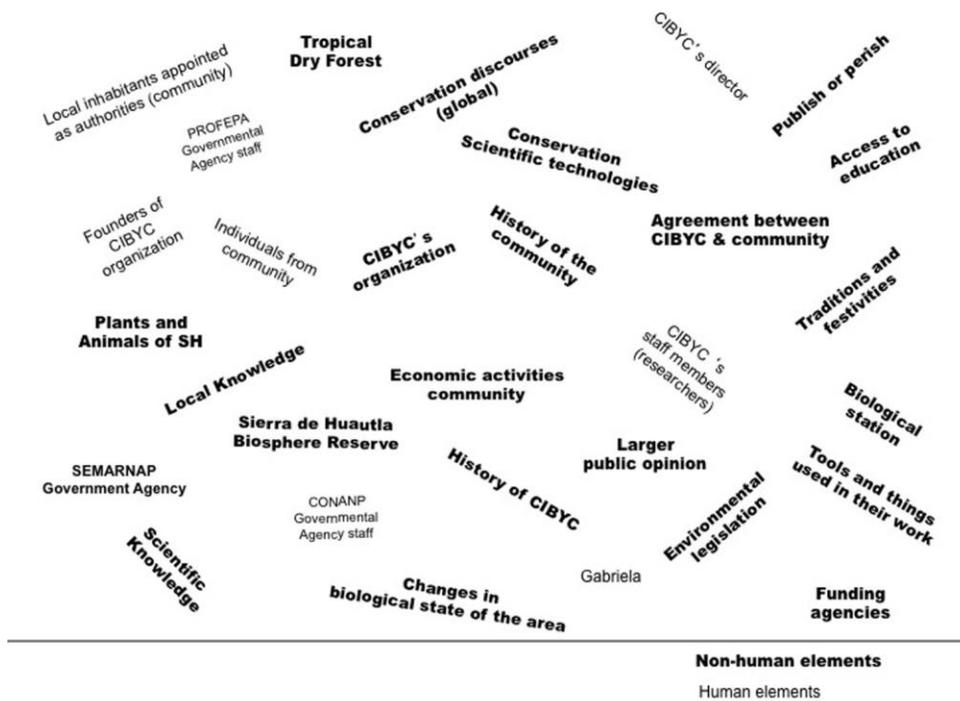


Figure A.1. First situational map. Main players/interactants in SHBR

Subsequently, following Clarke's suggestion of carrying out the relational analysis of the map, I identified relations among elements (Figure A.2).

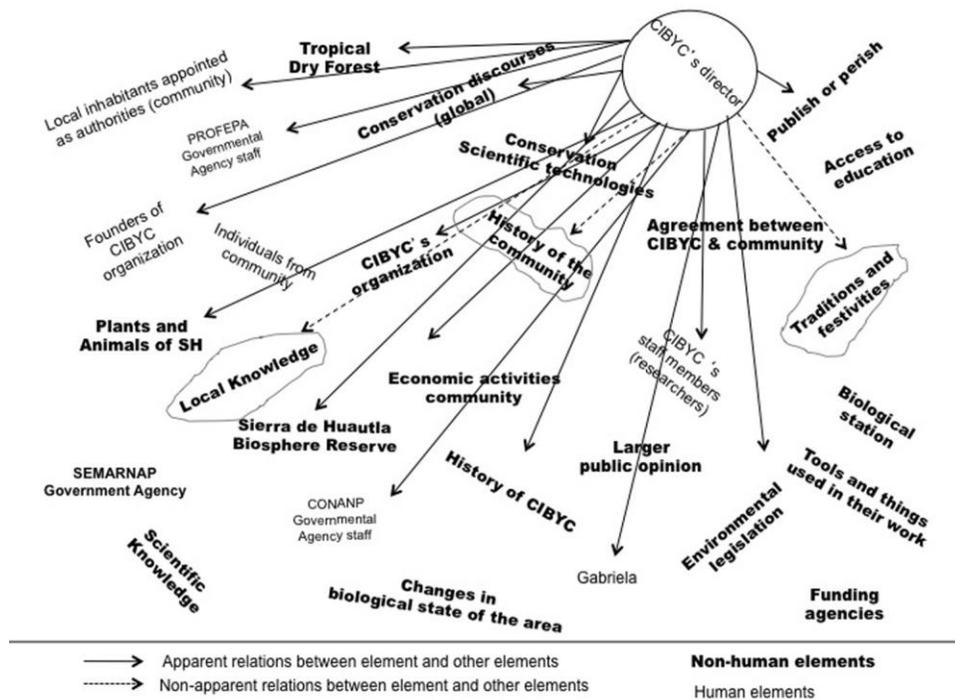


Figure A.2. Relational map (focus on research center director.)

The purpose of establishing relationships among elements was to make graphically visible where there were connections among my data and where there were not. This exercise also helped me become explicitly aware of the elements I considered relevant within the situation and helped me note areas where I did not have enough data. Although the connections that were clear and explicit offered interesting stories to pursue, the empty spaces or silences among elements were especially valuable to explore. While writing memos during this analytical exercise, I focused on these disconnections that I found in my data.

For example, as shown in Figure A.2, in the case of CIBYC's director, two connections were clearly visible: 1) between the director and other researchers (as collaborators publishing scientific materials and so on), 2) between the director and the governmental agency (since he acted as liaison for this agency and was directly involved with the conservation projects held in partnership). However, I found no visible connections between the director and elements such as cultural festivities or local knowledge in SH. After the relational analysis I develop the interview protocol for my meeting with the SHBR research centre director, adding questions related particularly, to

his perspectives about local knowledge inclusion in conservation practices and the type of interactions he had established with local communities. The specific interview questions derived from this analysis were: *What local practices do you consider important to include in the work on conservation in SHBR? What would you consider to be the role of local traditions in your working relations with communities in SH?* Additionally, I tentatively decided to pursue further exploration of these types of inquiry lines—disconnections among elements—with the purpose of exploring specifically those in my research protocol.

Appendix B.

Textual materials used as data sources in Chapter 6

Section 1. A position of authority enabled by a foreign degree

Sources offered information regarding higher education policies fostered by the Mexican Government during the late 1900s (1980-1990)

Licea de Arenas, J., Castanos Lomnitz, H., Valles, J., Gonzalez, E. (2001). Mexican Scientific Brain Drain: Causes and Impacts. *Research Evaluation*, 10(2), 115-119.

Zazur-Miranda, X. (2008). Regional integration and internationalization of higher education in Latin America and the Caribbean: towards an alternative scenario for 2021. In A. Gazzola & Didriksson, A. *Trends in Higher Education in Latin America and the Caribbean (173-233)* Caracas: IESALC-UNESCO.

Government priority on higher education mobility programs (1980-2000).

Pisanty-Levi, J. (2001). Environmental impacts related to transport in Mexico with special emphasis on highways. *Proceedings of the OECD Conference on International Science and Technology Cooperation*. (207-217) DOI: 10.1787/9789264192348-en

Licea de Arenas, J., Santillan, E., Arenas, M., Valles, J. (2003). Desempeño de becarios Mexicanos en la producción de conocimiento científico ¿de la bibliometría a la política científica?. *Information Research*, 8(2) paper no. 147. [Available at <http://InformationR.net/ir/8-2/paper147.html>].

The World Bank. (2002). *Constructing Knowledge Societies: New Challenges for Tertiary Education*. Retrieved from: http://siteresources.worldbank.org/INTAFRREGTOPTEIA/Resources/Constructing_Knowledge_Societies.pdf

Alcantara, Malo & Fortes (2011). Doctoral education in Mexico. In Maresi N. & Heggelund, M. (Eds.), *Toward a Global PhD? Forces and Forms in Doctoral Education Worldwide* (pp. 146-168).

Instituto Nacional de Estadística, Geografía e Informática (2009). *Estadísticas Históricas de México*. Retrieved from: http://www.inegi.org.mx/prod_serv/contenidos/espanol/bvinegi/productos/integracion/pais/historicas10/EHM2009.pdf

Fourcado-Gourinchas, M. & Babb, S. (2001). The rebirth of the liberal creed: paths to neoliberalism in four countries. *American Journal of Sociology* 108(3), 533-579.

Escobar Latapi, A & Gonzales de la Rcoha, M. (1995). Crisis, restructuring and urban poverty in Mexico. *Environment and Urbanization* 7(57), 57-76.

Centeno, M. A. (1997). *Democracy with reason: Technocratic revolution in Mexico*. University Park, PA: Penn State Press.

Alcantara, A. & Clements, M. (2009). Intellectual Property and the Cultural Aspects of Collaboration in the Global Culture: Comparisons Between Mexico and the United States. In J. Zajda & Rust, V. *Globalisation, Policy and Comparative Research Discourses of Globalisation* (pp. 125-138).

Section 2. Tropical dry forests as 'endangered ecosystems'.

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Articles prompted in the Thompson Reuters Web of Science search for the years (1990-2000) containing in the title: "tropical dry forest" for the research area: (biodiversity conservation) and for Mexico as country/territory.

- Dorado Ramírez, O. R. 2001. Sierra de Huautla-Cerro Frío, Morelos: Proyecto de reserva de la biosfera. Universidad Autónoma del Estado de Morelos. Centro de Investigación en Biodiversidad y Conservación. Informe final SNIB-CONABIO proyecto No. Q025. México D. F. Retrieved from: <http://www.conabio.gob.mx/institucion/proyectos/resultados/InfQ025%20primera%20parte.pdf>
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- Perez-Garcia, E. Gallardo, C & Meave, J. (1998). Floristic differentiation within and between xerophytic habitat islands in a seasonally dry forest region. *Biotropica* 30(2), 31-32.
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Mexican Government reports

- Arriaga, L. (2009). Regiones prioritarias y planeación para la conservación de la biodiversidad. In *Capital Natural de México*, Vol. II: Estado de conservación y tendencias de cambio. Conabio, México, (pp. 433-457). Retrieved from:
http://www.biodiversidad.gob.mx/pais/pdf/CapNatMex/Vol%20II/II10_Regiones%20prioritarias%20y%20planeacion%20para%20la%20conservaci.pdf

Reports from International Conservation Agencies

- Reid, W & Miller, K. (1998). Keeping options alive: the scientific basis for conserving biodiversity. Washington DC: World Resources Institute.
- Olson, D.M. & Dinerstein, E. (1998). The global 200: a representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12(3) 502–515.

Websites:

- World Wildlife Fund. Anthony B Rath (2012). Mexican dry Forests. URL:
http://wwf.panda.org/about_our_earth/ecoregions/mexican_dry_forests.cfm
- Comision Nacional para el Uso y Conocimiento de la Biodiversidad (2012). Mexican Biodiversity. Natural Capital and Social Well Being. URL:
http://www.biodiversidad.gob.mx/v_ingles/country/capitalNatMex_ingles.html

Management Plans:

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Appendix C.

Interview Protocols

Perspectives in conservation (research center/external agencies)

1. ¿Reconoces a alguno de estos autores? Me puedes decir con quién coincides en tu trabajo de conservación?
1. Do you recognize any of these authors? Can you please tell me which one is more aligned with your work in conservation?
John W. Terborgh Janice Alcorn Víctor M. Toledo
Kent H. Redford Daniel Janzen Julia Fraga
2. Please tell me what these 'represent' or signify in conservation theory/praxis terms.
2. Me puedes decir porfavor qué representan éstos en términos de teoría y práctica en conservación?
3. What is the role of local ecological knowledge in natural conservation projects such as the one in SH?
3. Cuál es para tí el papel del conocimiento ecológico local y del conocimiento científico en el trabajo de conservación natural en SH?
4. Qué practicas culturales consideras para realizar tu trabajo en conservación? Cual consideras que es el rol de las tradiciones locales en tu trabajo con las ocmunidades en SH?
4. What local practices do you consider important to include in the work on conservation in SHBR? What would you consider to be the role of local traditions in your working relations with communities in SH?

Professional history and involvement in SH (research center/external agencies)

1. ¿Qué tipo de trabajo desarrollas? ¿Tú trabajo siempre ha estado vinculado con el trabajo de conservación?
1. What type of work do you do? Have you always/How long have you worked in natural conservation projects?
2. Podrías hablarme de cómo empezaste a trabajar en el area natural protegida? Cuánto tiempo has trabajado aquí?
2. Can you please talk to me about your work in Sierra de Huautla? How did you get involved in Sierra de Huautla's project?
3. ¿Has visto cambios en el entorno desde que trabajas en SH? Puedes darme ejemplos porfavor?
3. Have you seen changes in the environment since you start working in SH? What kinds of changes have you seen since you have been there? Can you please give me examples?
4. Base on your involvement in this area, what would you say are the things of greatest concern to you? Provide details on why are these relevant?

4. Cuáles mencionarías como asuntos más importantes o de mayor interés para tí en Sierra de Huautla? Propociona detalles de porqué esto es relevante.
5. What tools or supports (it can be texts or documents, or instruments, or other tools) do you use most often in your activities? Do you relate those with your work in conservation? What implications have these tools for your work outcomes? your job?
5. Qué herramientas o materiales de apoyo (pueden ser textos, instrumentos, o cualquier otra herramienta) utilizas más en tu trabajo? Relacionas éstos materiales con tu trabajo en conservación? Considerarías que el uso de estos materiales impactan tu trabajo, tus actividades?

Personal History (Local inhabitants)

1. Can you please describe the place where you live? How did you come to this place?
1. Describe el lugar donde vives. ¿cómo llegaste aquí?
2. How long have you lived here?
2. ¿Cuánto tiempo has vivido aquí?
3. Have you seen changes in the environment since you have been here? Can you please give me examples?
3. ¿Has visto cambios en el entorno natural (monte) de este lugar desde que estas aquí? Dame ejemplos porfavor.
4. ¿What would you say are the things of greatest concern to you? Provide details on why are these relevant?
4. Cuáles mencionarías como asuntos más importantes o de mayor interés para tí en Sierra de Huautla? Propociona detalles de porqué esto es relevante.
7. What tools or supports (it can be texts or documents, or instruments, or other tools) do you use most often in your daily activities?
7. Qué herramientas o materiales de apoyo (pueden ser textos, instrumentos, o cualquier otra herramienta) utilizas más en tus actividades cotidianas?

Collaborations (all groups)

1. Can you please mention some associations with whom you collaborate and and can you describe them and their activities?
1. Puedes mencionar agrupaciones que trabajen en este lugar. ¿Cómo los describirías? ¿puedes porfavor, describir sus actividades?
2. Do you have a relationship with these organizations? What kind of relationship? Can you please give me examples?
2. ¿Tienes relación con estas organizaciones? ¿Qué tipo de relaciones establecen? ¿Puedes darme ejemplos porfavor?
3. What other stakeholders are involved in the work you do in Sierra de Huautla? What do you see as the matters of greatest concern to them?
3. ¿Puedes mencionar a otros involucrados en el trabajo que desarrollas en SH? Cuáles para tí son los asuntos mas importantes o de mayor interés para ellos?
4. Can you please describe the activities you do together?

4. Podrías porfavor describir las cosas que hacen en conjunto?
5. What is the history or background of this thing?
- 5.Cuál es la historia o cuáles fueron los antecedentes de esto?
6. Who did you work with on this thing?
6. Con quién trabajaste en este asunto?
7. What aspects was your organization responsible for? What aspects were other organizations responsible for? How was this negotiated?
7. De qué aspectos fue responsable tu organización? De qué aspectos fueron responsables otras organizaciones? Cómo fue esto negociado?
8. What difficulties did you experience in this endeavor? What went easily?
8. Qué dificultades experimentaste en esta tarea? Qué resultó sencillo?
9. Was this endeavor a success? Why or why not? Would others you know of see it as a success? (or a failure?)
9. En tu opinion, fue ésta tarea un éxito? Porqué? Crees que los otros involucrados lo verían como un éxito o un fracaso?