# INTEGRATED CONSERVATION IN MEXICO: RECONCILING CONSERVATION AND SUSTAINABLE DEVELOPMENT WITHIN NATURAL PROTECTED AREAS

**Linabel Segovia Sarlat**
**MPhil Development Studies**
**University of Sussex**

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## Abstract

This research focuses on the extent in which integrated conservation as an approach of management for protected areas can reconcile with the effective conservation of biodiversity while supporting the sustainable development of local communities that exist within or surrounding the boundaries of the reserve. It contributes to the global debate on the appropriateness of local community participation in conservation and the potential challenges facing the integration of conservation into local development. In order to do that, two case studies were carried out in biosphere reserves in Mexico where the aim of implementing this approach was identified.

An Integrated Conservation Assessment (ICA) was designed to assess the implementation of integrated conservation from the local stakeholders' perception. The components of the ICA include; transfer of local benefits and costs, sustainable livelihoods and local participation. One year's field work was carried out to collect information from the local communities through participant observation, informal interviews and user groups meetings. External stakeholders were also interviewed to obtain a balanced impression of integrated conservation that in turn complemented and expanded upon the perceptions of the local community.

A comparative analysis demonstrates that one of the reserves has attained a significantly higher level of integrated conservation in comparison to the other. In order to explain different outcomes of results between the two case studies, the research discusses some of the conditions that favour the implementation of an integrated conservation approach, both from the managers and from the local community's perspectives. These results support discussions on finding win win situations to increase the effectiveness of conservation and build local capacity for sustainable development.

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# Table of Contents

## LIST OF APPENDICES

## LIST OF ACRONYMS

| | |
|---|---|
| CAMPFIRE | Communal Areas Management Programme for Indigenous Resources |
| CBD | Convention on Biological Diversity |
| CINVESTAV | Centro de Investigaciones y Estudios Avanzados del Instituto Politécnico Nacional (Research and Advanced Studies Centre of the National Polytechnic Institute of Mexico) |
| CITES | Convention on International Trade in Endangered Species |
| CONANAP | Comision Nacional de Areas Naturales Protegidas (National Commission for Protected Areas) |
| CONABIO | National Commission for the Knowledge and Use of Biodiversity |
| CULTUR | Ministry of Culture and Tourism |
| FAEP | Federal Attorney for Environmental Protection (Procuraduría Federal de Protección al Ambiente- PROFEPA) |
| GEF | Global Environmental Facility |
| ICDP | Integrated Conservation and Development Project |
| IIC | Index of Integrated Conservation |
| INE | Instituto Nacional de Ecología (National Ecology Institute) |
| IUCN | International Union for Conservation of Nature |
| LPI | Living Planet Index |
| MALF | Ministry of Agriculture, Livestock, Fisheries, Rural Development and Food |
| MDG | Millennium Development Goal |
| MENR | Ministry of the Environment and Natural Resources |
| MENRF | Ministry of the Environment, Natural Resources and Fisheries |
| NEI | National Ecology Institute |
| NCPA | National Commission on Protected Areas |
| NGO | Non-governmental organisation |
| PAMP | Protected area management plan |
| PES | Payment for Environmental Services |

| | |
|---|---|
| PET | Programa de Empleo Temporal (Programme for Temporary Employment) |
| PRODERS | Programa de Desarrollo Rural Sustentable (Programme for Rural Sustainable Development) |
| PROFEPA | Procuraduria Federal de Protección al Ambiente (Federal Attorney for the Protection of the Environment) |
| PRSD | Programme for Rural Sustainable Development |
| PTE | Programme for Temporary Employment |
| SEMARNAP | Secretaría de Medio Ambiente, Recursos Naturales y Pesca (Ministry of the Environment, Natural Resources and Fisheries) |
| SEMARNAT | Secretaría de Medio Ambiente y Recursos Naturales (Ministry of the Environment and Natural Resources) |
| SIMAC | System of Information, Monitoring and Assessment for Conservation |
| UMA | Unidades de manejo ambiental para la conservación de la vida silvestre (Unit for wildlife conservation) |
| UNEP | United Nations Environmental Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| US | United States of America |
| UWC | Unit for wildlife conservation |
| WCED | World Commission in Environment and Development |
| WWF | World Wildlife Fund for Nature |

# CHAPTER 1: "INTRODUCTION"

## 1.1 Overview

Conservation of biodiversity is considered to be one of the main challenges for humanity in the 21st century. It is estimated that there are between 2 million and 100 million species of flora and fauna in the world; however, only about 1,800,000 have thus far been identified (Vié, Hilton-Taylor & Stuart, 2009). Biodiversity comprises "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complex of which they are part: this includes diversity within species, between species and ecosystems" (UNEP, 1992:3).

The contributions of all these life forms are not only essential for human survival but they also sustain diverse areas of development. Biodiversity ensures oxygen production, carbon sequestration, and water recycling for a healthy environment; it provides food supplies for agriculture, fisheries and other primary industries; it stabilises the climate and offers pollination services; it provides construction materials for human settlements and mitigates against natural disasters; in terms of tourism, it makes available habitat for species to view and scenery for recreation and inspiration (IUCN, 1998); and livelihoods are sustained by the availability of biodiversity to local communities (Redclift, 2000). For all of these obvious contributions and the ability of biodiversity to influence human well-being, conservation has become a central aspect of the development agenda.

As needs increase through both consumption patterns and population growth, pressure on nature intensifies, causing ecosystem depletion (Meadows & Club of Rome, 1972; Ash & Fazel, 2007). This anthropogenic pressure and the depletion of nature is putting future development potential at risk (UNEP, 2007). The latest update of the International Union for Conservation of Nature **(**IUCN) Red List of Threatened Species registers 17,291 out of the 47,677 assessed species as threatened with extinction (Vié, Hilton-Taylor & Stuart, 2009). Although rates of evolution and extinction have not been consistent throughout the ages, being affected by environmental variation,

contemporary patterns of human development habitat destruction have accelerated annual extinction rates to between 1,000 and 10,000 per 1 million species; figures that contrast with natural extinction processes, which are estimated at less than 1 a year for every 1 million species (Mackay, 2002).

Agricultural development has led to high rates of deforestation, loss of species, conversion of ecosystems, and genetic depletion (FAO, 2011; Ash & Fazel, 2007). Tropical forests have experienced the most dramatic land conversion into grassland since the mid-1950s; and half of all inland water ecosystems have been modified to accommodate hydraulic engineering projects (Ash & Fazel, 2007). In the last 20 years, unprotected natural habitat has been reduced by 50 per cent worldwide, indicating an imminent risk of massive biodiversity extinction (IUCN, 2005).

Accordingly, strategies to arrest these trends and conserve biodiversity have emerged, and one of the most significant is the establishment of natural protected area (IUCN, 2003: 2). Natural protected areas as a policy emerged in the late 19$^{th}$ century and have since spread significantly worldwide (UNEP & WCMC, 2010). However, the implementation and management of these reserves is a costly undertaking that requires human resources and infrastructure for surveillance and monitoring. Therefore, it is important to identify priority areas for humanity that need to be conserved in order to maintain the ecological cycles and services upon which human survival and development depend.

The worldwide distribution of biodiversity is not homogenous; so called ‘biodiversity hotspots’ contain a concentrated range of species and ecosystems, and about 75 to 90 per cent of the world’s most endangered mammals and birds (Myers, Mittermeier, Mittermeier, da Fonseca et al., 2000). These hotspots are often located in the tropics, and in developing nations in which funding for conservation is least available, and where challenges associated with poverty reduction pose complex questions on how best to address the issue of conservation.

The identification of priority areas for conservation raises the question of the allocation of conservation responsibilities and, by extension, who is required to carry the burden of

protecting these habitats. Therefore, the social implication of protected areas are important aspects of this research.

### 1.2 Research questions and aim of the study

The following research questions are issues that will be explored in the course of a review of conservation in protected areas with the purpose of identifying an approach of conservation that is both socially and ecologically acceptable:

- What are the social consequences of protected area conservation for local communities resident within or surrounding such areas?
- To what extent can conservation and local development be simultaneously addressed through the implementation of protected areas?
- How can the benefits of protected areas bring improvements to local communities?
- To what extent should local communities within protected areas be allowed access to the natural resources that it has been deemed necessary to conserve?
- How might local communities be engaged in support of conservation initiatives?
- What realistic conditions should be met in order to improve integrated conservation in protected areas?
- To what extent is the integrated conservation approach in Mexico moving from political narratives to practical experience?
- What can we learn from integrated conservation through the case studies based in Mexico?

The comparative analysis from the case studies are based on an Integrated Conservation Assessment (ICA). The objective of the ICA are:

1. Understanding the diverse livelihoods of the local stakeholders within the protected areas.
2. Identifying the changes that local communities have experienced as a consequence of the establishment of the protected area,
3. Identifying which of the changes identified are attributable to the protected area policies and how those transformations affect local communities.

4. Understanding how different stakeholders participate with the biosphere reserve management.

These questions are answered with data collected from fieldwork carried out in the protected areas of study and placed into context with a historical review of the protected areas in Mexico.

The results of the case studies aim at identifying lessons that contribute to the global debate on the appropriateness of the concept of integrated conservation. The case studies in Mexico represent a contribution to Latin American experiences for two main reasons, due to the comparatively recent adoption of the protected areas; and due to its social significance as 80 per cent of their protected areas host resident populations (Borrini-Feyerabend, 1999).

### 1.3 Research rationale

The role of the protected area has evolved over time, experiencing different approaches and purposes for its establishment (Chape, Spalding & Jenkins, 2008).The initial establishment of protected areas in America and in European colonies from the late 19$^{th}$ century was dominated by a vision that aimed to separate human settlements from the ecosystem (Neumann, 1998). However, replication of such an exclusionary model of conservation has resulted in a negative correlation between conservation, and the processes of rural development and social change (Anderson & Grove, 1987a; Saberwal & Rangarajan, 2003).

The burdens associated with conservation can be characterised as both the cost of reduced access to natural resources, and those costs associated with the opportunities that a community must forego with the implementation of environmental preservation programmes (Norton-Griffiths, 2000; Emerton, 2001; Guha, 2003).

Therefore this model has been considered particularly inappropriate in the context of developing countries, in which the majority of protected areas have historically been inhabited by local communities (often indigenous peoples) living in varying conditions of poverty. Indeed, many protected areas in developing countries have been created without consultation with their residents (Kemf, 1993).

From the point of view of local communities, it has been largely recognised that restrictive policies associated with access to natural resources bring significant local costs, including jeopardy of food security; loss of traditional knowledge and technologies; disempowerment as citizens; and denial of access to wood (Ghimire & Pimbert, 1997). Studies taken from across Africa and India that have monitored the imposition of such regulations in communities resident in protected areas reveal that the consequent emergence of social conflict can be summarised according to two common patterns. First, the attainment of conservation goals often militates against the fulfilment of the substantive needs of people dwelling in the protected area; and second, local people tend to be excluded from decision-making processes in respect of conservation goals and strategies (Stolton & Dudley, 1999).

From the point of view of the government, social conflicts in natural protected areas raise the cost of management, due to little community incentive to assist with conservation programmes, and the lack of alternative livelihoods that would buffer local communities against the impact of conservation strategies. Evidence of the level of local resistance to an exclusionary conservation approach can be tragically found in the violent conflicts that have led to the death of local community members in military-backed operations to enforce conservation practices (Neumann, 1998; Guha, 2003; Saberwal & Rangarajan, 2003). Therefore, this research addresses the increasingly conspicuous arguments of academics and conservationists who call for a new approach to environmental protection that integrates nature and culture (Saberwal & Rangarajan, 2003). This new strategy is characterised by emergent proposals for conservation that focus on community development, (Wilshusen, Brechin, Fortwangler & West, 2002; Hutton, Adams & Murombedzi, 2005) including community-based conservation, co-management, and integrated conservation and development projects; all of which emphasise the right of local actors to participate in environmental protection and sustainable local development. These emergent proposals argue that officially published mandates for conservation initiatives in protected areas have little influence on the actual implementation of environmental protection compared with the impact of local communities, as they are the direct users of the ecosystem.

More than three decades have passed since it was acknowledged that people and protected areas should be brought together. Yet, the irreconcilability of local community development and conservation in many protected areas is still a reality (IUCN, 2005). This stand-off is in large part because efforts to implement an integrated approach to conservation raise the question of who should be allowed access to the biodiversity and to what extent it should be restricted.

Moreover, critics of integrated conservation have questioned the effectiveness of this approach, claiming that the preservation of biodiversity is all too often sacrificed in the interests of improving livelihood opportunities for local communities living in protected areas. Consequently, academic critiques call for the increased centralisation of environmental protection that focuses more sharply on the scientific aspect of conservation and less on community development (Oates, 1999; Wells, Brandon, & Hannah, 1992; Attwell & Coterill, 2000). Discussions on the approach conservation are important not only in academic circles but also due to the effect they have on donor aspirations and the allocation of funding; and such counterarguments have in some cases persuaded donors to reject community conservation projects (Hutton, Adams & Murombedzi, 2005).

The emergence of conflict between the needs of biodiversity and the needs of local communities suggests that no conservation model will succeed if it does not incorporate the social needs and political contexts of a given protected area (Anderson & Grove, 1987b; Stolton & Dudley, 1999). For this reason, many authors have suggested the need to take the priorities of local populations into account in the design of conservation programmes, and to promote community participation in the management of protected natural areas. Participation is required at all levels and must ensure that local livelihoods utilise biodiversity sustainably. However, participation is almost always only compatible with conservation if the latter generates local benefits, and thus incentivises communities to contribute and actively engage in conservation programmes. Therefore, this study pays attention to the conditions that favour integrated conservation in protected areas.

### 1.4 Thesis structure

Chapter 2 reviews the current debate associated with the integration of conservation and development. It begins with a critique of the dominant development ideologies and its social and ecological effects. It explores the paradigm of sustainable development and reviews related concepts important for its implementation. It also reviews the evolution of conservation approaches identifying underlying causes of changes in conservation approach. Integrated conservation is examined with it proposals and counterarguments. Finally the chapter identifies three main components to assess integrated conservation: transfer of local benefits and costs (Ghimire, 1997; Emerton, 2001; Bond, 2001); sustainable livelihoods (Turner, 2004; Brown, 2002); and participation of local communities (Jacoby, 2001; Neumann, 1998; Saberwal & Rangarajan, 2003). Chapter 3 constructs a history of conservation in Mexico and reviews the national policy on conservation and protected areas including a historical review that places particular emphasis on the evolution of protected areas since 1994, when the Ministry for Environment, Natural Resources and Fisheries was established (SEMARNAT, 2000a). In the last 20 years, the evolution of protected areas has assumed greater significance, both in terms of resources invested and an approach to conservation that aims to integrate sustainable development in its narratives. The evolution of Mexican political conservation narratives is thus explored in this chapter. Chapter 4 outlines the research methods for this study. It explains the design of the Integrated Conservation Assessment and the mixed methods for data collection including participant observation, informal interviews, user group meetings, structured interviews and semi- structured interviews. It also establishes the methods for data analysis based on qualitative information. Chapter 5 presents an initial overview of the areas of study; this includes an account of the main economic activities in the communities which focuses on the history and evolution of fisheries and their role in local development. Analysis of historical socio-economic aspects of local development linked to the access to natural resources aims to put into context the challenges for conservation that will be identified and analysed in discussion of the current context. Chapter 6 presents the findings of the case studies. The results from the ICA present a comparative analysis of the case studies. The analysis the ICA is based on the main components of integrated conservation (local benefits and costs, sustainable livelihoods and local participation) and a detailed account of the component's indicators is provided. Chapter 7 discusses the results of the case

studies in the light of academic debates for and against an integrated conservation approach. Chapter 8 discusses the main conclusions of the research. Practical lessons learnt from experiences and challenges faced by the case study areas are identified. The research concludes that under certain circumstances (explicit in the components of the ICA) integrated conservation is an approach that offers important inputs to reconcile local development concerns while assisting in achieving conservation goals in protected areas.

# CHAPTER 2: "INTEGRATING CONSERVATION AND DEVELOPMENT"

## 2.1 Introduction

Protected areas have been a central strategy for conservation of biodiversity. This instrument of conservation has spread around the world particularly since the 1970s (Adams & Hutton, 2007) reaching 120,000 protected areas around the word to date covering 12.2 per cent of the inland global surface and 0.5 per cent of extra territorial seas (excluding Antarctica) (UNEP & WCMC, 2010).

Since the end of the twenty century, the social implications of protected areas have been a topic of growing interest, particularly in developing countries where most protected areas share include within their boundaries impoverished local communities, many of them indigenous to those lands (Kemf, 1993; Ghimire and Pimbert, 1997; Koziell & McNeill, 2002).

This characteristic has raised discussions about the role of local community participation in protected area management. Early exclusionary models of protected areas aimed at separating local communities from conservation efforts with the premise that human interaction with nature will inevitably deplete biodiversity. Research has shown that this model of conservation has negatively affected the local development of the communities inhabiting those areas (Homewood & Rodgers, 1987; Agrawal & Gibson, 1999; Neumann, 1998; Brockington, 2002; Saberwal & Rangarajan; 2003). Academics and human rights advocates have called attention to the rights of local communities to sustainable development on land set aside for conservation of nature (Colchester, 1997; Guha, 2003; Adams & Hutton, 2007).

The inclusion of local communities in protected areas is associated with the evolution of thinking from a conservation approach based on linear assumptions about the ecological systems to an approach based on the premise that culture and nature can coexist and that biodiversity can benefit from interaction with humans communities (Gómez-Pompa & Kaus, 1992; Leach & Scoones, 1997; Maffi, 2007).

Categories of protected areas which include local communities were established since the 1970s (UNESCO, 1996) and their implementation has raised questions about the effectiveness of conservation (Brockington, 2004) based on the fact that local communities within protected areas are the direct users of biodiversity to sustain their livelihoods (Neumann, 1998). Similarly, the social costs transferred to local communities facing poverty are questioned in terms of environmental justice as conservation policies can often restrict local livelihoods (Emerton, 2001; Saberwal & Rangarajan; 2003). Therefore an important aspect of this discussion centers on how to create win-win strategies to allow conservation of biodiversity while supporting local development (Redclift, 2000; Adams & Hutton, 2007).

This chapter aims at building up a theoretical framework to support the concept of integrated conservation within the context of sustainable development. Changes to conservation strategies; from conventional approaches in protected areas, towards an integrated approach, will be explored through a literature review of protected area management in developing countries.

A theoretical review of development will focus on the concept of sustainable development and its evolution from the 1970s. A theoretical background on economic development and most of the dominant ideologies of development will be presented. As this review is intended to provide context for the case studies in Mexico, it centres on the dominant Western views of development that have, in turn affected Mexican conservation and development.

A historical review on the integration of development and conservation agendas includes the revision of the global political context behind the adoption of this approach, incorporating questions environmental equity. Questions of social justice will be raised and a review of related concepts such as community, participation and social capital is included in this chapter.

This research assesses integrated conservation based on three main components: 1) The transfer of benefits from conservation to local communities, 2) Sustainable livelihoods and 3) Local participation. Each component is presented in this chapter as they will be

used to assess integrated conservation in the case studies carried out in Mexican protected areas.

## 2.2 Evolution of conservation of biodiversity

The importance of conserving the world's biodiversity has increased in urgency as more species of flora and fauna around the world are classified as vulnerable, and a growing number move closer to extinction. Indicators for different ecosystems such as tropical rainforests, freshwater systems, coral reefs, mangroves, mountain forests and seas have all been found to be much lower than 1970 levels (WWF, 2010).

The Living Planet Index (LPI) measures the changing state of biodiversity and the pressure of consumption on natural systems to compare the available volume of a given resource with the rate at which it is being consumed by human society. Based on trends with regard to 2,500 species of vertebrates, the 2010 LPI of global biodiversity indicates a decline of nearly 30 per cent between 1970 and 2007 (WWF, 2010).

Extinction is a natural evolutionary process, normally resulting in replacement by more advanced and better-adapted species. However, extinction rates have increased rapidly due to environmental threats resulting from human development (Primack, 2004). Extinction represents an irreversible and permanent loss of unique species in evolutionary history (Baillie, Hilton-Taylor & Stuart, 2004), many of which disappear before there has been a chance to register them or discover their potential contribution to human development. Loss of biodiversity, however, has implications beyond the contribution of individual species that concerns the intrinsic value vested in them by their very existence (Groombridge, 1992).

The consolidation of environmental concern as a discipline resulted in the rise of conservation biology in the 1980s. Conservation biology is a 'multidisciplinary discipline' that also includes the social sciences. It includes the documentation and description of the full range of known biodiversity with the aim of protecting species, communities and ecosystems, and restoring those that have been degraded (Primack, 2004). However, localised efforts to protect biodiversity existed long before the term 'conservation' was adopted in scientific format. International cooperation on

biodiversity conservation dates from the early 20th Century and national and regional preservation societies were established from the late 19th Century. The emergence of international co-operation in addressing biodiversity loss was notable from the beginning of the 1970s, when national and regional preservation societies created in the industrialised nations during the mid-nineteen hundreds strove to establish international collaboration on a broader range of conservation aspects, such as safeguarding ecosystems of cultural value; emphasising the importance of biodiversity protection within development, planning; and establishing international laws governing trade in terms of biodiversity. Examples include initiatives from; the United Nations Educational, Scientific and Cultural Organisation (UNESCO); and the Convention on International Trade of Endangered Species (CITES), signed in 1973, and the creation of the United Nations Environmental Programme (UNEP) in 1972 to co-ordinate conservation at an international level and the continual expansion until the Global Environmental Facility (GEF) was established in 1990 as a means of promoting financial commitment to the implementation of conservation efforts around the world (Speth & Haas, 2006).

Progress in environmental protection can be gauged by the improved status of 40 species (37 of them mammals) in the latest update of the IUCN Red List, which indicates an improvement as a result of conservation efforts (Baillie, Hilton-Taylor & Stuart, 2004). This and other positive reports reinforce the commitment to conservation action, policies and programmes around the world. However, the majority of indicators of biodiversity have continued to show declining trends over recent decades, particularly in the tropics (Butchart, Walpole, Collen, Strien et al., 2010). For this reason the present study will analyse conservation strategies in terms of protected areas in particular, as they are considered one of the most effective ways of countering the threats of habitat and biodiversity loss (Vié, Hilton-Taylor & Stuart, 2009).

### 2.3 Background on development ideologies

Multiple definitions of development have been established and endorsed by dominant forces over time carrying implicit sets of laws and behavioral patterns (Chambers, 1995). Development carry levels of wellbeing, set of knowledge, the capacity to intervene, change and dominate (Sidaway, 2002). Development strategies have

emerged as practical paths to be pursued by international agencies, nation states, non-governmental and community-based organisations or individuals, in an effort to stimulate change within a particular geographical region (Potter in Desai and Potter, 2002). The present study recognises that the concept of development has had different meanings at different times, for different people, in different places; but that it always refers to a positive change (Chambers, 1995).

Classical and neo classical economics have strongly lead development and the positive change in human living has been understood in terms of economic growth. The capitalist society has lead Western development and this model has been promoted in developing countries to improve development standards. Throughout the 18$^{th}$, 19$^{th}$ and 20$^{th}$ centuries, this theory of development has paid little attention to the social distribution of income, ensuring that every social class can meet its basic human needs; and little attention to the natural capacities of the ecosystems to regenerate natural resources for production inputs and to assimilate production waste.

However the evolution of conventional economics into modern theories of development has incorporated social aspects of development (Peet & Hartwick, 2009). Similarly the contributions of ecological economics have questioned neoclassical economic assumptions locating the economic system within a natural system that is finite (Costanza, Cumberland, Daly & Goodland, 1997). These contributions have had an important role in assessing development and identifying phenomena such as social inequality, poverty and environmental degradation as consequences of a development model centered on economic growth. Within modern definitions, development is understood as an ‘improvement in a complex of linked natural, economic, social, cultural and political conditions” (Peet & Hartwick, 2009: 3). However, given the different perceptions of what an ‘improvement’ is when different cultural ways of seeing the world exist, development remains a concept open to interpretation and constantly evolving. Ideas of development are therefore controversial (Potter, 2002).
In this section a brief review on the evolution of the dominant development ideologies and visions as a background to the current sustainable development debate, is presented.

## 2.4 Evolution of the dominant development theories

The concept of development has changed over time. Social evolution from feudal to capitalist systems during the 18th century in Europe illustrates important transformations on ideas of development. The Enlightenment period in Western Europe challenged the prolonged domination of mysticism created by clergical institutions that created superstition (Peet & Hartwick, 2009). The Enlightenment period opened up critical reasoning which promoted new ideas of social organisation, democracy, and technological advance (Power, 2002). Social change occurred. The new social order brought around the division of labour, allocation of prices, markets and trade principles strongly influenced by the work of classical economist in the late eighteen and early nineteenth century (Costanza, Cumberland, Daly & Goodland, 1997).

The work of Adam Smith in the *Wealth of Nations* (1776) brought economic visions of human beings as traders, self-interested individuals and a focus on making money (Butler-Bowdon, 2012). His concepts, a reaction against the social order ruled by the nobility, proposed markets that could regulate social order by free competition (Peet & Hartwick, 2009). With these concepts he established principles for an efficient modern economy. Its description of national wealth were based on economic growth, accumulation of capital, re-investment, division of labour, specialisation of the production process, and relatively free trade as the basis of modern prosperity (Sapsford, 2002; Butler-Bowdon, 2010).

David Ricardo (1772-1823) added scarcity to Smith's theory. His work, focused on the land owning class, dealt with concerns of reduction of fertile land and the growing population which affected the cost of food and economic returns. This initiated discussions about the links between natural ecosystems and economics (Costanza, Cumberland, Daly & Goodland, 1997). His theory of free trade based on the principle of comparative advantage stated that international specialisation among countries will lead to global benefits in terms of economic growth (Sapsford, 2002).

Other classical economists followed Smith's principles and neo-classical economists in the last half of the 19th century continued with an emphasis on productivity and the use of technology (Binns, 2002). Economic principles such as economies of scale focused

on mathematical models to minimise costs of production and conditions for optimal production (Peet & Hatwick, 2009). These conventional economists' principles are still used in today's policies of development; but controversies about their viability have arisen such as, whether the individual pursuit for material accumulation leads to prosperity when the environmental implications of production and consumption threatens the state of biodiversity worldwide (Costanza, Cumberland, Daly & Goodland, (1997).

Smith's principles assumed that nature could provide unlimited materials and assimilative capacities. This view distorted notions of the value of the ecosystem which in turn led to a cavalier approach to biodiversity depletion (Barbier, 1994). A broader analysis of the consequences of this economic model's effect on sustainability will be explored in this chapter.

**2.5 Developing countries perspectives**

Development in developing countries needs to be analysed with consideration of historical colonial context and the relationship between developing and developed countries. Under colonialism, the power of domination imposed new social structures on countries to allow natural and human exploitation (McMichael, 2008). The implications of a society structured around raw materials exploitation to feed other countries' economies are important historical issues that should be included in order to understand the processes of social and ecological change in both the colonial and post-colonial eras (Redclift, 1991; Adams & Mulligan, 2002).

Colonialism contributed to improving human standards in the Western societies while reducing human standards for colonial native communities (McMichael, 2008). A vision of supremacy associated with colonial powers was cultivated and was accompanied with the perception that colonial cultures were backwards in terms of development (Plumwood, 2003).

Principles of development for indigenous cultures focused on the use of resources to satisfy their needs on their own lands with adaptive methods rather than the pursuit of material accumulation (McMichael, 2008). Social perceptions of nature also differed. For example, Europeans considered that land needed to be transformed to produce

capital while native cultures outside the market institutions did not have the share the vision of constantly transforming land, and held strong cultural nature-related traditions (Anderson & Grove, 1987). Imposition of development models during colonial times had negative effects for both nature and indigenous peoples, as reflected in Kenya, with the imposed sedentary model of development enforced to integrate Massailand into colonial economies (Collet, 1987).

As a result of post-colonisation strong political divisions arose between developed and developing countries (McEwan, 2002). Post world war interventions for development dominated by United Sates were based on economic growth through increasing production and a reliance on technology (Escobar, 2012) following principles of industrialization and international free trade as a mechanism to maximise efficiency (Binns, 2002; Sapsford, 2002). Top-down discourses included in development programmes such as the basic needs approach in 1970's, and structural adjustment programmes are known for their failures to achieve expected improvements in prosperity, creating instead increased poverty reflected in debt, famine and violence (Simon, 2002; Escobar, 2012). Traditional ideas associated with frugality and sufficiency were transformed as community bonds fragmented at the same time that development policies affected property rights impeding communities from access to water, land and other resources (Escobar, 2012).

The evolution of the concept of poverty expanded from a narrow definition based on a lack of income to one which embraced various dimensions of deprivation (White, 2002), including vulnerability; social inferiority; lack of a voice and power in society; physical weakness; powerlessness; and seasonal deficit (Chambers, 1995) Acknowledgement of these aspects of poverty were incorporated in the development discussions (White, 2002). The concept of poverty such as, the deprivation of food, shelter, education and healthcare are considered an 'antithesis of development' is identified by some commentators as being an outcome of development programmes (O'Connor, 2002: 37).

Reactions from developing countries argue that the 'third world' is product of discourses of modernisation challenging the universality concept of development rooted the European Enlightenment (Escobar, 2012).

Structuralism critiques and dependency theories which emerged since 1950's addressed the inequitable results of global development (Thirwall, 2002). These critiques raised the concept of marginality associated with 'a lack of integration into a capitalist society' (Clark, 2002: 93). Critiques around the world reiterated that international terms of trade perpetuate inequities between former colonial nations and the post-colonial periphery (Redclift, 1991; Clarke, 2002; Binns, 2002; Escobar, 2012). Peripheral relations to capitalist countries create 'the development of underdevelopment' by perpetuating arrangements for Latin-American countries as providers of low-cost primary sources to industrialised countries (Conway & Heynen, 2002: 97). As Miller (1995) points out, the same process that created vast improvements in the development of colonial powers created extreme underdevelopment in the colonised nations.

Latest accounts of worldwide wealth distribution reflect the prevalence of these challenges. 80 per cent of global income, goes to people that live in high income countries, this is just over 1 billion out of the 6.5 billion people worldwide (Peet & Hatwick, 2009). Poverty in the low-income countries is reflected by numbers with a varied percentage of people surviving with less than $2 a day varies from 50 to 90 per cent depending on the country (Milanovic, 2007 in Peet & Hatwick, 2009).

### 2.5 Sustainability paradigm

By the early 1960s, the negative effects of uncontrolled industrialisation on the state of biodiversity and social inequality were becoming part of the development debate (Carson, 1962; Adams, 2008). Environmental problems such as air and water pollution escalated both in developed and developing countries threating to the environment and human welfare (Costanza, Cumberland, Daly & Goodland, 1997). Critiques of a narrow view of economic growth contributed to a wider understanding of development incorporating social objectives (Thirlwall, 2002). Critiques of the simplistic conception of society as a group of self-interested individuals grew into movements based on collective action and concern for communities (Costanza, Cumberland, Daly & Goodland, 1997). These concerns reached political platforms in 1972, during the United Nations Conference on the Human Environment in Stockholm. The publication of the book *Limits of Growth* (Meadows & Club of Rome, 1972) in the same year warned

about the future consequences of increasing trends of population growth and unbridled consumption in the face of the limited capacity of the Earth.

Ecological economics established in the 1980's brought important contributions for the sustainability debate. The understanding of the economy as an open system set up a new thermodynamic perspective within the productive process by incorporating energy and matter flows in the economic process (Costanza, Cumberland, Daly & Goodland, 1997). Its contributions and the re-consideration of conventional economic logic that take account of externalities of economic process and allocate values of environmental services provided the basis for policy instruments that are at the centre of the agenda of sustainable development (Costanza, Cumberland, Daly & Goodland, 1997; Tacconi, Mahanty & Sulch, 2010).

Sustainable development was defined in 1980, by the World Conservation Strategy (WCS) (IUCN, 1980) as "the management of the human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". This definition was an important contribution to draw attention to the discussion of sustainability; however, its integrative approach was limited to a strong environmental vision without incorporating major discussions on the cultural, economic, political or social changes that would be required in order to implement sustainable development (Adams, 2008). While exploring the concept of carrying capacity it focuses on population and their balance with natural resources, resembling Malthus' ideas of development (Adams, 2008).
A few years later, the World Commission on Environment and Development (WCED), contributed to this debate with the Brundtland report, *Our Common Future* (WCED, 1987: 8), defining sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition addresses basic human needs and acknowledges the limits of the natural systems. *Our common future* definition reflects a more integrated approach of sustainability as it discusses the inter-connexions between development and conservation in more depth including political, economical and technological requisites; and addresses integrative and egalitarian principles (Adams, 2008). The maturity achieved between the WCS and the Brundtland report definition on sustainable

development is reflected in the latter report's increased political dissemination in the international arena (Adams, 2008).

*'Caring for the Earth: a strategy for sustainable* living' published by IUCN, WWF and UNEP was an important contribution in establishing the paradigm of sustainable development (IUCN, 1991). '*Caring for the Earth'* elaborated on the themes of the WCS with more in depth contributions on the principles required to implement sustainable development, for instance; population growth and limits of carrying capacity was addressed in relation to consumption patterns between developed and developing countries rather that in relation to Malthus' theories (Adams, 2008).

The definition of sustainable development attempted to amalgamate both social and environmental goals. Its social component, expressed as "meeting the needs of current generations" implies poverty eradication. Poverty was recognised as both a major cause and effect of environmental problems (WCED, 1987). In the phrase, the "right of future generations to meet their own needs," the environmental component points to the fundamental need to conserve natural resources that form the basis of life on Earth. In sum, sustainability is used as an integrative concept (Redclift, 2000).

Efforts to improve upon this paradigm were evident two decades after Stockholm, at the Earth Summit in 1992; and ten years later, in the World Summit on Sustainable Development. Both Summits were important forums in strengthening sustainable development. The *Convention on Biological Diversity* (CBD) has currently been ratified by 193 countries with the purpose of defining strategies and policies for the conservation of biodiversity; the sustainable use of its components; and the equitable distribution of benefits associated with genetic resources (UNEP, 2010). The fact that the CBD was initially launched in 1992 at a conference addressing sustainable development notwithstanding, it did not seem to create the same level of engagement amongst the development actors who were responsible for major pressure on biodiversity as it did amongst environmental actors for whom the agreement represented a leading contribution. The incorporation of conservation in development declarations is illustrated by the Millennium Development Goals (MDGs) which acknowledge the conservation of biodiversity in indicator 26: Ratio of Area Protected to Maintain

Biological Diversity to Surface Area (Koziell & McNeill, 2002; Sachs, Baillie, Sutherland, Armsworth et al., 2009).

At a theoretical level, the conservation of biodiversity is a fundamental concept in terms of the effort to achieve sustainability. However, the simplicity of its approach invariably "obscures underlying complexities and contradictions" (Redclift, 2002: 275). With this argument, Redclift (2002), points out the utilitarian rationale to satisfy human needs, which represents the legacy of an ideology dominant in the colonial era (Adams & Mulligan, 2002). The notion of satisfying human needs is polemic as they are understood and prioritised differently by different societies; and need to pay attention to costs transferred from one society to another (Redclift, 2002).

Sustainability indicators such as the ecological footprint (Wackernagel & Rees 1996) that measure the impact of production and consumption on natural ecosystems brought important insight for this discussions. The ecological footprint of nations demonstrated how developed countries (characterised by societies with high levels of consumption) often fall into ecological deficit by relying on the ecological services of other countries (of less consumption patterns and larger natural spaces) (Wackernagel & Rees 1996). 'Ecological services are those ecosystems functions that are currently perceived to support and protect human activities or affect human wellbeing' such as waste and carbon sequestration and hydrological services provided by many protected areas (Barbier, Burgess & Folke, 1994 in Costanza, Cumberland, Daly & Goodland, 1997: 95).

Within the global pressures for conservation of biodiversity and the promotion of protected areas, the developing world has argued that industrialised nations relied on ecosystem depletion to achieve growth. In other words, developing countries "felt that the concept of global resource management was an attempt to take away from them the national control of resources and …did not see much reason to find and pay for the solutions" (Biswas and Biswas, 1984: 36 in Adams, 2008: 60). Therefore, issues of equity and social justice in international relations are intrinsic aspects of debate around the sustainable development paradigm (Redclift, 1991).

The Kyoto Protocol adopted in 1997 witnessed strong debates around social justice within the United Nations Framework Convention on Climate Change. The uneven distribution of greenhouse emissions between developed and developing countries, the first accounting for more than 80% of greenhouse concentration in the atmosphere, is recognized as an essential component of the accumulation of industrial wealth (Hamlinton, 1999). As a result of such international dialogue, political declarations have incorporated aspects of international cooperation for sustainable development, addressing common but differentiated responsibilities (Stone, 2004).

However, despite contributions of international funding agencies for conservation (Speth & Haas; 2006; Adams, 2008), developing countries allocate significant and increasing national investment in conservation, which is often still insufficient in many cases. For example in South Africa, it is estimated that R7.6 billion are required over the next 5 years to implement conservation programmes although only just over half of this sum has currently been raised by the implementing agencies (NBI, 2009). In Brazil, the National Environment Fund, created in 1989, has invested over US$100 million in support of conservation programmes (MEB, 2010).

Griffiths (Norton-Griffiths, 2000) notes that Kenyan protected areas offer a global subsidy, providing environmental services with a value estimated at US$11 billion. Protected areas in developed countries are usually small in size (compared with the scales of the country), while in developing countries protected areas are not only larger (compared with country size) but also more protected areas of restricted categories are found in them (Upton, Ladle, Hulme, Jiang et al 2008). Valuation and integration of environmental services in the market is advocated by research and conservationist institutions to secure the provision of those services (Tacconi, Mahanty & Sulch, 2010).

Payment for Environmental Services (PES) are mechanisms designed to incorporate the demands of developing countries to account economic incentives towards conserving their ecosystems by incorporating monetary value to environmental services (ES) (Bulte, 2008; Tacconi, Mahanty & Sulch, 2010). In PES schemes, the providers of environmental services (owners of the territory) are paid for adopting sustainable land uses to enable those environmental services (such as hydrological services, carbon sequestration, biodiversity conservation among others) (Greiber, 2009; Tacconi,

Mahanty & Sulch, 2010). PES are defined as "(1) voluntary transaction where (2) a well-defined ES (or corresponding land use) is (3) being 'bought' by a (minimum one) ES buyer (4) from a (minimum one) ES provider (5) if and only if ES provision is secured (conditionality)" (Wunder, 2008: 280). Even though experiences on PES are documented from the 1980s, it is still considered a new instrument as it has only been applied in few countries (Greiber, 2009). Principles of PES recognise that ecosystem degradation and changes to the land use exist due to those who do it receive a benefit from it; therefore, funding is needed to offset the forgone benefit of altering forests (Tacconi, Mahanty & Sulch, 2010). Even though alleviation of poverty is not an objective of PES, experiences have shown that poor land-holders, can benefit from participating in these schemes (Bulte, 2008; Wunder, 2008). Therefore PES represents an interesting instrument for conservation and development in protected areas and are at the core of the sustainability agenda.

Despite advances in mechanisms to promote sustainability, as a concept, sustainable development is used in a wide context at a discursive and political level (Adams, 2008). The practical links between conservation and development that emerged throughout the movement toward sustainability have been the focus of political discourse, academic analysis and international debate. Potter (2002) notes that while some theories evolve one after another, other ideologies emerge simultaneously in different localities. What immediately becomes apparent is that both conservation and development ideologies have been created in parallel, crossing and co-existing over time. In practice, theories tend to complement or provide more elements with which to understand the process of development in human societies (Potter, 2002). The following section will focus on the local analysis of this debate.

### 2.6 Community conservation

From the 1970's, bottom-up approaches of development have gained momentum in the developing world (Parnwell, 2002) as top-down approaches stemming from colonial development and perpetuated in conventional capitalist development strategies have been challenged for contradictory results for development in terms of exclusion and the disempowerment of communities (Parnwell, 2002).

The role of community participation has been recognised as a requisite to achieving sustainable development since the WCS. It has been predominant in *Agenda 21* and reinforced in *'Caring for the Earth'* (Adams, 2008). With increasing emphasis on democracy and the capacity of social actors to contribute to the development process, attention has focussed on communities and their important role in organising and managing development and conservation projects (Borrini-Feyerabend,1999; Adams, 2008).

Basic assumptions regarding community, conservation and the links between them have enormous significance in shaping community conservation projects. Inaccurate attempts to delineate communities in the past have contributed to the failure to articulate their effects on nature and have skewed the implementation strategies of community conservation projects (Leach & Scoones, 1997; Agrawal & Gibson, 1999; Brown, 2002; Berkes, 2004;). Therefore a theoretical review of its components is essential for this research.

The debate around what constitutes a community has been contested by the representations of spatial units, social structure and shared norms responsible for the promotion of desirable conservation policy (Agrawal & Gibson, 1999). These authors' critiques of the territorial conception of community argue that this feature alone could mislead the study of community conservation, given that the land acreage linked to communities can vary considerably (Agrawal & Gibson, 1999). "Communities are complex entities, whereby differences of ethnicity origin, class, caste, age, gender, religion, profession, and economic and social status can create profound differences in interests, capacities and willingness to invest in the management of natural resources" (Borrini-Feyerabend 1996: 32).

The assumption that communities share similar characteristics of ethnicity, religion and language is also challenged as such uniformity does not always exist, and, where it does, cannot as a rule be equated with full homogeneity of culture (Leach & Scoones, 1997; Agrawal & Gibson, 1999; Borrini-Feyerabend, 1996). Given the multiple interests that characterised communities, traditional shared norms do not always focus on the sustainable use of biodiversity, which can pose challenges to environmental protection (Borrini-Feyerabend, 1996; Leach & Scoones, 1997).

Most importantly, the community is not a static entity but constantly changing and responding in different ways to the challenges it faces (Berkes, 2004). This new theoretical approach to the study of communities has allowed a growing number of researchers to make important contributions showing that communities are capable of contributing to conservation projects (McNeely & Miller, 1984; Saberwal & Rangarajan; 2003).

Social capital as a concept emerged in the 1990's in the community development agenda (McAslan, 2002). Social capital is understood as 'features of social organisations, such as networks, norms, and trust that facilitate actions and co-operation for mutual benefit' (Putnam 1993:35 in McAslan; 2002). The extent of social cohesion, skills, knowledge and interest are assets found in communities that empower the capacity of a community to participate in the decision making process (Gilchrist, 2000). Participatory approaches for community development have received important attention since the 1980's (Adams, 2008). Participation is defined as 'sharing by people in the benefits of development, active contribution by people to development and involvement of people in decision making at all levels of society' (UN 1979:225 in Desai, 2002:117). Participation will be addressed in detail in a following section addressing the components of integrated conservation.

Community development principles focus on working with communities rather than working for communities (Gilchrist, 2000). Community development aims to support and shape social networking in order to facilitate the emergence of flexible, effective and empowering forms of collective action (Gilchrist, 2000:273).

Concepts of community, social capital, poverty and participation provide important context when examining community conservation. Redclift (2000) points out the importance of understanding that the perception of biodiversity for the poor is often intricately connected with their livelihoods; for whom conservation implies a more significant impact in their lives compared with perceptions of conservation by non-poor peoples, for whom biodiversity might be associated with recreational or aesthetic considerations. This illustrates the context where conservation policies such as protected areas restrict poor people's local livelihoods, while for rich people, principles such as

frugality, and personal choices for measured consumption are only political declaration rather than enforced policies and therefore do not directly affect their lives. Not surprisingly, connotations of 'Conservation of biodiversity' vary across a spectrum of human contexts, having a different significance to different people (Anderson & Grove, 1987a). Official academic definitions of conservation supported by international organisations have, in the past, failed to recognise this varied meaning of conservation across communities (Adams, 2008).

The study of social relations with the environment is the focus of current research in political ecology (Peet & Watts, 2004); contributions from this field cover aspects of social access to natural resources, and the implications for both the environment and livelihood in relation to access to nature (Hecht & Cockburn 1989 in Watts & Peet, 2004).

An examination of people living under the complex and diverse dynamics of poverty (Chambers, 1995) emphasises the critical role of biodiversity in their well-being (UNDP, 2002) in terms of:

1. Livelihoods – People faced with poverty depend directly on natural resources and environmental services for their livelihoods. Therefore, they are severely affected when the environment is degraded or access is denied.

2. Health – People in poverty suffer from pollution, unsafe or inadequate water supplies, and exposure to toxic chemicals without being able to protect themselves or claim compensation for these adverse effects of industrialisation.

3. Vulnerability – People living under conditions of poverty are particularly vulnerable to environmental hazards and contingences. In fact, vulnerability is the most critical dimension of poverty in relation to the environment.

Therefore conservation of biodiversity must address its relationship with the practical aspects of poverty and local development (Potter, 2002) including, the contribution of biodiversity to areas of food security; health care; income generation; the reduction of vulnerability to meteorological events; and ecosystem services that facilitate access to acceptable water, soil and air quality (Koziell & McNeill, 2002).

A principle behind community participation in development is that people have the right to participate in decisions that affects their lives (Desai, 2002). As conservation programmes have direct effects on local livelihoods, Western, (2001) questions who designs conservation policies and programmes? In this respect Adam and Hulme (2001) argue that conservation needs to be designed with local consultation.

The correlation between poverty and environmental degradation often rests on the conventional assumption that the poor overexploit natural resources in order to meet their short-term needs without regard for the long-term impact on the ecosystems that sustain them (Brocklesby & Hinshelwood, 2001). Environmental degradation contributes to further impoverishment by adversely affecting health, nutrition and other dimensions of well-being (Leach & Mearns, 1992). Nevertheless, a number of recent studies have pointed out that the major source of degradation is actually the destructive effect of wealth in the form of material investment for development and consumption (Forsyth, 2004, Watts & Peet, 2004).

In absence of local capacity to influence the decision making process, poor people are often marginalised. Marginalisation as a consequence of the dominant economic development models imposed (Clark, 2002) force less empowered groups from the most fertile land, which is appropriated by powerful actors such as large agricultural, mining and forestry operations (Watts & Peet, 2004; Redclift, 2000; Saberwal & Rangarajan, 2003; Pisupati & Warner, 2003). As a result, the land on which poor people are forced to live is usually more vulnerable to degradation (Koziell & McNeill, 2002). Figure 2.1 illustrates data from Pisupati & Warner (2003) showing percentages of poor people across Asia, Sub-Saharan Africa and Latin America who occupy marginalised land.

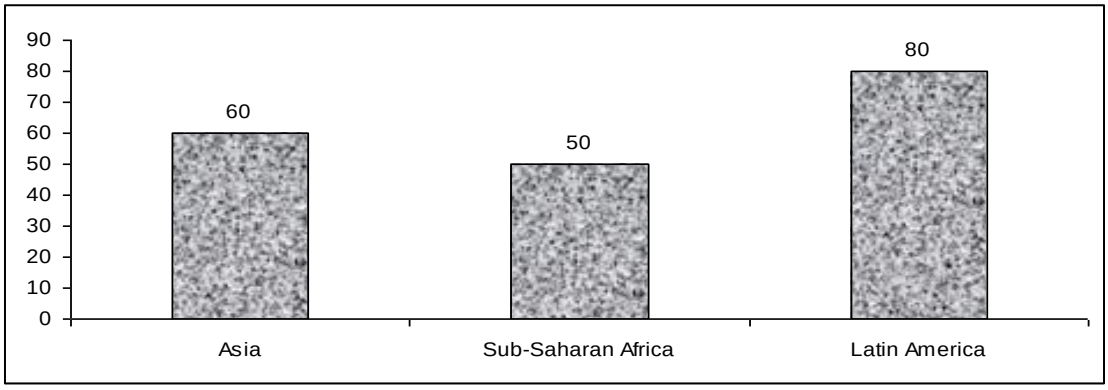



Figure 2.1 Percentage of the poorest living on marginalised land (2003). Source: World Bank 2002 in Pisupati and Warner, 2003.

In this vein, social research argues that commercial activity – rather than poverty – represents the stronger cause for the rapid depletion of ecosystems (Agrawal & Gibson, 1999).

Development agendas do not constitute the only dynamic that forces people from resource-rich land. Conservation projects – the establishment of protected areas in particular – also affect access to the natural bases that poor people use to sustain their livelihoods (Saberwal & Rangarajan; 2003). Therefore, poverty–environment dynamics do not necessarily comply with the simple formula that increased poverty results in increased environmental degradation (Brocklesby & Hinshelwood, 2001). Indeed, the present study questions whether conservation can also threaten local development.
Studies of poor farmers in Amazonia show that natural forests are perceived to be an impediment to agricultural livelihoods (Hunter, 1996 in Schwartzman, Moreira & Nepstad, 2000). Therefore, conservation projects implemented in local communities facing poverty have often ended in trade-offs between securing basic needs and ensuring the sustainability of biodiversity (Redclift, 2000). This implies that conservation per se might not be a priority for local communities.

This research argues that the definition of sustainable communities not only outdates ideas of conventional development but also brings into the international debate principles of development that were present in alternative visions of development identified in traditional indigenous communities. Adams highlights the radical definition that WCS gives about ‘sustainable community’; as a community that ‘cares for its own environment and does not damage those of others. It uses resources frugally

and sustainably, recycles materials, minimises wastes and disposes of them safely. It conserves life support systems and the diversity of local ecosystems. It meets its own needs so far as it can, but recognises the need to work in partnership with other communities.

For that reason, this research places an important value on insights from community conservation experiences. The examination of these experiences in natural protected areas is the focus of this research therefore a theoretical review of the concepts of integrated conservation in protected areas will be addressed in following sections.

### 2.7 Natural protected areas; an overview

Protected areas vary according to mechanism of establishment, the most common pattern being that designated by government legislation. However, there also exist protected areas created by indigenous people based on traditionally occupied land; biologically rich stations of reasonable size used for research and conservation; and privately purchased land protected by non-governmental conservation organisations (Borrini-Feyerabend, Kothari & Oviedo, 2004).

The protected natural area concept originated in the late 19th century, and the proliferation of such areas in different parts of the world has increased significantly since the creation in North America of Yellowstone National Park in 1872 (Neumann, 1998). The first initiatives behind the establishment of protected areas were based on the notion of landscape images of wilderness that deserved to be preserved. Neumann (1998) argues that because the once vast uncultivated areas of Europe had been modified for the intensification of production, European colonialists saw the wilderness of colonial countries as an ideal state of nature and an image that should remain intact. However, other historical motives included control over important harvested natural resources, (including timber, game or other resources); and to a lesser degree, protected areas have served scientific research purposes (Chape, Spalding & Jenkins, 2008).

In 1961, the IUCN started publishing and updating the United Nations List of National Parks and Equivalent Reserves which had strengthened the concept of natural protected areas worldwide (McNeely & Miller, 1984). The establishment of protected areas for

the purpose of achieving global conservation goals was explicitly defined from 1992 in the CBD (UNEP, 1992). The current definition of protected areas is described as "a clearly defined geographical space, 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" (IUCN, 2008).

The World Database on Protected Areas estimates terrestrial protected areas cover 12.2 per cent of the global surface and 0.5 per cent of extra territorial seas (excluding Antarctica) (UNEP & WCMC, 2010). Figure 2.2 shows the growth in protected areas around the world.

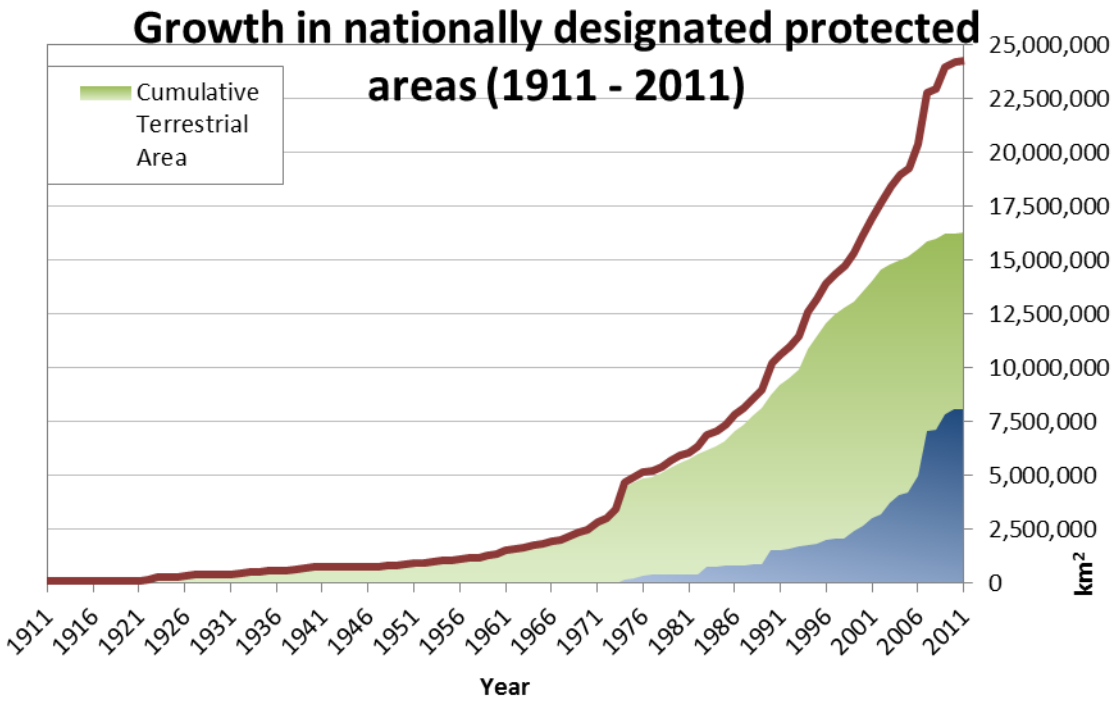



Figure 2.2: Growth of protected area ($km^2$) established between 1911 and 2011. Source: IUCN and UNEP-WCMC (2012)

The creation of protected areas has an essential role in preserving the full range of biodiversity contained within them and ensuring the natural process necessary to perpetuate biodiversity (Primack, Rozzi, Freinsinger, Dirzo et al., 1998). A study conducted by Bruner, Gullison, Rice and da Fonseca (2001) found that protected areas were better able to withstand threats of clearing, hunting and logging than surrounding areas. It is estimated that 10 per cent of a country that has adopted the system can sustainably protect 50 per cent of its species (Primack, 2004). Moreover, assessments of

protected areas worldwide show that 88 per cent of terrestrial vertebrates are included within various protected areas around the globe (Primack, 2004).

A more recent assessment on the extent of biodiversity covered within the world's protected areas published four years later found that 1,310 species were not included in those areas, of which 709 are at risk of extinction (Chape, Spalding & Jenkins, 2008). This reveals that despite the expansion of protected areas, species over-exploitation is still increasing at a rapid rate. In sum, results from the most recent assessments show that the current territory of protected areas worldwide is not sufficient to adequately protect the world's biodiversity, particularly in marine areas (Chape, Spalding & Jenkins, 2008). The establishment of a system to connect different sized protected areas into habitat corridors to allow the dispersion, colonisation and genetic flow of wildlife into a larger protected area has become an important step to improve the effectiveness of conservation (Primack, Rozzi, Freinsinger, Dirzo et al., 1998; Primack, 2004).

The clear importance of the principles behind the concept of protected areas notwithstanding, how effective has this strategy been in conserving biodiversity? For protected areas inhabited by local communities, local support has been debated as a requisite for its effectiveness, as local people have the practical access to the ecosystems that aim to be conserved (Brockington, 2004). Under the debate of sustainable development, this research will explore the relevant issues such as the social consequences of the establishment of protected areas for surrounding local communities, and the ecological effect of communities in protected areas.

### 2.8 Social impacts of protected areas

Protected areas are generally associated with images of beauty and natural tranquility; however, in reality they are frequently places of social conflict. Many of the territories under protective regimes in developing countries are inhabited by local communities (usually indigenous peoples) living in conditions of poverty (Koziell & McNeill, 2002); with many areas created without consultation with their inhabitants (Kemf, 1993). Ideologies of poverty as a cause of biodiversity degradation have had an important effect on the way conservation strategies are designed in protected areas.

Protected areas around the world include rural and indigenous populations living within their designated boundaries (Borrini-Feyerabend, Kothari & Oviedo, 2004). In South America, 86 per cent of the national parks have people living within their precincts; and similar percentages can be cited across Africa and Asia (Ghimire and Pimbert, 1997). Indigenous people are identified as "culturally distinct ethnic groups, who have a different identity from national societies, draw existence from local resources and are politically non-dominant" (ICIHI, 1987 in Colchester, 1997: 101). Indigenous people are described in the World Bank policy as distinct, vulnerable, social and cultural group possessing characteristics such as self-identification, indigenous language, collective attachment to geographically distinct habitats, or ancestral territories with customary cultural, economic, social, or political institutions that are separate from those of the dominant society (WB, 2013).

Critiques on the conventional approach of conservation during the 1970s and 1980s are based on an a dichotomy between nature and culture which contains the premise to separate humans and nature as human development is seen to have detriment on biodiversity (Maffi, 2007; Homewood & Rodgers, 1987; Neumann, 1998; Brockington, 2002; Saberwal & Rangarajan; 2003).

In his analysis of Arusha National Park, which was established in Tanzania in the 1960s, Neumann (1998) points out that by implementing a centralised narrative of conservation, the result was the prohibition of customary patterns of use. Based on his reviews of other experiences across Africa, he concludes that the rapid expansion of protected areas of the continent represented a legal mechanism for evicting rural communities and barring their access to local land on which they relied for survival (Neumann, 1998).

In his book *Fortress Conservation*, Brockington (2002) describes the experience of Mkomazi Game Reserve, also in Tanzania, whose establishment in 1988 necessitated the eviction of cattle herders, denying customary rights for local pastoralists and causing impoverishment to their communities. His analysis reveals that despite a development and relocation package for the evicted communities, the social costs of relocation were heavy and did not adequately compensate them for the loss of economic and cultural livelihoods (Brockington, 2002).

Similarly, in India, the work of Saberwal & Rangarajan (2003) demonstrates the negative effects of a conventional approach of protected areas upon local communities. In 1997, the Supreme Court of India mandated each forestry department to settle all 'existing rights' disputes in the country's protected areas within one year. This affected around three million people living in such regions by displacing them to other areas. Social activists argue that the communities had lived in these locations for decades and had a right to remain where they were; yet, the Indian Wildlife (Protection) Act demands that all human resource use should cease within protected areas (Saberwal & Rangarajan, 2003).

Between 1986 and 1996 an estimated 3.1 million people were forced into resettlement in order to make way for the establishment of protected areas (World Bank, 1993 in Colchester, 1997). Compensation for such disruption has often been inadequate, particularly in the case of indigenous people (Colchester, 1997); while a wide range of negative effects on local communities, including losses at economic, cultural and psychological levels, has been documented (Colchester, 1997). Compensation has been found to have a strong correlation with natural protected areas effectiveness (Bruner, Gullison, Rice & da Fonseca, 2001).

Local resistance to protected areas has on occasion escalated into violent clashes that have led to tragic events. Such was the case of the Keoladeo National Park in India, where, in 1982, the police killed several people while they were protesting over the establishment of the park, claiming their own right to local land use (Guha, 2003). Conflicts and deaths caused by military enforcement have also been documented in national parks in a number of African countries, including Togo, Central African Republic, Tanzania, and South Africa (Neumann, 1998). This is illustrated by protected area policy in Africa and India, which shows how local settlers have been deprived of benefits obtained from the forest at the same time as costs associated with conservation are imposed upon them (Guha, 2003).

Even when protected areas do not require social displacement, conservation policies on their local communities have often negatively correlated with local livelihoods (Emerton, 2001). Given the social cost of establishing protected areas with a top down

approach, it is questionable whether they have resulted in the efficient conservation of biodiversity. According to Sherpa (1993 in Colchester, 1997), conservation policies in the Mount Everest region not only had a negative social impact and created discontent among Nepalese herders, the changes imposed on traditional practices by the establishment of Sagarmartha National Park resulted in an increased rate of forest destruction. In India, Gadgil and Guha (1993 in Colchester, 1997) report that the local community's resentment towards conservation in the Kanha National Park led them to set fire to legally protected forests and instigate other insurgencies related to discontent over land access. Similar studies in Latin America and Africa (Alcorn, 1993 in Colchester, 1997; Stuart, 1984; Anderson & Grove, 1987a; Neumann, 1998; Adams, 2004) challenge the ability of protected areas to successfully protect biodiversity.

The alienation of and imposition of restrictions on local communities that reside within or adjacent to protected areas brings to the fore issues of equity and environmental justice in the operation of such areas. Saberwal & Rangarajan (2003) suggest that the rural poor in India are forced to pay the price of protected area conservation on behalf of a society that has destroyed all other remaining habitats.

Significant studies in India have found that large companies are far more responsible for the over-exploitation of forest resources and habitat than are the local communities (Saberwal & Rangarajan, 2003); and massive depletion corresponds to a high demand for industrial development and increased levels of consumption in urban areas (Guha, 2003). Conservation initiatives funded by international conservation organisations have documented adverse consequences for local communities (Colchester, 1997). The Save the Panda programme in China inflicted severe penalties on local residents who transgressed laws while powerful external actors went unpenalised (Schaller, 1993 in Colchester, 1997). Similarly, the Save the Tiger programme in India has also been controversial in its imposition of increased burdens and restrictions on local settlers (Gadgil & Guha, 1993 in Colchester, 1997). These global examples offer an insight into the damaging effects that internationally funded conservation policies have had on local development in third world countries; an insight that clearly calls for a new approach to conservation.

## 2.9 Reconciling conservation with local sustainable development: Integrated conservation in protected areas

Integrated conservation and development is influenced by a shift in the classic view of ecosystems in static equilibrium from the 1950's that was the basis for the conventional conservation approach, and it has embraced the new thinking toward non-equilibrium ecosystems from the 1990's. This evolution in ecological thinking assumes that ecosystems are open, always subjected to a variety of influences from surroundings and are in a state of flux (Borrini-Feyerabend, Kothari and Oviedo, 2004; Wallington, Hobbs & Moore, 2005).

Therefore, human disturbances (such as grazing from herbivores and periodic fires) that occur within ecological limits can be part of the dynamic pattern of conservation (Borrini-Feyerabend, Kothari and Oviedo, 2004; Wallington, Hobbs & Moore, 2005). Within these principles, ecosystem management is best understood as an adaptive process, strongly dependent on local biological history and context (Brown, 2002; Maffi, 2007).

Several studies confirm that the highest levels of biodiversity are often found in areas of human population, as partially disturbed areas are frequently utilised by plants and animals (Gómez-Pompa & Kaus, 1992; Agrawal & Gibson, 1999; Guha, 2003).

This symbiosis between nature and human culture, and the process by which one informs the other is becoming more accepted, influencing new approaches to conservation (Saberwal & Rangarajan, 2003: 2). With such a vision, new proposals suggest that social assets – e.g. values, traditions, the creative process and innovation – represent invaluable elements of biodiversity conservation (Galla, 2004). Based on this science, integrated conservation and development approaches recognise the capacity of nature and culture to coexist (Brown, 2002; Maffi, 2007). For Haverkort & Millar (1994: 51) "biological diversity can only be maintained or enhanced if the cultural systems that prevail in the area will be maintained or strengthened" (Haverkort & Millar, 1994: 51). These principles have been recognised by Ethnoecology and Enthobiology since the late 1980's and have been the focus of research in the field of Bio-cultural diversity since the late 1990's (Berkes, 2003; Maffi, 2007).

In order to restore social and economic benefits to local communities that reside within or around protected areas, the 1980s and 1990s saw a new conservation approach that aimed at promoting biodiversity while supporting indigenous populations (Beltrán, 2000; Borrini-Feyerabend, Kothari and Oviedo, 2004; Brockington, 2002). Such a strategy represents an alternative to that exclusionary model of *Fortress conservation* (Brockington, 2002) with its characteristic 'fences and fines' approach inherited from colonial times (Brandon and Wells, 1992; Brown, 2002).

Integrated conservation acknowledges the substantive needs of the local population dwelling in the area, a consideration that frequently opposes protection goals; and recognises that failing to include local people in determining conservation strategies is a major source of conservation conflict (Stolton & Dudley, 1999; Borrini-Feyerabend, 1999, Adams & Hulme, 2001). Hutton, Adams & Murombedzi (2005) describe several advantages expected from implementing this approach: It leads to improved local income, which plays both a significant role in poverty reduction and provides an economic incentive for conservation. It reduces conflict with wild animals and thus the costs they inflict on people, which leads to increased tolerance of wildlife and better outcomes for biodiversity. It improves efficiency, and reduces the cost of overheads as the community management of natural resources become more efficient than the state management.

Practical examples containing this principles are found in the literature and strategies with different names including; co-management, joint forest management, conservation-with-development, community-based management, integrated conservation and development projects, indigenous and community conserved areas, and other forms of collaborative management (Wells, Brandon & Hannah, 1992; Stocking & Perkin, 1992; Borrini-Feyerabend, 1996; Leach & Scoones, 1997; Borrini-Feyerabend, 1999; Guha, 2003; Adams & Hulme 2001; Rodgers, Hartley & Bashir, 2003; Johannesen, 2004, Kothari, 2006).

Integrated conservation recognises that traditional knowledge on biodiversity-related matters. Traditional ecological knowledge is defined 'as a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down

through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (Berkes, Colding & Folke, 2000). An increasing number of experiences gathered under the community conservation umbrella means that Western science and development practitioners are currently reconsidering the potential contribution that local cumulative observation of environmental change and adaptation to it can offer (Mauro & Hardison, 2000). However, the low priority this has received is reflected in an increasing trend towards loss of indigenous biodiversity knowledge, which represents a potential loss for conservation (Butchart, Walpole, Collen, Strien et al., 2010).

Despite the benefits that this approach aims to offer at conceptual level, integrated conservation is considered to be a complex approach at a practical level therefore it requires further refinement to understand the challenges that its implementation brings (Kemf, 1993; Berkes, 2003; Adams & Hutton, 2007).

### 2.10 Critiques associated with integrated conservation

Critics of people-orientated approaches have called for a return to the 'back to the barriers' narrative (Oates, 1999; Attwell & Coterill, 2000; Brosius, Tsing & Zerner (1998) Barrett and Arcese, 1995; Terborgh, 1999; Oates, 1999; Terborgh, 1999).
Such critics argue that greater emphasis should be placed on official enforcement of the protection of critically endangered habitats and species around the world.

Critiques of community conservation have been strongly influenced by Garrett Hardin's *The Tragedy of the Commons* (Hardin, 1968, 2005). His theory describes the behaviour of herdsmen sharing a common and open access space who are subject to an inevitable process in which the rational decision to pursue the best individual interest represents an irrational decision for the group, as users add more animals to their herds, which leads to over-exploitation and tragic consequences for all. Thus, when individuals are trapped in a situation that leads to the destruction of common ground, private and centralised management on the part of coercive institutions is considered to be the only viable possibility of avoiding tragedy (Hardin, 1968, 2005).

In *Myth and Reality in the Rain Forest*, John F. Oates (1999) outlines experiences in West African protected areas that made him reconsider conventional exclusionary

approaches to conservation. He argues that local government failure and political instability are major threats to conservation efforts. For example, he points out that the proliferation of guns for use in the region's civil wars coincides with a phase of steadily increasing poaching at the end of conflicts, which accounts for the dramatic decline in wildlife, including local extinction of rhinoceroses and elephants in particular regions.
Oates laments the change from nature-focussed conservation to a local community-focussed approach. He contends that the new community conservation strategy has abandoned the goal of biodiversity protection on the philosophical principle of conservation aimed at protecting nature for its own intrinsic value in favour of the anthropocentric and economic theory of conservation for development, whereby conservation of nature is worthwhile only as a means of satisfying human needs (Oates, 1999). For him, the simplistic vision of these connections has led to the institutional arrangements of a marriage between conservation and development, and an ever more expensive bureaucracy, resulting in inversely proportional funds for conservation in the field (Oates, 1999).

Oates proposes the propagation of two major myths associated with community conservation that have had a profound impact on the failure of projects pursuing environmental protection and local human development simultaneously. The first myth is related to the ostensible harmonious relationship between local communities and nature. He challenges the perception of such an equilibrium between indigenous people and local ecosystems, which is often advocated as a counter position to colonial development theory (McMichael, 2008).

In the book *Requiem for Nature*, Terborgh (1999) also critically reviews the community-orientated approaches implemented by conservation organisations. Given his experience in Manu National Park, Peru, Terborgh agrees with Oates, describing the 'empty forest syndrome', to which land depleted by fauna and increasingly occupied by people is subject (Redford, 1991). Both authors not only question the harmonious relationship between indigenous groups and nature in the modern world, but also claim that such people have a strong negative impact on their forest dwellings and the environment in general (Terborgh, 1999; Oates, 1999).

Redford (1991) argues against the idealisation of indigenous communities living in ecological harmony with nature claiming that "indigenous people can be either forced, seduced, or tempted into accepting new methods, new crops, and new technologies…[such as the] adoption of firearms for hunting" (Redford, 1991: 47). Indigenous systems of knowledge including methods and techniques for land use have also been challenged in terms of their sustainability. Oates and Terborgh argue that these systems are often only viable where there is low population density, abundant land and limited engagement in the market economy (Redford, 1991; Oates, 1999; Terborgh, 1999).

The second myth that Oates (1999) considers to be perpetuated by community conservation advocates is that local residents of forests will demonstrate strong communal engagement in environmental protection. He argues that there is little evidence to suggest that traditional communities in Africa have conservation-focussed livelihoods, stating his belief that the egalitarian African village is a 'golden age fallacy' (Hills, 1986 in Oates, 1999: 54); and that it is in reality more often characterised by the extent of division rather than cohesion. Accordingly, he does not support the notion of participatory approaches to develop community processes, considering them to be paternalistic.

In the same way, Terborgh states that the main challenges to environmental protection are social, listing the existing features of overpopulation, poverty and corruption amongst local inhabitants as reasons why community conservation has no future. Moreover, he considers that although integrated approaches may aspire to an ideal outcome, they are unattainable and detract from the aims of true sustainable development. Thus, he argues that bottom-up conservation projects are doomed to failure, advocating a return to older top-down approaches, together with a strict enforcement regime that leaves no room for sustainable support, as the only effective way to ensure the conservation of biodiversity (Terborgh, 1999).

### 2.11 Counter arguments for integrated conservation

Integrated conservation proponents have developed strong counter arguments to rebuke scholars who advocate a return to a pure preservationist approach.

As far as Hardin (1968) is concerned, the only justifiable context in which commons could exist is under conditions of low population. However, a number community-based conservation models, such as traditional fisheries, have demonstrated the sustainable management of biodiversity (Evans & Birchenough, 2001). Jau Park in Amazonia, one of the most extensive protected areas in the world, also represents a successful example in which local communities have played an essential role in conservation programmes in reducing the incidence of accidental forest fires (Schwartzman, Moreira & Nepstad, 2000). The tragedy of the commons ignores alternative methods of ecosystem management dependent on communication and the system of shared management that invariably characterises traditional societies (Merino-Pérez & Segura-Warnholtz, 2004).

Experiences of local inclusion in the Usambara Mountains, Tanzania lead to minimise conservation of biodiversity goals in favour of local development goals (Stocking & Perkin, 1992). This clearly demonstrated the need to increase the transfer of benefits from conservation to local communities (an argument that is discussed in the next section). Research on integrated conservation and development in the Annapurna Conservation Area in Nepal (Baral, Stern & Heinen, 2007) show that the length of the project was associated with stronger conservation activity, describing how projects progressed from paying higher attention to development in the early stages but in the longer term (often a decade), conservation focus balanced with development focus as local participation and local empowerment improved (Baral, Stern & Heinen, 2007).

Critiques of the harmonic relations between indigenous people and nature have been rebutted by successful examples on conservation projects with indigenous people in protected areas documented in Kaa-Iya del Gran Chaco National Park and Integrated Management Natural Area, Bolivia; Cayos Miskitos and Franja Costera Marine Biological Reserve, Nicaragua; Kytalyk Resource Reserve, Russian Federation; and Kakadu National Park, Australia. These experiences show that when local participation exists from the early stages, incidences of conflict are low and benefits are high for both local communities and managers of the protected area, which increases the likelihood of better conservation outcomes (Beltrán, 2000).

The empty forest syndrome is contested by studies in Kenya which focus on the effectiveness of integrated conservation by Western (2001). “Evidence suggests that on balance, wildlife numbers are stable or increasing compared with background trends” (Githaiga, 1998 in Western, 2001: 201). Several studies on the effects of local hunting have also revealed that it does not represent a threat to game species in the long term; on the contrary, experiences of the interaction of local communities with ecosystems reveal major conservation opportunities (Schwartzman, Moreira & Nepstad, 2000).

This is evidenced by studies of forest conservation in West Africa which have found that traditional local livelihoods rather than negatively affecting processes of environmental change have actually enriched soils and forest coverage (Fairhead & Leach, 1998). Similarly, pastoralist livelihoods practiced for over 2,500 years in East Africa have been documented to coexist with nature without evidence to threat biodiversity (Collett, 1987).

Similar results were found in research in Brazil, in which the population of reserves by indigenous groups have been shown to effectively slow the process of deforestation in comparison to other protected areas free of human interaction (Schwartzman, Moreira & Nepstad, 2000). A conventional exclusionary approach model of conservation could become the worst enemy of environmental protection (Schwartzman, Moreira & Nepstad, 2000).

Proponents of community conservation acknowledge that within local populations, individuals will occasionally take narrow, self-interested decisions based on short-term goals. However, the view that this is always the case allows no room for the role of negotiation within communities and the evidenced existence of collective norms based on a willingness to co-operate (Ostrom, Burger, Field, Norgaard et al., 1999).

Integrated conservation with poor level of success in conservation have been examined and findings were identify from varied experiences: unconvincing local participation; low benefit generation; and the demand on the part of donors for swiftly achieved successful outcomes (Mistry, Berardi, Simpson, Davis et al., 2010). In fact, the implementation of projects on such erroneous assumptions has led to a renewed impetus back to barrier-based conservation theory in the belief that the community constitutes an

obstacle to sustainable resource management (Agrawal & Gibson, 1999; Mistry, Berardi, Simpson, Davis et al., 2010).

Berkes (2004: 162) concludes that, "Asking whether community-based conservation works is the wrong question… Rather, it is more important to learn about the conditions under which it does or does not work." Similarly, Adams and Hulme (2001: 198) argue that the real issue is not whether conservation should be implemented in collaboration with communities, but how.

### 2.12 Components of integrated conservation

The integration of local communities and conservation require a holistic approach (Kerkhoff, 2005). However, the ability to integrate conservation and local development from discourse to practice has remained limited (Adams, 2008; Adams, Aveling, Brockington, Dickson et al., 2004; Redclift, 1984). Practical experience shows that the two objectives may not be easy to implement simultaneously in protected areas. At a local level they do not necessarily evolve or 'bed down' as was assumed when they were theorised, often having only limited success (Newmark & Hough, 2000).

The term integrated conservation and development project refers to a particular line of funding whereby the approach focuses on returning benefits to local communities and empowering them as successful institutions in the course of biodiversity conservation (Scherl, Wilson, Wild, Blockhis et al., 2004; WWF, 2009). However, it is important to emphasise that the term 'integration' as defined in the present study is not restricted to the community level. There are cases of communities successfully acting as independent, autonomous and co-ordinated entities that have embraced conservation and taken decisions associated with access to biodiversity. Nevertheless, while the integrated approach with which this study is concerned considers the community as an essential actor in conservation, it also recognises the limits local communities face and the important roles other actors have in effectively conserving biodiversity.

In this thesis, integrated conservation is defined as an approach to environmental protection that allows different actors to combine and integrate efforts towards the promotion of biodiversity in a co-operative process, whereby the livelihoods of local

communities are based on sustainable practices that allow for conservation. This conception echoes the principles of adaptive management described by Berkes (2004: 626) as "(1) sharing of management power and responsibility through multiple institutional linkages that may involve government agencies, NGOs, and other communities; and (2) feedback, learning and building of mutual trust among partners."

The multitude of approaches that exist under the banner of integrated conservation (e.g. community conservation and co-management) imply more than just a partnership with local communities; but all too often the focus of the approach is limited to a bilateral alliance (the community and the conservation donor agency), which does not fully capture the opportunities multiple interactions at different levels could bring (Berkes, 2004). The crucial role of the community is by no means reduced in importance under a broader integrated approach, it is enhanced under the context of sustainable development. Its role in ecosystem conservation is directly related to its immediacy and access to biodiversity, but this does not mean that the local community must shoulder the entire burden of achieving conservation goals (Brown, 2002). Indeed, it is important to note that the scope of some conservation challenges can reach beyond the ability of the local community to deal with (Ostrom, Burger, Field, Norgaard et al., 1999). In other words, 'community-based' conservation overemphasizes the role of local communities, as much as the precious command-and-control; government-driven model underemphasized it" (Barret et al., 2001 in Berkes, 2004: 625).

In the early stages of the conservation debate, Anderson and Grove (1987a) pointed out that the concept of environmental protection requires a close examination of the social and political changes it is necessary to make before conservation goals can be met. Similarly, the present study argues that in order to increase the implementation success rate of integrated conservation, it is essential to rethink not only the general theoretical assumptions behind this approach (as outlined in the previous section), but also three main components: 1) the flow of costs and benefits to and from the affected communities; 2) the environmental impact on the livelihoods that sustain these communities; and 3) the attitude of local communities towards participating and engaging with conservation policy.

Within this basis, it is proposed that the three components included in Figure 2.3 are taken into account in a re-examination of the social and political context associated with the implementation of integrated conservation; and they will be discussed individually in the following section.

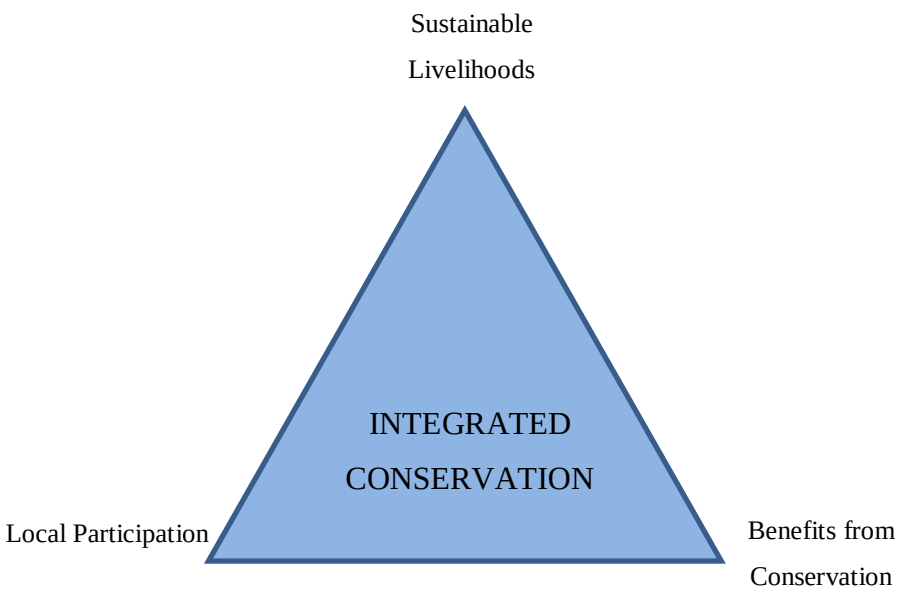



Figure 2.3 Essential components of integrated conservation. Source: The author.

This study will research what underlying factors can potentially influence these components in order to create viable strategies to support the successful implementation of integrated conservation projects.

### 2.12.1 Local participation

The importance of local community participation in the management of protected natural areas has been recognised since the World Park Congress in 1982 (Borrini-Feyerabend, 1996). Consequently, the broad acceptance of participatory conservation has become more widespread as top-down models of conservation have often failed to link local development with conservation (Agrawal & Gibson, 1999). These experiences often include centralised conservation agencies whose policy of forcing local communities to comply with unpopular environmental programmes in protected areas is increasingly called into question (Saberwal & Rangarajan, 2003).

The limited capacity of centralised approaches to conservation has led researchers to explore alternative methods that include people's participation in conservation in order to ensure the sustainability of programmes (Agrawal & Gibson, 1999). Attempts at community conservation that allows local communities to remain in the protected area include participative policy development associated with local restrictions over access to nature.

Local participation has been defined as "empowering people to mobilise their own capacities, to become social actors rather than passive subjects, manage the resources, make decisions, and control the activities that affect their lives" (Cernea, 1985 in Wells, Brandon & Hannah, 1992: 42). Mannigel (2007) points out the importance of understanding participation as a means of achieving goals; thus, the appropriate degree of participation does not only increase the chances of reaching a successful outcome but also reduces the transaction cost (Chambers, 1992).

The participatory approach represents a fundamental methodological tool with which to study the process of social interaction in local communities (Pimbert & Pretty, 1997). Contributions from this methodology include understanding local skills and knowledge sets associated with wildlife management in diverse areas. Such approaches are essential in empowering local communities towards the achievement of a conservation objective, and for the effective design of localised and specific conservation programmes in protected areas (Rodgers, Hartley & Bashir, 2003; Saberwal & Rangarajan, 2003).

Increased participation has contributed to reducing destructive and illegal practices in protected areas (Wells, Brandon & Hannah, 1992). Some proponents of local participation state that if communities are not involved in the sustainable use of their natural resources, they will use them in a destructive way; but if conservation is set out in accordance with the interests of local needs, communities will protect their natural resources (Rodgers, Hartley & Bashir, 2003).

Pimber and Pretty (1997) distinguish different levels of participation. These may take a passive form, for example, attendance at a sensitisation meeting intended to create conservation awareness in the community; the offer of compensation for the effects of

an intervention; or a share in the benefits of conservation. Active participation may include activities such as involving local people in the management and decision-making process of a protected area project (Mannigel, 2007).

Wells, Brandon and Hannah (1992) point out that participation implies the continual involvement of the local community rather than sporadic or occasional involvement. They classify participation in four forms: gathering information from beneficiaries, decision-making, initiating action, and participatory evaluation. As Figure 2.4 shows, recent conservation approaches that aim at incorporating local participation present certain differences according to the level of engagement of local participation in environmental protection.

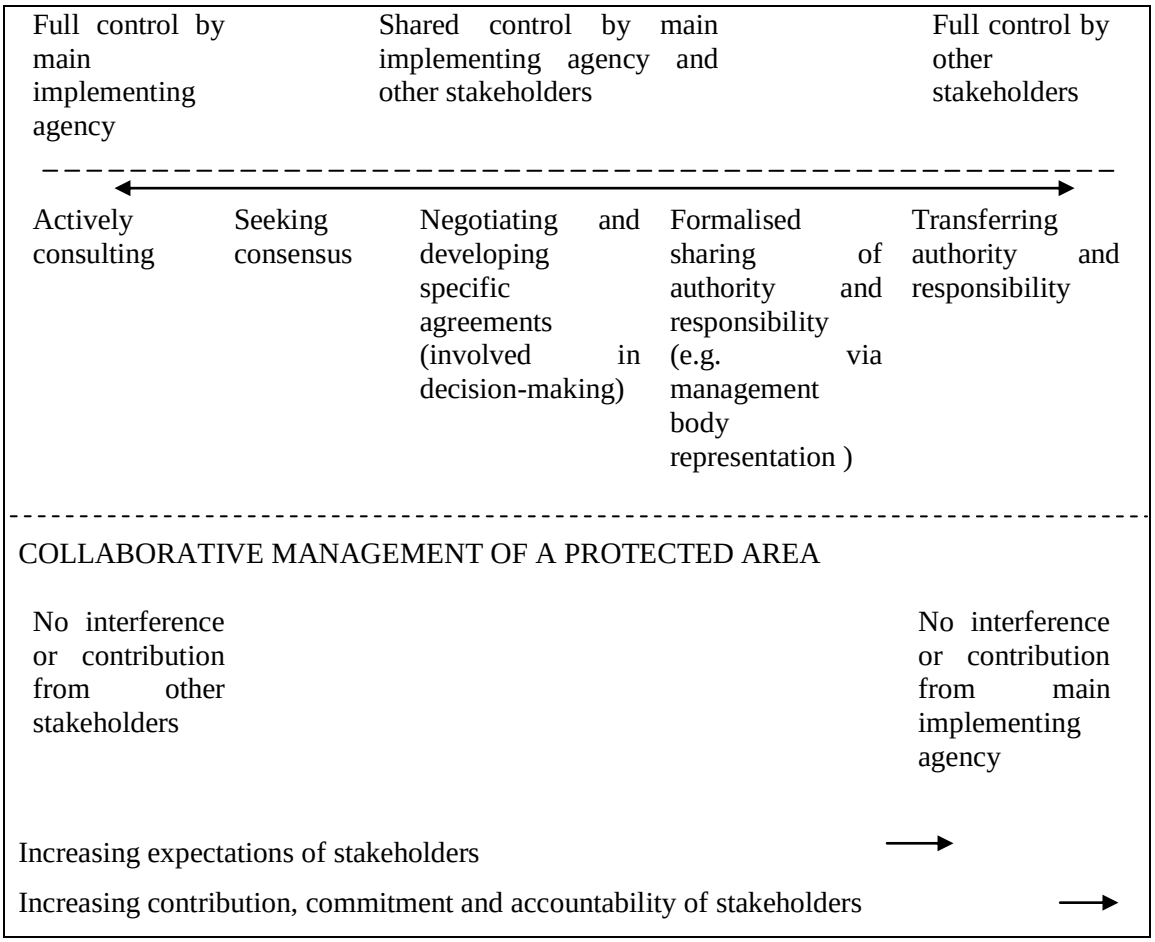



Figure 2.4 Participation in protected areas – a continuum. Source: Borrini-Feyerabend, 1996: 17.

Adaptive co-management experiences have demonstrated that local participation can lead to the sharing of management and community responsibility through multiple

partnerships; and can also promote a learning process that builds trust among the partners (Berkes, 2004). Within this process, plentiful experiences have documented the important role that NGOs have played in mediating and promoting local participation (Desai, 2002). These experiences highlight the importance of participation, as local involvement cannot be imposed by means of a top-down approach (Brown 2002); thus, participation is not an easy undertaking within the new community theory.

Kemf (1993) highlights two essential prerequisites for local participation in protected areas: first, fluent communication between local stakeholders and the managers of the protected area; and second, mechanisms to ensure that compensation for and benefits of protected area intervention reach local stakeholders (this will be the focus of the next section). To increase communication, agencies often rely on agents of change (facilitators) or promote the building of local institutions (Wells, Brandon & Hannah, 1992). Stakeholder identification is essential for this purpose in order to address different interests. The capacity and willingness to invest in the management of natural resources is crucial to the promotion of participation in protected area projects (Agrawal & Gibson, 1999; Borrini-Feyerabend, 1996). Additionally, participation analysis should take into account the degree of incorporation of local views. This does not mean acquiescence to all requests and suggestions for managing the area, but that a clear evaluation of local input is addressed and not ignored. This incorporation of local views will in turn increase participation.

### 2.12.2 Benefit sharing

A general consensus amongst integrated conservation approaches recognises the need for a sustainable flow of benefits to local communities as a result of interventions. Some of the benefits provided to local communities include employment; revenue sharing; limited access to natural resources; provision for infrastructure such as schools and health centres; and participation in decision-making (Newmark & Hough, 2000). Monetary and non-monetary incentives such as empowerment are just as important in community conservation (Kothari, 2001). Non-monetary incentives also include cultural benefits, commercial or domestic use of biodiversity, and involvement in aspects of local governance (Berkes, 2004).

Emerton (2001) argues that the benefit-base model does not fully address the economics of community conservation; thus, for this reason, any transfer of benefits is not sufficient to stop local people exploiting nature and engage them in conservation activities. Two main proposals are offered for a better understanding of incentives and benefits: the first focuses on the allocation of benefits, and the second addresses the final balance.

The first proposal deals with the distribution of benefits in the community (Emerton, 2001; Norton-Griffiths, 1996, 2000; Norton-Griffiths & Southey, 1995). Benefits that communities receive should be analysed in comparison with those that conservation projects generate in respect of other social entities. Natural protected areas often earn financial revenue for governments; making an important contribution to national income and to the private sector, tourism in particular (Bond, 2001). For example, in Zimbabwe, income from recreational hunting increased from US$2 million to US$12 million annually between 1984 and 1993 (Bond, 2001). Direct financial benefits also frequently take the form of either temporary or permanent employment, including positions as park rangers, tourist guides, administrative staff, cooks, and construction workers (Wells, Brandon & Hannah, 1992).

While direct economic benefits for local communities are sometimes relatively significant, they often represent only a small amount of the total revenue generated from biodiversity conservation (Hulme & Murphree, 2001). Thus, it is not surprising that if only a small proportion of the benefits are shared, there is little incentive to conserve biodiversity (Emerton, 2001).

For example, Zimbabwe's average Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) financial benefit per household is low, having been estimated to be just US$4.49 in 1996 (Bond, 2001). Such disparities in the distribution of direct benefits could discourage wildlife conservation (Emerton, 2001). In 1990, out of the $15 million of wildlife revenue generated via tourism in Amboseli National Park, Kenya, only 1 per cent was distributed to local communities, which grossly under-represents the opportunity cost to the Maasai of providing grazing for the wild animals that are the main tourist attraction (Norton-Griffiths, 1996). Assessments from Monarch Butterfly overwintering reserves in Mexico, Khao Yai, Thailand, and Volcanoes

National Park, Rwanda also demonstrate minimal incentives for local communities to engage in conservation (Wells, Brandon & Hannah, 1992).

Indirect benefits from conservation channelled from park entry fees, hunting permits, tourism, or other activities are mostly in the form of social infrastructure such as health centres, schools, water facilities, nutrition programmes, and grassroots development activities (Wells, Brandon & Hannah, 1992). There is no doubt that these kinds of benefits represent important contributions to local development, but the share is not likely to represent an economic gain for households to sufficiently incentivise communities to stop accessing biodiversity to meet their own livelihoods (Emerton, 2001). On the other hand, expatriate citizens and park visitors receive a high degree of indirect benefits via access to pristine land and environmental services (Koch, 1997; McIvor, 1997; Murombedzi, 1999; Emerton, 2001).

Benefits are crucial, but they must take into account the extent of the social cost incurred as a result of engagement in the conservation of biodiversity. Three main types of cost can be identified: 1) limited access to natural resources, such as wood for fuel or construction, meat, medicinal plants, and other resources obtained locally to secure livelihoods; 2) loss of livestock due to wildlife attacks, crop damage from an increase in wildlife intrusion, transmission of disease to livestock, and human injury or death from wildlife encounters (Emerton, 2001; Ghimire & Pimbert, 1997, Murombedzi, 2001); and 3) the opportunity costs of surrendering land previously used for agriculture or cattle ranching, and forgone access to sectoral subsidies for crop and livestock production (Norton-Griffiths & Southey, 1995).

In Kenya, it has been estimated that lost revenue from potential agricultural and livestock production returns in the country's natural protected areas could amount to US$203 million (Norton-Griffiths & Southey, 1995). This forgone revenue represents the high opportunity cost of conservation; and often, there are no mechanisms to compensate landowners for such a cost (Norton-Griffiths, 2000). Efforts to incorporate the transfer of benefits to local communities into integrated conservation projects notwithstanding, the capacity to alleviate poverty is limited as the scale of local costs represents an unequal burden for local communities (Norton-Griffiths & Southey, 1995). Recent PES schemes can contribute to compensation and benefit transfer in cases

of poor landholders of marginal land, low access to capital where their opportunity cost of conservation under a PES programmes could raise their incomes (Wunder, 2008; Tacconi, Mahanty & Sulch, 2010).

Taking the above caveat into account, integrated conservation projects attempt to redress the inequities of benefit sharing by focusing on combination of incentives such as employing local people; allowing limited access to natural resources; micro-entrepreneur funding; and even sharing a percentage of the revenue generated from entry fees, which also contributes to park management (Murombedzi, 2001). In Kenya, for example, US$2.5 of the US$20 park entry fee goes to landowners as compensation (Norton-Griffiths, 1996).

Therefore, the application of a benefit system must be understood and utilised not only as an incentive for conservation, but also gauged in relation to the costs that conservation imposes. If local communities are to adopt wildlife preservation policies, the offer of compensation is not a sufficient incentive to ensure their compliance unless the sum of the benefits generated exceeds the total cost to them (Emerton, 2001; Bond, 2001).

It is critical that the above principle be applied, or otherwise economic benefits from conservation could actually be used to frustrate environmental protection objectives. This is illustrated in Murombedzi's (1999) review of Zimbabwe's CAMPFIRE, which is regarded as one of the most successful community conservation projects on the continent. CAMPFIRE is an initiative in which the benefits of wildlife management, which includes safari ventures and game cropping, are re-directed to local communities through the use of communal land. Benefits are maximised as wildlife densities are high and large acreages wilderness is available that has poor soil and low levels of precipitation (Murombedzi, 1999).

Masoka, a poor and isolated community with a population of 250 households and a land area of about 400 $km^2$ constitutes the prime CAMPFIRE ward. Masoka community enjoys one of the highest CAMPFIRE benefit packages due its low permanent population, but also attracts migration as it presents one of the highest rates of rural immigration in Zimbabwe (Nabane, 1995 in Murombedzi, 1999). Wildlife management

in CAMPFIRE is geared towards limiting agriculture, grazing and livestock expansion by means of a participatory planning process.

A striking finding by Murombedzi (1999) is that the community directs its monetary benefits from CAMPFIRE away from conservation goals by investing in agricultural productivity that destroys the forest. Additionally, the government supports agricultural expansion through a tsetse fly eradication programme. The author explains that the revenue generated from wildlife preservation is not sufficient for household capital accumulation, which encourages the community to conserve wildlife only up to a certain threshold determined by the coercive authorities in an attempt to prevent poaching and promote land use management.

The author further points out that this is a centralised programme of conservation and not community-based natural resource management. Murombedzi (1999: 292) concludes that "where wildlife costs continue to be greater than the benefits, management of wildlife will continue to be top-down, authoritarian and coercive, and communities are not likely to seek or be granted rights to the wildlife resource." This experience shows that if incentives are to be viable, the financial benefits from wildlife conservation must exceed agricultural income (Bond, 2001). An illustration of this can be seen in taking the average benefits generated from wildlife conservation in CAMPFIRE regions as a percentage of gross agricultural income, which was less than ten per cent in 1990, 1992 and 1993 (Bond, 2001).

The generation of benefits from protected areas should be an essential element of any integrated conservation approach. A viable final balance of benefits over costs is not only essential to incentivise local participation, but it is also central to the process of institutional change required to achieve effective integrated conservation (Bond, 2001). In sum, the transfer of benefits from many protected areas is still limited and does not provide sufficient incentive to encourage the full support of the community that effective conservation projects require (Newmark & Hough, 2000).

Environmental protection policies geared towards the promotion of incentives are essential to the establishment of a co-operative process; and, in order to provide incentives, it is necessary to determine a direct correlation between local livelihoods and

conservation. This represents a key strategy by which to assist the flow of benefits from conservation; for livelihoods are then viewed not just as compatible with conservation but also as directly contributing to it (Brown, 2002). However, creating sustainable livelihoods in practice has proved to be an extremely complex process, which will be addressed in the following section.

### 2.12.3 Sustainable livelihoods

Hulme (2001) argues that local livelihoods must yield sustainable revenue flows in order to succeed in both development and conservation goals. A livelihood is sustainable when it is able to cope with and recover from stresses and shocks, and maintain and enhance its capabilities and assets, both now and in the future; while not undermining the natural resource base (Chambers & Conway, 1992).

Commentators argue that community conservation initiatives should include strategies for managing wildlife for economic gain through sustainable hunting, fishing and tourism. Unless wildlife offers economic returns, many reserves in less developed countries in particular will not survive (Hughes, 1998; Amos, 1998 in IUCN, 1998).

Sustainable livelihood opportunities constitute a determinant of the success of integrated conservation (Turner, 2004). The first stage of the process of building sustainable livelihoods may require subsidies and compensation. Compensation needs to be provided for restrictions to livelihoods while substitutes are explored and established. Examples of strategies to redress damage to livelihood practices include the provision of water points if natural sources of water were used before the protected area was established; and the introduction of stall-feeding if protected area land was previously used for grazing (Wells, Brandon & Hannah, 1992). As substitutes for traditional practices cannot always be found, sustainable alternative methods of increasing income should be addressed.

However, subsidies cannot be paid indefinitely and the role of sustainable livelihoods support is thus critical to the viability of conservation projects in the long term. Failing to take this into consideration could create dependency rather than reciprocity between local communities and conservation agencies (Newmark & Hough, 2000). In this

respect, PES are mechanisms that can offer interesting opportunities in protected areas as they could potentially match the opportunity cost of livelihoods that could be practiced in absence of conservation regulations (Tacconi, Mahanty & Sulch, 2010). PES experiences in Costa Rica, Bolivia and Mexico have showed significant contributions for household income from PES programmes (Wunder, 2008).

Sustainable livelihoods invariably necessitate capacity building, and access to the resources with which to design a process for the transformation of extensive systems into intensive and low-impact agricultural, farming and forestry practices. Initiatives aiming to make livelihoods compatible with conservation have placed much importance on land use planning, pasture conservation, and agricultural and wildlife management.

Agencies often quote total revenue generated from sustainable livelihoods at a community level, but at a household level, the sums are often minimal (Turner, 2004) and, as noted in the previous section, incomparable with the income obtained from high-impact agricultural and livestock production. Not surprisingly, low-income communities rely on extensive systems for livelihoods earned from logging, forest collection, shifting agriculture, slash-and-burn cultivation, hunting, and livestock production (Ghimire & Pimbert, 1997). Therefore, a complete analysis of local livelihoods should include a comparison of the extension of sustainable livelihoods with those that generate negative environmental effects.

Such a shift towards the enhancement of sustainable livelihoods requires heavy investment in inputs such as infrastructure, animal foods and other kinds of equipment; and often, new sustainably designed entrepreneurial programmes do not garner the degree of support many conventional agricultural and livestock production programmes enjoy. However, experiences based on the limited success of some integrated conservation projects reveal that the generation of alternative livelihoods requires multiple capacities that are beyond the skill of many conservation organisations to build. Therefore, integration and co-ordination with other actors and institutions becomes essential practice. The establishment of a successful partnership between agencies associated with conservation and local communities requires institutional processes and legislation to promote networking with different institutions and organisations (Rodgers, Hartley & Bashir, 2003).

The exploitation of linkages between local actors, governmental conservation agencies, and other institutions that interact over environmental objectives is essential if integrated conservation is to be achieved (Brown, 2002). Berkes (2004) proposes that a 'cross-scale' approach is more appropriate in dealing with conservation challenges; similarly, the present study contends that the engagement of a variety of institutions is required for the effective integration of conservation.

Ironically, local inhabitants of protected areas are expected to surrender land usages that provide higher economic returns than the majority of those compatible with conservation. Therefore, a solid policy of sustainable livelihoods generation among populations residing within and around protected areas potentially represents the most effective benefit to local communities and the basis for long-term success. 'Conservation programmes are only valid and sustainable when they have the dual objective of protecting and improving local livelihoods and ecological conditions (Ghimire and Pimbert, 1997: 3). Therefore, stimulation of economic development for its communities by supporting sustainable livelihoods is a central aspect of integrated conservation in protected areas (Wells, Brandon & Hannah, 1992).

For this reason, the vision of natural protected areas as institutions that have an important role in poverty reduction should be moved from discourse to implementation for unless there is clear recognition of the legitimacy of local people to secure livelihoods through the sustainable use of resources, implementation of conservation objectives will remain a policy-based aspiration (IUCN, 1998; IUCN, 2005).

## 2.13 Conclusions

Throughout this chapter, the evolution of conservation of biodiversity and its practical links with development has been the focus of analysis. The historical context from dominant development ideologies has been described as a background to the emergence of sustainable development as an ideology that aims to integrate different aspects of development with environmental protection. This chapter has identified the multiple relationships within the development agenda and the conservation agenda in the context of protected areas.

A historical review of protected areas has examined the social and ecological impacts of different approaches of conservation implemented in protected areas, particularly in developing countries where major challenges associated with local development coexist with the urgency to conserve biodiversity.

Exclusionary models of protected areas have brought disappointing experiences for both biodiversity conservation and local communities, generating a shift in conservation approaches. An inclusive model of integrated conservation and development aims to reconcile both conservation and local development. However, critiques of this approach argue that conservation goals are sacrificed in order to favour local communities and claim that implementation of integrated conservation is merely a utopian ideal.

The chapter discusses the roots of these critiques and argues that integrated conservation still offers potential contributions for the successful implementation of protected areas within the context of sustainable development. Therefore, an examination is proposed to understand the dynamics that affect integrated conservation. Three main components are identified to assess integrated conservation: the transfer of benefits, sustainable livelihoods and local participation. An exploration of these components in the case studies aims at providing important findings in terms of practical conditions that can favour successful results in implementing this emergent approach in protected areas.

# CHAPTER 3:"A HISTORY OF CONSERVATION IN MEXICO"

## 3.1 Historical background

The progress of Mexico's environmental protection strategy must be viewed in the context of the social history that forms the background to different stages of nation building up to the present day; which, in turn, sheds light on the construction of narratives reflected in conservation policy and local development. However, before a narrative clearly focused on the position conservation has achieved in state policy, it is necessary to identify and address international evolution in thinking with regard to the use of forests and natural resources, in parallel with national development and local realities in Mexico.

With this purpose in mind, the evolution of ideas regarding conservation policy and practice are addressed during different political stages in Mexico's history. The analysis includes limited aspects of pre-colonial times, before moving on to identify relevant social and political features of the colonial and independence eras. Aspects of the agrarian reform implemented as an outcome of the Mexican Revolution are acknowledged as an essential context in which to explore issues related to land access and usage.

Thus, this chapter aims at identifying essential historical events in order to contextualise and understand efforts made towards a reconciliation of the tension between conservation and local development in today's environmental framework. Current conservation policies then become the most important focus of this chapter, in particular, those that address the management of natural protected areas.

Mexico possesses an enormous variety of wildlife, representing over 12 per cent of world biota and a high number of species endemic to the country (CONABIO, 2000). This characteristic marks an important feature in the evolution of biodiversity that is also an attribute of other megadiverse countries. Indeed, Mexico's high levels of biodiversity position it as the third most megadiverse country in the world after Brazil and Colombia (Toledo, 1997).

According to Reyes-Castillo and Montes de Oca, (1997), Mexico has the greatest number of reptiles in the world, 53 per cent of which are endemic; and the country is ranked fourth in number of amphibians and second in terms of terrestrial mammals, with one third of the latter being endemic. In terms of marine mammals, Mexico has species across the three main categories – *Cetacea, Carnivora and Sirenia* (SEMARNAP, 1997). Mexico also plays an important role in the dissemination of biodiversity, as four international bird migration routes are located in the country. It is also the summer destination for migratory butterflies and marine mammals (Reyes-Castillo & Montes de Oca, 1997). In terms of vegetation, Mexico is considered to be the 5$^{th}$ richest country globally, with 55 per cent of its plant species considered to be endemic (Ramamoorthy & Lorence, 1987, in Ramamoorthy, Bye & Helgueras, 1998).

Not surprisingly, many agricultural species grown worldwide have their centre of origin in Mexico. At least 32 crop plants are recognised as having evolved in the Mesoamerican area; and there are records of at least two hundred locally cultivated native plants (Rzedowski, 1997). Agriculture development in Mexico can be traced to ancient indigenous knowledge that predates the arrival of the Spanish; and, according to Rzedowski (1997), corn, beans, pumpkin and chilli were local dietary staples before colonial times.

Despite a history of ecosystem exploitation, Mexico retains a large part of the territory's biodiversity. However, from the mid-1990s the effect of national development ideologies has led to enormous rates of wildlife depletion, river pollution, overexploitation of the water table, and one of the highest deforestation rates in Latin America (Gómez-Pompa & Kaus, 1999). This has occurred despite clear efforts to consolidate a conservation policy. For this reason, there is an urgent need to strengthen and increase attention to the conservation policy and implementation in the country.

Almost every known type of environment on the planet is to be found in Mexico, (Toledo, 1997), which therefore encapsulates all the challenges and opportunities that biodiversity offers. Accordingly, Mexican biodiversity is not only a matter of national interest, but is also widely considered to be of global significance (Ramamoorthy, Bye & Helgueras, 1998).

National biodiversity has shaped Mexican history and development. Conservation initiatives had grown significantly more centralised by the end of the 20th century, when a strong cultural identification with the country's natural resources began to translate into political will.

The objective of this chapter is not only to describe the current direction of national conservation policy, but also to identify its links with developmental strategies and its effects, in particular, on local development. In short, the chapter discusses the extent to which integrated conservation exists as a policy narrative of environmental protection in Mexico, and places particular emphasis on the evolution of natural protected areas.

### 3.1.1 Pre-colonial and colonial times

According to documentation left by missionaries arriving on the shores of 'New Spain', as Mexico was called by colonialists, the territory soon became known as, 'the jewel of Spanish colonies,' since it was so well endowed with natural resources; fertile land, game and a diversity of trees in its extensive forests which provided much sought after timber (Simonian, 1995: 41).

However, when the Spanish arrived, the forests were not in their primordial state, but had been developed by the highly civilised societies that flourished in different regions of the territory known as Mexico today. Beltrán, (1964) suggests that by the time of the arrival of the Spanish, the utilisation of natural resources required to sustain great architectonic cities such as Chichen Itzá in Yucatan and Teotihuacán in central Mexico would have already altered the original state of the ecosystem. In fact, the conquistadors described a densely populated territory with extensively cultivated land that resembled Spanish farms (Denevan, 1992, in Gómez-Pompa & Kaus, 1999). However, the introduction of new agricultural techniques, livestock brought to start farming enterprises, and the exploitation of mines to sustain the colonial economy all conspired to dramatically increase the rate of environmental destruction (Beltrán, 1964).

The Spanish culture influenced by an anthropocentric vision where man is expected to dominate nature, heralded the beginning of a new notion of exploitation of natural

resources. The colonial utilitarian approach to accessing natural resources (Adams & Mulligan, 2002) operated in contradiction to the diverse and profound role that nature played in ancient civilisations, including subsistence farming, and cultural and religious expression (Toledo, 2005). European determination to obtain sources of wealth such as precious and semi-precious minerals, wood, and other natural resources from its newly acquired land dramatically affected indigenous communities and their ecosystems (Grove, 1995). In contrast, civilizations such as the Mayan culture have been noted for their ability to maintain forest composition and agriculture without major changes to the ecosystem (Gómez-Pompa & Kaus, 1999).

Cultural and religious ideologies constitute vital sources of knowledge in terms of understanding and identifying patterns of natural resource usage. For example, the forest had a spiritual meaning for ancient civilisations in Mexico. Plants were venerated for their curative powers; and animals were believed to possess knowledge of the gods (Simonian, 1995).

Conservation of nature was not a priority for the Spanish administrators. According to Gill, (1931), at the time of the Spanish conquest, approximately 85 per cent of the territory christened New Spain was covered by forest; and by the close of the colonial era less than three hundred years later, Humboldt estimates that only 50 per cent of the area was forested (Gill, 1931). The Spanish seizure of the land was accompanied by a process that demystified and disempowered nature. For example, respect shown by offerings placed to the jaguar before changing land use to agriculture was rejected by missionaries who, demonstrated their disrespect for tradition by having their dogs hunt groups of wild cats such as jaguars and pumas. Transformation on perceptions on nature is observed by the encounter between two different cultures. With the Spanish introduction of livestock, jaguars have ended up being persecuted to avenge attacks on cattle, whereas they used to be a respected ally in Mayan agricultural systems because they focused on hunting herbivores that raided crops and therefore positively affected local communities (Faller, 2009). Rather than documenting and learning from local knowledge, during colonial times, indigenous populations were, “decimated, weakened, and suppressed by arms, religion and disease” (Gómez-Pompa & Kaus, 1999: 5983). The destruction of codices and written knowledge did not only mean the erosion of traditional culture but also the wisdom necessary for the facilitation of biodiversity

conservation. Indigenous voices claim that, as a consequence of these acts, “the roots of the country’s environmental crisis lay in the Spanish suppression of native religions and their introduction of detrimental land use practices” (Simonian, 1995: 10). Potential contributions of indigenous knowledge to conservation were overlooked for long periods in the history of conservation of Mexico and regained only at the end of the 19th century with the rise of the ethnoecology approach, discussed in following sections.

### 3.1.2 An independent nation

Biodiversity conservation did not figure in the design of the first Constitution, which was implemented five years after Mexico gained independence from Spain in 1821. Moreover, the limited restrictions to forest use ordered by the Spanish, which were the only existing conservation laws, were discarded (de Quevedo, 1924). The leading Mexican social class, the Mestizos – a race consisting of a mixture of Spanish and indigenous ancestry, or even Spanish people born in Mexico – aspired to a Western-style model of development and envisioned the establishment of a homogenous national identity for themselves (Bartara & Otero, 2008). However, such a vision overlooked the immense diversity of indigenous peoples in Mexico, and the traditions, languages and practices that were as varied as the biogeographic regions of the country. Consequently, progress focused on the priorities held by those of the leading class with little participation by the surviving indigenous communities. Bartara & Otero, (2008) argue that if Spanish rule was characterised by the abusive exploitation of indigenous communities, post-colonial government attempted to eliminate this group from society altogether.

As a result, the natural environment, perceived only in terms of input for construction, the fuelling of industrial progress and the exploitation of the natural environment, was tempered only by general forest dispositions. No regulatory framework based on intrinsic value to preserve the natural environment existed (de Quevedo, 1923).

Simonian (1995) believes that the 19th century narratives inspired to conserve landscapes that emerged where industrialisation was advanced in Europe and US had little impact at on Mexico. The focus of the builders of the nation at that time focused on industrialisation as a means of driving the country's development (Simonian, 1995).

### 3.1.3 Pre-revolution times

The latter decades of the 19th century marked an important phase in the stability of the Mexican state, which was led by the government of the dictator Porfirio Díaz from 1876 to 1911 (Lozano Fuentes & López-Reyes, 1988). The development of the railways was considered the engine of national progress; at the beginning of *el Porfiriato*, there were 691 km of track and by the end of it there were 24,717 km throughout the country (Lozano Fuentes & López-Reyes, 1988). The expansion of the mining industry was also a critical development, which enabled Mexico to become the world's largest producer of silver and the second largest producer of copper (Lozano Fuentes & López-Reyes, 1988).

These two activities meant the exploitation of the forest and its biodiversity, exacerbated by inefficient logging techniques without regulation in the rush to secure materials for posts and rails, as well as coal and steel production (Gill, 1931). Gill, (1931) considers that this period saw the greatest forest devastation. Indeed, in spite of the raising of a variety of different voices asserting the urgency for protecting fauna and forests that were being severely depleted, little political headway was made in this direction until well after the turn of the 20th century (Aguilar-Zinzer, 2007). Moreover, agriculture did not receive the same level of interest as that of industry; and, as a result, food production stagnated at the same time as the population exploded. From 1880 to 1910 the population increased by 50 per cent (Lozano-Fuentes & López-Reyes, 1988).

As large areas of land were owned by indigenous communities, the government of Porfirio Díaz implemented the *Lerdo* Law, which particularly affected church property, but formed a legal basis for the privatisation of any land in a state of disuse, appropriating it from the local communities that were scattered throughout vast areas of forest. This alienation of property was justified by the government mandate to drive the modernisation of the country.

Such alienation deprived indigenous communities of 90 per cent of their land; which meant not only the exploitation of the forest, but, as Bartara & Otero, (2008) point out,

the creation of a class of low-paid labourers, with no food security, who had no alternative but to endure appalling working conditions on their own land.

This was the heyday of the *hacienda*, when large areas of land (called *Latifundios*) that were concentrated in the hands of the wealthy reached greater proportions than in colonial times (Lozano-Fuentes & López-Reyes, 1988). The social structure consolidated a breach between leading social classes and indigenous communities that is illustrative of the inequalities that prevailed in the country.

### 3.1.4 Revolution and post-revolution

Leading figures, such as Zapata, initiated the Mexican Revolution in 1910 with the aim of removing the dictator Porfirio Díaz and returning the land to the peasants. Concern over social repression could be heard during the peasant struggle in the national slogan and demand: 'land and identity', which expressed sentiments associated with nature and culture. In this respect, Bartara & Otero, (2008) argue that these revolutionary ideals aimed to reaffirm the importance of local culture. Aspirations legitimately described as the objective of the revolution, expressed people dissatisfaction with the loss of land and the subsequent transformation of local livelihoods brought about by such acts. Land suppression was perceived to have to impact on important aspects of natural environment livelihoods and in the long term to impact on cultural traditions. Because they had lost influence with the government, a number of landowners aligned with the revolutionary cause. In 1917 the constitutional amendment which included agrarian reform and a pledge to return land to its previous owners was passed.

The complexity of Mexico's agrarian problems is not intended to be the focus of the present analysis, but they do constitute a contextual element in the history of conservation in the country that is essential to consider. Based on Article 27 of the Constitution, the agrarian reform instituted the redistribution of land (*latifundios*) and the return of property to people and communities. A major aspect of the 1917 agrarian reform is the creation of the *ejido*, a system of communal land use that granted local communities access to redistributed land and freedom to use it in the interests of rural development (Procurauría Agraria, 2008).

However, property rights of the *ejido* were restricted and it was over a decade before the agrarian reform started to be implemented with different approaches in various regions and at separate times (Boyer, 2007). Nevertheless, between 1911 and 1992, over 1 million hectares of land – half the country's territory – was returned to peasants through 300,000 *ejido* and to communities accounting for 3.1 million families (Warman, 2003). Yet, the agrarian reform failed to provide sufficient impetus for local development, leaving *ejido* members in conditions of extreme poverty (Warman, 2003). In the following section, the initial steps towards the design of a conservation policy are identified. and its impact examined in terms of the development of the communities that were finally granted rights to recover their land.

### 3.2 Construction of a biodiversity conservation framework

Links between social development and biodiversity conservation in the modern Mexican paradigm are a result of the evolution of land tenure policies and access to biodiversity that – planned or not – have had significant effects on the state of both biodiversity and local development. This section provides a brief review of the evolution of the forest regulations that were the precursors of conservation policies.

#### 3.2.1 Paternalism

The first national law for the regulation of Mexican forests emerged in the 1920s (Boyer, 2007) as a response to the major concerns of a small circle of intellectuals led by Miguel Ángel de Quevedo.

Under de Quevedo's leadership, the Mexican Forestry Society was formed, and a journal called *México Forestal* (Forested Mexico) that was published from 1921 promoted progress in silviculture, that made a significant contribution to the designation of extensive areas of forestland as national parks (Aguilar-Zinzer, 2007; Boyer, 2007). The promulgation of the 1926 Forest Law was considered to be the Mexican Forest Society's most significant achievement (de Quevedo, 1923).

The emerging narrative on the conservation of the forests flourishing in Mexico had a significant effect on the right of access to land, a subject that became the core of the debate on agrarian reform; as, due to the return of land to indigenous and local

communities, over 50 per cent of the country's inland territory became common property, 80 per cent of forestland falling under the *ejido* system (Merino & Segura, 2002).

The Mexican Forestry Society called for public protest about the risk to peasant land ownership, claiming that only experts in the field had the capacity to understand the relation between forest usage and conservation (Martínez, 1930; Blanco Macías, 1954; Mexico Forestal, 1965). In fact, it was argued that 80 per cent of the country's deforestation could be attributed to exploitation by, and the incapacity of, *ejido* communities, that had been created by the agrarian reform, and that there had been a lack of vision in indiscriminately returning extensive areas of forestland to dispossessed people (Martínez, 1930). This was quite an accusation considering that timber companies operating in Mexico – many of them foreign owned – followed no code and were provided with the technical wherewithal to exploit vast areas of forest (Boyer, 2007). Indeed, advances in legislation at this stage still failed to stop illegal logging, which actually increased regardless of whether the trees grew in designated enclosures or protected areas (Boyer, 2007).

Discrimination between private and communal landowners in terms of their respective obligations and access to the forest was legally cemented by harsh bureaucratic requirements for *ejido* to control logging. Moreover, strict regulations in respect of extraction techniques neglected peasant communities, as they did not have the economic capacity to gain access to the required technology. The law did not make any provision for support in the acquisition of such expertise but focused rather on didactic forest conservation awareness programmes in local communities, with the aim of highlighting the need to change traditional forest practices (Boyer, 2007).

Even though the law represented a serious effort to reverse deforestation, the top-down approach behind it resulted in very little success in meeting this objective (Boyer, 2007). Boyer (2007: 97) labels de Quevedo's approach "scientific paternalism," as it underestimated the capacity of local communities and assumed that the function of the state was to control forest usage. Therefore, in many respects, rather than promoting community development, the legislation merely 'criminalised' peasant practices (Boyer,

2007: 116), forcing them into black market activities and excluding them from the benefits of legitimate commercial enterprise.

Since people had traditionally used and relied upon forests for food and income, the revolutionary struggle for property rights was an important development in the history of conservation in Mexico. It represented a shift in thinking about biodiversity. The return of restrictive land policies denied unrestricted access. Previous capitalistic-driven access to natural resources had resulted in the exploitation of the forests with no comprehensive legal framework to regulate such activity.

### 3.2.2 Restriction

Amendments to the Forest Law in 1940 moved towards stimulating forest industries by protecting the market as the country became dependent on imported wood for its consumption. Yet, rather than establishing a management plan for efficient forest usage, legislation focused on granting concessions to private companies, the government possessing the power to issue such licences even in areas that were communally owned. Logging was carried out by external companies that simply had to pay rent for land usage to the owners, many of them members of *ejidos* (Merino-Pérez & Segura-Warnholtz, 2004). According to Merino-Pérez & Segura-Warnholtz (2004), forest concessions imposed severe restrictions on local communities in terms of traditional forest usage including wood collection, charcoal production and agriculture; but in return, they received only a fraction of the benefits generated by the forest. In short, the policies of logging closure and company concessions conspired to deny peasant communities the right to access the forest and obtain comparable benefits from it (Bray, 2007). Such restrictions would have further affected cultural practices related to the forest when local communities had already lost the right to engage in several indigenous customs at the same time as they were attempting to build a peasant identity.

Most timber industries had low-yield techniques of wood extraction and the government was thus obliged to establish areas of logging closure when an area became overexploited. Merino-Pérez & Segura-Warnholtz (2004) argue that in spite of the impetus to increase wood production in the 1950s, by the end of the decade, 58 per cent of forestland had been declared off limits. The logging closure policy was a response to

the failure to regulate sustainable use on the part of concessions (Merino & Segura, 2002; Boyer, 2007).

Such legislation promoted repressive bureaucracy in the implementation of conservation that restricted local access to the forest (Merino-Pérez & Segura-Warnholtz, 2004). In response to the discontent of local communities with regard to forest usage, the law focused on the provision of subsidies for agricultural activities (Cedeño-Gilardi & Pérez-Salicrup, 2005).

As Boyer (2007) points out, the dynamics of land access in the mid 20$^{th}$ century were similar in other parts of the world where property in the hands of rural people was appropriated and transferred to state control to be managed by so-called experts. The difference in the context of Mexico was that post-revolutionary policy granted rural communities nominal ownership of the land but hobbled this arrangement with legislation that did not allow their free use of it. In general, environmental protection policies during this restrictive period favoured a preference for the conversion of woodland into agricultural *ejido* land, a policy that had profound repercussions for biodiversity conservation.

### 3.2.3 Production

Critiques of the restrictive approach to forest legislation argue that the new ideas Enrique Beltrán introduced into the forest debate in the 1960s shed light on the cause of forest destruction. Beltrán argued that a restrictive forest policy had provided an incentive for the destruction of the forest, as the land was perceived to be more economically viable if it were used for agriculture or livestock breeding (Beltrán, 1964).

Beltrán points out that the economic returns from Mexico's forests were poor given that so much of the country was wooded – close to 40 million hectares at the time. He compares Mexico with other countries endowed with abundant forest cover such as Norway and Sweden, which, although they possessed the comparatively smaller areas of 6.1 million hectares and 22.95 million hectares respectively, received a significant contribution to their economies from the proceeds of planned forest exploitation (Beltrán, 1964).

In 1963, with an estimated wood extraction revenue of $10 billion, given the use of efficient extraction techniques, the actual proceeds of approximately $860 million fell far short of agricultural production that year (Beltrán, 1964). However, Beltrán argues that with efficient management, forest production could generate more revenue than agriculture; and with rational management, it was possible to increase extraction areas in a sustainable manner (Beltrán, 1964).

This assertion was a significant development in the national conservation debate, particularly given that the erratic enforcement of previous logging closure areas previously often left room for large private and parastatal companies to continue with their poorly regulated forest exploitation practices (Merino & Segura, 2002; Pacheco, Ibarra, Cronkleton & Amaral, 2008).

As Beltrán (1964), and Merino-Pérez and Segura-Warnholtz (2004) demonstrate, rather than developing industry technologies, the limited regulation of forest management resulted in a proliferation of inefficient companies with poor conservation standards that were dependent on protected markets.

As an intellectual, Beltrán believed in putting technical knowledge to rational use and therefore favoured a policy on the regulation of production, rather than a merely restrictive one as was the case in previous laws that had failed to guarantee the protection of the forest or its biodiversity (Beltrán, 1939, 1964). This line of thinking that focussed on production efficiency brought important considerations that favoured forest practices commensurate with a conservation discourse; however, the limited role of local communities in terms of forest access was also cast into the debate. At the time of this approach, the government continued attempts to deal with discontent amongst local communities constrained by forest access policy; and agricultural development was promoted as a means of granting right of access to *ejido* land, as forest management was considered to be beyond the ability of local communities to implement unaided.

### 3.2.4 The green revolution

Following development policies that focused on agricultural activities on e*jido* land, approximately 65 per cent of Mexican forestland had been reinstated as common property by the end of the 1970s (Pacheco, Ibarra, Cronkleton & Amaral, 2008).

The green revolution of the 1970s and 1980s that maximised agricultural production had significant repercussions in terms of both biodiversity and local development. The National Commission for Deforestation was created to provide financial support to peasants in clearing the land to open up new areas for production (de la Maza, 1999; Cedeño-Gilardi & Pérez-Salicrup, 2005). Areas not naturally fertile were highly dependent on agrochemicals and therefore expensive to maintain, many of them becoming economically non-viable (Merino & Segura, 2002). On land already given over to agriculture, subsistence crops were largely replaced by sorghum as it generated greater revenue (Cllenger in Cedeño-Gilardi & Pérez-Salicrup, 2005).

In addition, from 1970 to 1985, a national programme for the promotion of cattle ranching as an alternative to crop agriculture on former forestland was promoted with the support of the World Bank (Cedeño-Gilardi & Pérez-Salicrup, 2005).

In the 1970's, funding for agriculture, and for livestock breeding in particular, received significant investment from national banks and international financial organisations (Toledo, 1989). By 1980, 70 per cent of this credit was being utilised for animal rearing, including cattle, pigs and poultry, the latter two being mainly responsible for extensive soil and water pollution due to a lack of efficient manure processing (Toledo, 1989).

After the return of land to local communities and the implementation of programmes to promote farming activities, levels of production on private land proved to be far higher than that of the *ejido*. In 1970, 88 per cent of cattle breeding was undertaken on private ranches, while *ejido* contributed only 12 per cent of the breeding stock (Toledo, 1989). This was because from the 1960s to the 1980s, when significant areas of forestland were leased to private companies for logging, local communities were permitted to engage only in agriculture and livestock breeding using extensive models of farming adopted from the United States (Toledo, 1989).

By 1989, approximately half of the country's territory was under livestock production, an area five times larger than that given over to agriculture (Toledo, 1989), which was considered more efficient than livestock farming in terms of space and energy consumption. Since then, agriculture has continued to compete for territory with ranching, cattle farming being the preferred activity. During this period, there were few political advances in conservation regulation. Indeed, these decades witnessed a dramatic increase in deforestation, which was promoted via official policies and development programmes (Toledo, 1989; Cedeño-Gilardi & Pérez-Salicrup, 2005). In terms of local development, this approach brought only minor benefits to local communities compared with private producers; and, as it required external input, the *ejido* became an unviable productive system for its owners.

### 3.2.5 Community allowance

The Mexican economic crisis of the 1980s reduced social investment, which local communities had hitherto relied upon widely for subsistence. People were obliged to return to the land as financial pressure increased on them as a result of a loss of support from assistance programmes (Cedeño-Gilardi & Pérez-Salicrup, 2005). In this decade, the transfer of forestland from *ejido* to private industry concession was also abandoned as a policy, and some communities were allowed to resume extraction of non-wood resources. However, government training programmes had insufficient assets to comply with national free market policies (Merino & Segura, 2002).

During the 1980s, relatively few communities managed to establish forestry production enterprises, but those that did made significant progress towards the conservation of the forest by creating mechanisms to prevent fires and illegal logging. However, the liberalisation of markets by means of international agreements imposed on newly established community-based co-operatives brought with it enormous pressure to compete (Pacheco, Ibarra, Cronkleton & Amaral, 2008). In 1986, an amendment to the Forest Law for the first time recognised the right of local communities to access the forest as long as an integrated management plan was implemented (Merino-Pérez & Segura-Warnholtz, 2004; Pacheco, Ibarra, Cronkleton & Amaral, 2008). Nevertheless,

insufficient resources to overcome the challenges within the free trade context resulted in low success rates (Merino & Segura, 2002).

In 1992, new amendments to the Forest Law granted local communities responsibility for the management of *ejido*, which stimulated the initiatives of individual community-based entrepreneurs, providing important lessons in terms of local employment and the creation of an incentive to implement a patrol system to combat the practice of illegal logging (Pacheco, Ibarra, Cronkleton & Amaral, 2008).

Plans to decentralise the use of the forest and recognise local communities as central actors in sustainable forest management made significant headway in this period; however, most of the plans were restricted to the theoretical level rather than being put into practice, particularly where conservation support and funding was in competition with other areas such as private agriculture (Pacheco, Ibarra, Cronkleton & Amaral, 2008).

In spite of its modest advances, this approach formed an important basis for addressing conservation and local development by allowing the *ejido* to start to promote forest management.

### 3.2.6 Ethnoecology

With the clear purpose of emphasising the importance of traditional cultures in the protection of natural ecosystems, the ethnoecology approach gained greater attention in Mexico from the mid 1980's (Gómez-Pompa, 1987; Gómez-Pompa, Flores & Fernández, 1990; Gómez-Pompa & Kauss 1992; Toledo, Alarcon-Chaires, Moguel, Olivio et al., 2001). This approach consists of three main elements. The first is based on the diversity of Mexico's ecosystems. Similarly to Beltrán, Toledo recognises that the benefits of the forest have traditionally been minimal given the vast areas of woodland that are suitable for extraction. However, in divergence from Beltrán's contention, Toledo argues that the main reason for this is the predominance of a technological model imported from industrialised countries where low levels of diversity allow for the specialised production of a few species only that are of high commercial value (Toledo, 1989).

Second, there is a need to drive the woodland productive process by means of an integrated management approach rather than via several discrete policies. This vision requires forest management to be integrated with other productive processes such as agriculture, fisheries and livestock (Toledo, 1989).

Third, it is necessary to explore those technologies that have the potential to facilitate accession to biologically diverse ecosystems in an integrated way (Toledo, 1989). This is the central ethnoecological principle, which focuses on the value of the experience, knowledge and practices of local and indigenous communities; from which it is hoped to create a variety of productive and technological strategies for ecological research (Toledo, 1989; Mauro & Hardison, 2000; Gómez-Pompa & Kaus, 1992). In order to realise this vision, Toledo (1989: 65) proposes a process that engages the "ideology of de-colonisation" to reassess the empirical knowledge of peasant producers and "de-fetish" scientific knowledge, placing them side by side so that they may complement each other.

The relation between traditional indigenous knowledge and biodiversity conservation is part of the international debate on integrated conservation affording limited recognition in the CBD (UNEP, 1992). Three main aspects are identified in this approach: the local community itself; the relationship of the community with nature; and the relationship of the community with other social actors (Toledo, 1989). In other words, by failing to incorporate a community development approach into conservation projects, many local communities have disintegrated, which has exacerbated both the marginalisation of indigenous peoples and the deterioration of the ecosystem (Gómez-Pompa & Kauss, 1992; Toledo, 1989). This approach should be able to make a significant contribution, particularly given that Mexico is second only to Papua New Guinea in respect of the proportion of national woodland that is subject to communal property rights (Klooster & Ambinakudige, 2007).

Traditional indigenous knowledge from the Mayan culture, the geographical area where the case studies of this research are located, is considered to be an important element for conservation of the protected areas of interest as Mayan presence in rain forests are well known for containing high levels of biodiversity (Gómez-Pompa and Kaus, 1999; de la

Maza, 1999). The Mayans sustained their population over centuries in numbers and density far in excess of those existing in the same region nowadays without compromising biodiversity (Dunning, Beach & Rue, 1997 in Gómez-Pompa & Kaus, 1999).

The debate on the collapse of the Mayan civilisation, which has been attributed to overexploitation of natural resources has been modified latterly by a more acceptable explanation based on the geographic studies of Hodell, Curtis and Brenner (1995), which confirm that there were long-term periods of drought at the time of the decline of the classic period of the Mayan Civilisation between 1,300 and 1,100 BC. “No evidence of any major biological collapse, evidence only of a population collapse” was recorded (Gómez-Pompa & Kaus, 1999: 5983). Alternative conservation approaches however have been noted in Mayan agroforestry systems and biodiversity management (Gómez-Pompa & Kaus, 1999). In order to find sustainable strategies to face challenges of soil degradation and deforestation caused by the imported models of cattle farming in Mexico, as identified in Ria Lagartos, (one of the case studies), knowledge about forage plants used by Mayans could provide practical options for silvopastoral systems in the particular topography of Yucatan (Flores & Bautista, 2012).

Underpinned by strong leadership in socio-ecological research, the principles of ethnoecology have become politically influential in making innovations in the evolution of this approach to conservation. However, the progress it has been able to make – albeit reinforced by academic centres – is still rather modest compared to the achievements of other approaches advocated by private interest, such as the green or biotechnological revolution. Yet, the basic principles of this approach can be found in modern political conservation narratives that aim at integrating environmental protection with local development.

### 3.3 Development of an integrated conservation policy

In his history of conservation in Mexico, Simonian, (1995) argues that considering the varied and continuous examples of environmental abuse, it might well be concluded that Mexico has never had a history of conservation. Yet, the claim that there has been a general absence of government support for environmental protection (Simonian, 1995)

may overlook an important era of efforts in this field, an era during the early 1990s. Indeed, attention should be drawn to the strong academic tradition and non-governmental organisations that have championed professional efforts to initiate small-scale conservation projects and the sustainable use of natural resources throughout the country; and which have advocated a national policy that responds to the needs of such initiatives (Philippi, Soares Tenório & Calderoni, 2002; PNUD & SEMARNAT, 2004).

The mobilisation of an international environmental movement in the 1970s and 80s presented in Chapter 2 had echoes in Mexico. These early stages in the evolution of a clear environmental policy coincided with acute pollution problems in the country; and although atmospheric pollution was the most pressing problem, particularly in Mexico City, as previously discussed, deforestation, water and soil pollution also posed significant problems (Micheli, 2002).

According to Carabias and Provencio, (2010), the steps taken regarding the knowledge of the state of biodiversity from the seventies evidenced that historical natural resource policies, legislation and management were, in a good measure, the sources of the environmental degradation in those times.

In response to this situation, the General Law for the Prevention and Control of Environmental Pollution was passed in 1971 in order to control greenhouse emissions (SEMARNAT, 2000a). This law was replaced in 1982 by the General Law for Environmental Protection, which, in spite of amendments to the legislation, still had a greater focus on urban and health aspects, paying limited attention to the conservation of biodiversity at the ecosystem level (SEMARNAT, 2000a). However this did contribute to management changes at the administrative level, which represented the dawning of an awareness of the need to initiate a process that would work towards an integrated environmental conservation approach.

Demonstrating a sharper focus on biodiversity, Mexico signed the CITES in 1991. Subsequently, as an implementation strategy, rehabilitation centres for quarantined wildlife have been opened where animals that have been impounded at airports are rehabilitated (SEMARNAT, 2008).

Neither did Mexico overlook the international momentum that would culminate in the Earth Summit. With the ratification of the CBD and the country's commitment to Agenda 21 signed in 1992, the environmental sector saw an increase in commitment to the environmental agenda and an upsurge in social participation whose contributions in the transformations of conservation policy are to be highlighted. The Advisory Councils for Sustainable Development, that were established in 1995 as a response to the commitments, ratified by Mexico in the Earth Summit, were a mechanism to strengthen social participation in the environmental agenda in the context of incipient steps for increased democracy in the nation (SEMARNAT, 2008). A series of changes to environmental policy, for example, amendments to the Forest Law in 1992, brought important innovations in forest conservation in the form of increased funding for community-based production and mechanisms for the recognition of environmental woodland services (Merino-Pérez & Segura-Warnholtz, 2004).Three other important institutions were created in 1992: the Federal Attorney for Environmental Protection (FAEP, PROFEPA in Spanish), whose function was to oversee the implementation and enforcement of environmental laws; the National Institute of Ecology, for the purpose of generating environmental information to guide policy making in the interests of sustainable development; and the National Commission for the Knowledge and Use of Biodiversity (CONABIO in Spanish), which was created to promote activities aimed at generating information on biodiversity in the interests of conservation and sustainable use. Also with influence from the CBD, in 1998, CONABIO published a national study – *The Biological Diversity of Mexico* – that constituted the country's first mandatory environmental assessment (CONABIO, 2000). Utilising data gathered for this study, the first National Biodiversity Strategy of Mexico was designed and published in 2000 (CONABIO, 2000).

Progress in driving environmental policy towards an integrated approach to conservation and sustainability was made through the interest of influential academic and social groups, as well as leading figures in the environmental sector who were involved in the operations of governmental environmental organisations. The evolution of this sector resulted, in 1994, in the creation of the Ministry of Environment, Natural Resources and Fisheries[1] (MENRF, SEMARNAP in Spanish), which was followed by reforms to the General Law of Environmental Protection over the following two years (SEMARNAT, 2000a).

[1] *Following ministry restructuring in 2000, responsibility for fisheries was transferred to the Ministry of Agriculture, Livestock and Rural Development; consequently, SEMARNAP became SEMARNAT.*

The process of reorganisation of the environmental protection legislation and administrative framework, commencing in 1994, contributed to the introduction of a sustainability approach in the policy narratives of other departments (Carabias and Provencio, 2010). Evidence of a move towards an integrated approach can be seen in the 1997 Forest Law, which recognised that woodland destruction was a result of inappropriate policies, and acknowledged links between the forest, and social and economic conditions in rural areas. Based on the Forest Law and its implementation, innovative mechanisms were created to support community-based forest use (Pacheco, Ibarra, Cronkleton & Amaral, 2008). Changes in the approach to protection that had been made during the previous two years of implementation were reflected in a new piece of legislation, the General Law of Sustainable Forest Development, also ratified in 2001 (Merino & Segura, 2002). Inaugurated in 2001, the National Forestry Commission supported programmes such as rural appraisal studies, marketing studies, training programmes, ecotourism, forest certification, community-based forest exchange forums, and other initiatives arising from locally perceived needs.

Another important mechanism for the conservation of biodiversity that shows a clear movement towards an integrated approach is the General Wildlife Law, ratified in 2000 and most recently amended in 2010 (DOF, 2000). This ruling introduced fundamental changes in terms of the relationship between biodiversity and property rights. As exemplified in the different stages of the evolution of conservation in Mexico, norms and laws have historically denied the use of natural resources to communities and *ejido*. The national wildlife programme recognised that failure to provide communities with rights over natural resources caused social discrimination, low production and loss of biodiversity (INE & SEMARNAT, 2000a); therefore, article 18 of the General Wildlife Law, gives landowners the right to utilise wildlife sustainably.

To ensure that the generation of development opportunities for local communities is carried out in accordance with the sustainable utilisation of the forest, the General Wildlife Law established in 2000, the Unit for Wildlife Management (UWM; *Unidades de manejo ambiental para la conservación de la vida Silvestre* in Spanish – *UMA*) (DOF, 2010). The UWM was created as a mechanism to allow sustainable access to species of commercial interest whilst reducing the illegal misuse of natural resources

(DOF, 2006a). An important characteristic that made UWM an interesting scope for conservation was the 'permitting' rather than 'prohibiting' of access to wildlife under sustainable and regulated principles. By 2010, close to 11,551 UWMs covering an area of 37.46 million hectares had been established, in which such diverse species as puma, peccary, bighorn, reptiles, fish and birds are managed (SEMARNAT, 2012). Expansion of UWM in the north of Mexico where cooler and desert areas are included and large hunting and game ranches located, has been greater than in the south of Mexico where rainforest and tropical ecosystems exist. Between 2007 and 2012, 120 UWM were established in Yucatan covering 57,973 hectares (SEMARNAT, 2012).

As described in the context of Mexican pre-revolution times during '*el porfiriato,'* the Mexican Constitution used to dictate expropriation of non-productive land. Modification of article 27 in 1992, regarding unused land, opened up scope to explore new legal schemes for conservation on private and communal land (Faller, 2007). For instance, Certified Areas for Conservation is an important scheme that promotes the voluntary participation of social actors in conservation by official designation (SEMARNAT, 2012). Since 2002, 216 certified areas have been registered in Mexico covering an area of 251 000 hectares, 35 per cent of which have been established in *ejidos,* protecting species such as royal eagle, quetzal, jaguar, rams, toucans, butterflies, and snakes (de la Maza 2012). This initiative, by creating biological corridors, complements the strategy of natural protected areas as many priority species and ecosystems are outside the protected area system. Owners of areas certified, are elegible to receive support to access funding for sustainable projects such as the Program of Environmental Services. In Yucatan, 2 certified areas are registered, *"Finca de San Luis'* covering 14.05 hectares and '*El Zapotal'* with 2,358.12 hectares (SEMARNAT, 2012). Certified in 2006, *'El Zapotal'* borders the biosphere reserve Ria Lagartos (a case study of this research) and serves as a buffer zone to the reserve, where conservation projects of resident and migratory birds, jaguar and other mammals are carried out by *Pronatura Peninsula de Yucatan,* the owners of this area (Faller, 2012).

In line with the integrated conservation approach, Environmental Service Payment schemes managed under the National Commission of Forestry provide economic incentives to *ejido* communities to implement conservation practices (Iglesias *et al* 2010). The Program of Environmental Service Payment in Mexico includes the

Programme for Hydrological Environmental Services, created in 20003. In 2004 the Program for the Development and Markets of Environmental Services of Carbon Sequestration and the Programme for Silvopastoral Improvements were created. Implementation of these programmes began after operative rules were determined in 2006. Since then, Projects of Environmental Services Payment in Mexico support approximately 5,000 *ejidos,* communities and small owners of forest land covering 3,080,500 hectares of Mexican ecosystems (Macip-Rios and Macip, 2013).

These recent transformations in Mexican environmental policy show interesting advances that embrace a narrative of integrated conservation and development which can be identified in different areas of the national conservation agenda. Changes in the environmental and natural resources sectors, experienced at institutional level, contribute to the shaping of the agenda on protected areas. The extent to which these narratives are implemented and the challenges it faces in practice are the focus of this research.

### 3.4 Protected areas in Mexico

This section will present a brief historical account of protected areas in Mexico, the evolution of their policy and legislation and focus in particular on biosphere reserves, given the role of community participation that characterises this category.

#### 3.4.1 Evolution of protected areas in Mexico

The tradition of protected areas in Mexico dates from pre-Hispanic times, when such areas were organised among the Aztecs and the Náhuas by closing them for wood collection and hunting in order to improve species management (de la Maza, 1999). Examples of these areas include Chapultepec Forest, which was protected under the rule of Nezahualcóyotl in 1428; and Oaxtepec Gardens, which were protected under Moctezuma Ilhuicamina in 1450 (Ordóñez Díaz & Flores Villela, 1995; de la Maza, 1999).

Protected areas did not play an important role during colonial times. With the exception of Chapultepec Forest which was protected for recreation purposes in 1530, traditional protected areas were overlooked after the first stage of the colonial period.

The first protected area was established in 1876 – 55 years after Mexico gained independence. El Desierto de los Leones was established during *el Porfiriato* in an attempt to offset the fact that areas of forest adjacent to it faced drought as consequence of unbridled logging (Ordóñez Díaz & Flores Villela, 1995). However, the protection of this area of Mexico City did not herald a more extensive conservation initiative but a strategy to meet a specific urban need in protecting a particular area of forest in order to guarantee the water supply to the capital (CONANP, 2007).

There were significant developments in the implementation of protected areas during the administration of Lázaro Cárdenas (1934–1940), under the leadership of Miguel Ángel de Quevedo. Eighty-two natural protected areas were created with various purposes, including the preservation of nature, recreation, and the protection of landscapes such as historical sites that contained significant cultural artefacts (Ordóñez Díaz & Flores Villela, 1995).

From 1940 to 1976, national interest moved away from protected areas and only seven were established during this period (Castañeda Rincón, 2006). However, during the administration of Adolfo López Mateos (1958–1964), under the guidance of Enrique Beltrán's incorporation of IUCN principles, the few protected areas that were established emphasised the conservation of flora and fauna, rather than just the landscape (de la Maza, 1999).

The low interest in protected areas from the 1940s to the 1970s peaked between 1970 and 1976 with an underlying trend towards the abolition of established reserves in favour of productive or extractive activities (de la Maza, 1999). Indeed, by the end of the 1970s, the designation 'protected area' had become synonymous with expropriation and was perceived to be an imposition on landowners that led to potential conflicts over land use (CONANP, 2007).

During the presidency of Miguel de la Madrid (1982–1988), more emphasis was placed on environmental protection with the creation of the post of Minister of Urban Development and Ecology to take charge of protected areas which, at that date covered 1.5 million hectares (slightly over 0.5 per cent of the national territory). Due to their

promotion the protected areas increased to 1.5 per cent of the national territory under this administration (Challenger, 1998 in Castañeda Rincón, 2006). There was continued expansion of protected areas, which reached five per cent of national territory during the presidency of Carlos Salinas de Gortari (1988–1992) (Challenger, 1998 in Castañeda Rincón, 2006). However, the ensuing period – from the Ernesto Zedillo administration (1994–2000) to the present day – has been the most important, not just in terms of expansion, but also due to the consolidation of protected areas under the leadership of Julia Carabias Lilo. During the presidency of Vicente Fox Quesada (2000–2006), 31 additional protected areas were established, which increased coverage to 3 million hectares – equivalent to 10.2 per cent of the country with Ernesto Enkerlin Hoeflich at the head of the NCPA.

The most recent data on protected areas reports a further extension of approximately 174 million hectares, bringing the protected are to 12.92 per cent of the territory (CONANP, 2011). Figure 3.1 shows the distribution of protected areas within the different categories of Mexican legislation.

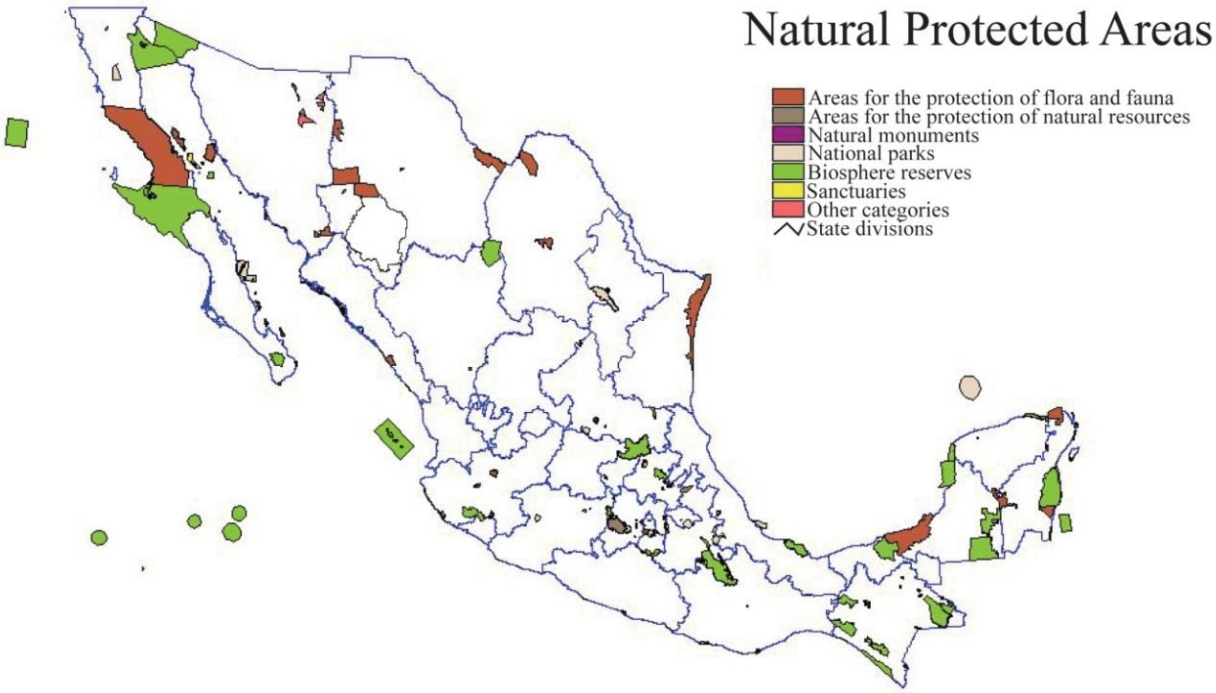



Figure 3.1 Distribution of natural protected areas in Mexico.
Source: Adapted from Yáñez Mondragón, 2007.

### 3.4.2 Protected areas legislation and policy

Natural protected areas are defined in Article 44 of the General Law of Ecological Equilibrium and Environmental Protection (DOF 2013: 32) as, "areas of the national territory and those where the nation has sovereignty and jurisdiction, where the original environments have not been altered significantly by human activity, or require to be preserved and restored". The Law establishes that owners of land within protected areas must assume the designations on the management plan.

The Purpose of Protected Areas, described in law include:

1) To preserve natural environments; different biogeographic and ecological areas, fragile ecosystems and their functions.
2) To safeguard genetic diversity to ensure the continuity of the evolutionary processes of biodiversity.
3) To ensure preservation and sustainable use of ecosystems, its elements and its functions
4) To provide spaces for research of biodiversity and their equilibrium.
5) To generate, rescue and diffuse knowledge, practices and technologies. (traditional or new) to allow preservation and sustainable use of biodiversity.
6) To protect communities, roads, industrial infrastructure, and agricultural areas by creating forest areas where hydrological services safeguard these projects.
7) To protect natural surroundings of historical, artistic and archaeological sites and natural areas with cultural importance, recreational or touristic importance or that pose importance for the identity of indigenous peoples.

The variations and categories of the protected areas in Mexico do not follow all IUCN categories. According to the General Law of Ecological Equilibrium and Environmental Protection (DOF, 2013) national classification of protected areas includes:

1. Biosphere Reserves
2. National Parks
3. Natural Monuments
4. Areas for the protection of the natural resources
5. Areas for the protection of flora and fauna
6. Sanctuaries

7. State and municipal areas established under that state or municipal legislation.
8. Voluntary areas of conservation.

Natural protected areas have been administrated by different governmental departments and ministries which have changed with each new presidential administration in the twentieth century due to the absence of a long term protocol for the management of the environmental sector (CONANP, 2007).

Institutional changes experienced in Mexico in the last twenty years resulting in the creation of the MENRF in 1994, meant that the natural protected area began to grow in importance, a momentum that culminated in the creation of the National Commission on Protected Areas (NCPA) in 2000 (SEMARNAT, 2000a).

There was an escalation in the establishment of reserves – particularly from 1934 until the beginning of 1990s. Most were considered to be protected areas on paper only as they had been established without a management plan or the services of a dedicated team of administrative personnel on account of minimal or non-existent budgets for their operation (Rivera & Muñoz, 2006). Since 1994, with institutional changes, great effort has been made to ensure that all natural protected areas have an uninterrupted supply of operational resources (SEMARNAT, 2009). Commitment to improve the potential of protected areas to conserve biodiversity has been such that by 2000, 88 per cent of them at least had some dedicated personnel on site (SEMARNAT, 2000a).

Accordingly, the NCPA strategic programme mission statement is, “to conserve the natural patrimony of Mexico through natural protected areas and other modalities of conservation, promoting a conservation culture and the sustainable development of the local communities within them” (SEMARNAT & CONANAP, 2007: 3). This announcement at the beginning of the 21$^{st}$ century certainly marks a departure from the conventional vision of conservation towards one that explicitly aims to combine conservation with local development. This is consistent with Article 47 of the General Law of Ecological Equilibrium and Environmental Protection where the establishment and management of natural protected areas emphasises local participation and contains the elements present in the integrated conservation narrative,

Evidence of the weight accorded to this conservation strategy may be seen in the budget allocation for the sector, which increased from 11 million pesos (equivalent to approximately US$838,974) in 1995 to 1,108 million of pesos (equivalent to approximately US$84,507) by 2009. Figure 3.2 illustrates this cumulative increase in expenditure.

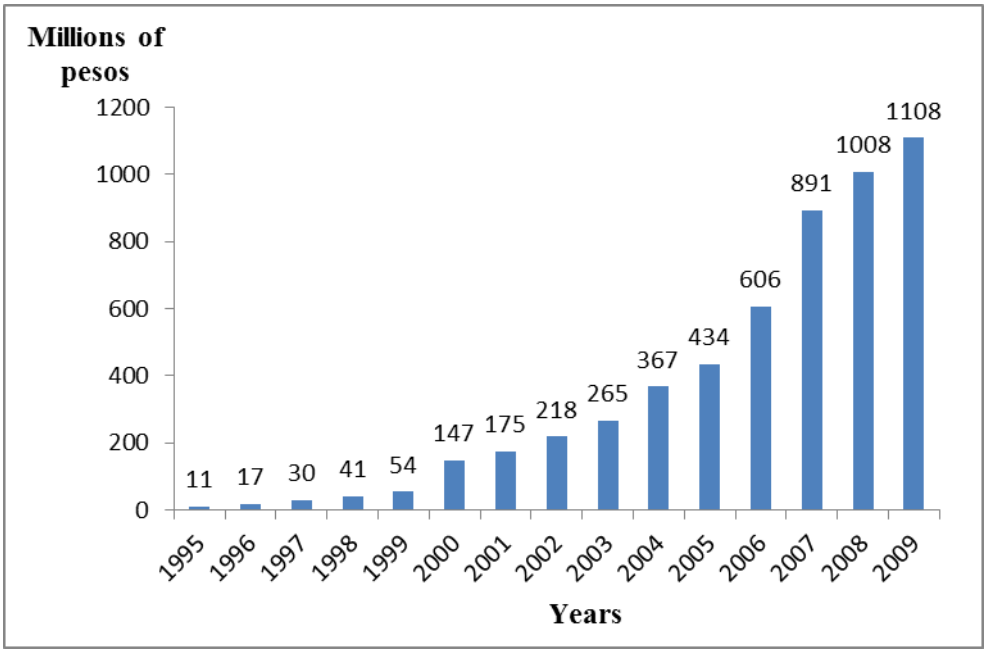



Figure 3.2 Budget allocated to natural protected areas in Mexico between 1995 and 2009. Source: CONANP, 2010.

More importantly, the 2000-2006 strategy of protected areas made a significant contribution to the consolidation of existing reserves; not only by increasing the extension of protected areas in the country, but more importantly, by strengthening their management capacity. By the end of this period, 58 per cent of protected areas (totalling 10.98 million hectares) had been provided with a published management plan (CONANP, 2006c).

Despite important steps to consolidate an integrated approach to conservation in Mexico since the 1990's, serious critiques, regarding changes on administration or approaches, claim that polices are only a discursive matter given that natural protected areas in practice are an inefficient strategy with poor planning. Low budgets and limited social inclusion makes it difficult to conserve not only biological diversity but also social diversity (Colmenero & Bravo, 1996; Flores Villela, 2004; Azuela & Mussetta, 2009;

Fenner Sánchez. 2011). Examples of this include the National Park *Tepozteco* and Biosphere Reserve *Montes Azules* where social conflicts experienced are detriment to conservation projects (Colmenero & Bravo, 1996; Flores Villela, 2004; Azuela & Mussetta, 2009 & Fenner Sánchez. 2011). This is reinforced by records of experiences in National Parks *El Chico* and *Desierto de los Leones*, that cite how deforestation for wood extraction and invasions ignore any conservation status, or *Canon del Sumidero* who speaks of the building of large dam buildings that ignore the integrated policy of protected areas, and evidence the low priority that conservation policies have in comparison with other development policies (Flores Villela, 2004).

In the last statistics published in 2009, 12.3 million hectares representing over 51 per cent of the territory under protection had a formulated a management plan and administrative infrastructure (SEMARNAT, 2009). Efforts to monitor emblematic species have also been supported recently as part of reserve management activities. In 2002, only 2 protected areas were monitoring emblematic species, by 2008, 33 were carrying out systematic monitoring of biodiversity (CONANP, 2009b). However, although these numbers evidence important steps in the consolidation of Mexico's protected areas, the number of areas monitoring species are still a minority. Almost 50% of the areas are without a working management plan. Consistent methodology, funding restraints, reduced personnel and social inclusion still pose great challenges for all in the implementing and strengthening of management capacity.

### 3.4.2 Biosphere reserves in Mexico

Since the Mexican social context was marked by the presence of local communities within the protected ecosystem (Gómez-Pompa & Kaus, 1999), the protected area model adopted from the USA – which had a recreational focus and aimed at preserving areas of wilderness – did not prove to be the most appropriate for successful implementation. Thus, the rise of the biosphere reserve concept – which combined the protection of nature and scientific research, with local development and environmental education (UNESCO, 1996) – represented a more appealing model for the Mexican context. Biosphere reserves were developed by UNESCO at the end of 1974 (UNESCO, 1996), and the first such projects in Mexico were established in 1977 in *Mapimí* and *Michilía* in the North, followed in 1978 by *Montes Azules* in the South (Alcérrega

Aguirre, Consejo Dueñas, Flores Villela, Gutiérrez Carbonel et al, 1988). However, implementation of biosphere reserves was still not a simple task. Social conflicts emerged around relocation of indigenous communities for the protection of *Montes Azules* in Chiapas. This conflict, attracted the attention of the international community and promulgated discussions over restricted access to forests (Azuela & Mussetta, 2009). The lack of social studies or a strategy for engaging local participation before designating *Montes Azules* as a protected area in 1978, which included the *Lacandon* rainforest that was returned to indigenous families by agrarian reform in 1972, created social reaction where conservation was seen as a new political excuse to restrict local access to forest (Colmenero & Bravo, 1996; Castells, 1999 in Azuela & Mussetta, 2009).

Therefore, more focus was given to local development in biosphere reserves policies. Article 48 on the General Law of Ecological Equilibrium and Environmental Protection relates specifically to biosphere reserves and the regulation to allow local development (DOF, 2013). Biosphere reserves 'constitute relevant biogeographic areas at national level, are representatives of one or more anthropogenic significantly unaltered ecosystems where restoration and preservation is required and where representative species of national biodiversity inhabit including endemic, threatened or in danger of extinction' (DOF 2013:37). 'Nuclear' zones are to be used only for preservation of biodiversity activities and environmental education. Any use of resources that have an impact on the ecosystems are forbidden. 'Buffer' areas in biosphere reserves, are those where productive activities will be allowed, but only by local communities that inhabit them at the time of their declaration. Productive activities will be restricted to allow only those compatible with the objectives and criteria of sustainable use according to the management plan, and any ecological land use if applicable. The protected areas can contain any kind of property right (DOF, 2013).

Biosphere reserves constitute an important model, and are believed to be the solution to providing sustainable land use in parallel with conservation in Mexico's protected areas (Gómez-Pompa & Kaus, 1999). In terms of the social dimension, it may be noted that by 1995, protected areas housed a population of 1,900,000 people distributed throughout some 2,000 communities; most of which were in biosphere reserves and subject to a high degree of marginalisation (SEMARNAT, 2000a). Figure 3.3 shows the

extent of biosphere reserve cover in 2011 in comparison to other categories of protected area.

| Category of protected area | Number of protected areas | Percentage of national territory |
|---|---|---|
| Biosphere reserve | 41 | 6.44 |
| National park | 67 | 0.75 |
| Natural monument | 5 | 0.01 |
| Area for the protection of natural resources | 8 | 2.26 |
| Area for the protection of flora and fauna | 35 | 3.38 |
| Sanctuary | 18 | 0.07 |
| Total | 174 | **12.92** |

Figure 3.3 Categories of protected area and their distribution in Mexico.
Source: CONANP, 2011.

In accordance with the vision of biosphere reserves, the National Advisory Council for Protected Areas developed a new concept of environmental conservation whereby, in addition to a focus on biodiversity, there was an underlying objective to provide opportunities for local development in which local participation was essential (CONANP, 2006). Consistent with this vision, the NCPA strategic programme (2006–2012) consists of elements that direct the environmental debate along the lines of integrated conservation (CONANP, 2006c; SEMARNAT & CONANP, 2007), as discussed in this thesis.

In order to implement social participation, the Programme for Rural Sustainable Development (PRSD) was established to fund community initiatives, with the aim of embracing local populations as important actors in conservation and promoting their participation. Projects funded by this program include, plant nurseries, viability studies for sustainable productive activities, soil restoration projects, eco-tourism infrastructure, aquaculture projects and trainee programmes for those involved in local organisations.

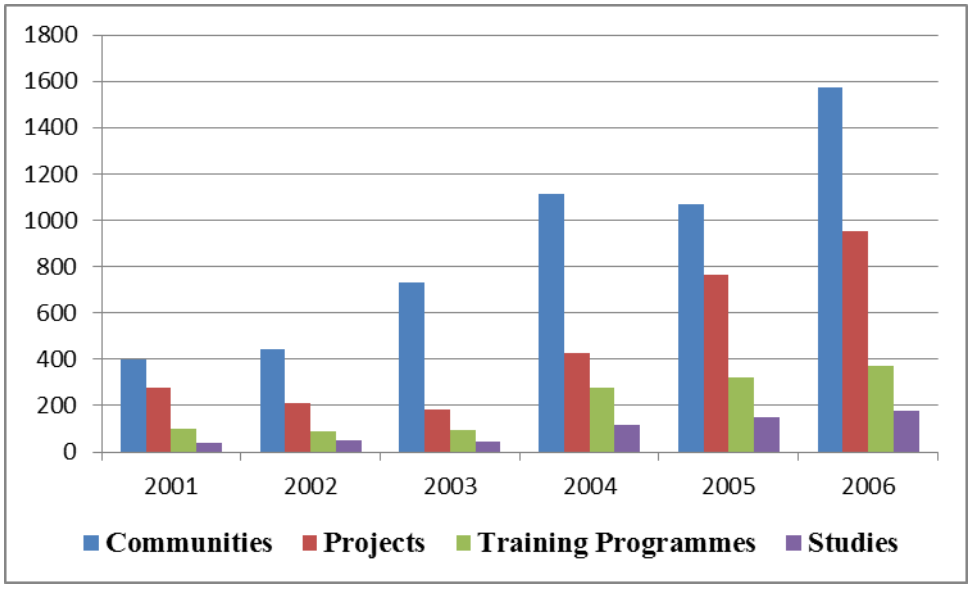



Figure 3.4 Communities and projects supported by PRSD (2001–2006).
Source: CONANP, 2012.

PRSD funding increased from 5 protected areas in 2001 to 78 in 2006. Figure 3.4 shows the increase and distribution of initiatives funded by PRSD between 2001 and 2006 (CONANP, 2012). Programme resources increased by 42 per cent from 2004 to 2006, rising to 100 million pesos (equivalent to approximately US$7,627,474) (CONANP, 2012). During the 2001-2006 administration, investment in PDRS continued to grow from 473 programmes supported in 2001 to support for 5,663 projects in 2009 (CONANP, 2010).

The Programme for Temporary Employment (PTE) was another instrument specifically designed to promote an integrated approach that aimed to provide short-term jobs in development, such as the restoration and construction of infrastructure for conservation programmes. As Figure 3.5 shows, from 2001 to 2009, the PTE budget increased from 6,435 thousand Mexican pesos (equivalent to approximately US$490,800) to 100,009 thousand of Mexican pesos (equivalent to US$ 7,627,000). This funding was invested in 79 separate protected areas (CONANP, 2009).

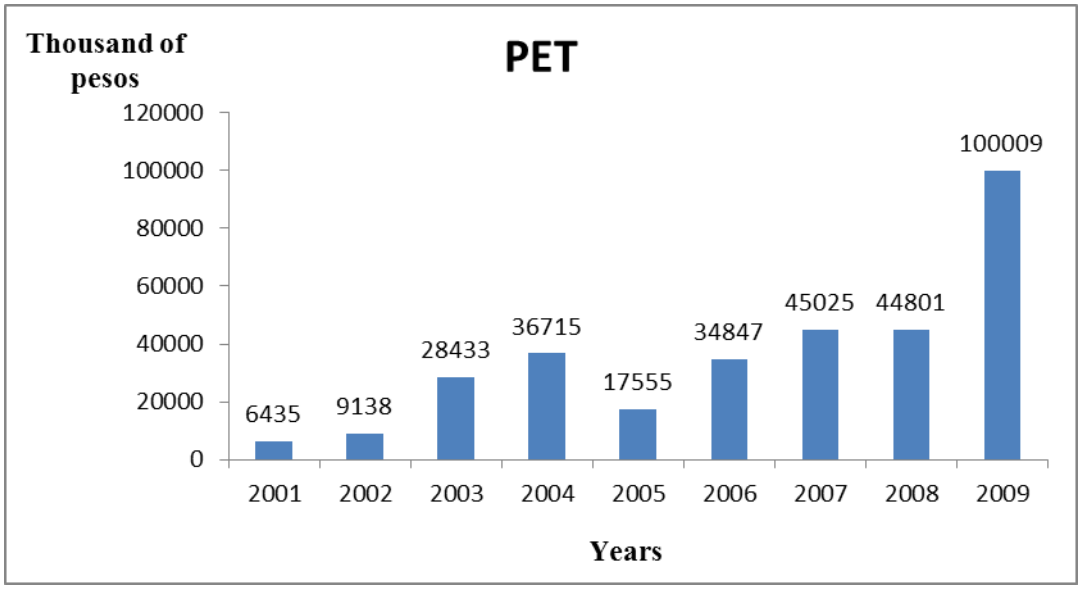



Figure 3.5 Investments in PTE from 2001 to 2009 in Mexican protected areas.
Source: CONANP, 2010.

Besides official reports recording the evolution of protected areas in recent decades, the contributions of social and academic organisations in influencing and shaping this vision should not be overlooked. The assistance of NGOs and academic institutions has been instrumental in the implementation of biosphere reserves (Alcérrega Aguirre, Consejo Dueñas, Flores Villela, Gutiérrez Carbonel et al., 1988). Examples of such support include non-governmental input into projects in *Amigos de Sian Kaan*, *Pronatura Península de Yucatán*, *Biocenosis*, and *Ninos y Crias* (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998; Alcérrega Aguirre, Consejo Dueñas, Flores Villela, Gutiérrez Carbonel et al., 1988; INE & SEMARNAP, 1999; SEMARNAP, 2000). International funding has also been vital for the Mexican protected areas, which received approximately US$133 million from 1992 to 2007 – from GEF resources (Yáñez Mondragón, 2007).

Studies carried out in Mexico by Figueroa and Sánchez-Cordero (2008) between 1993 and 2002 to assess the contributions of protected areas – biosphere reserves in particular – found that natural protected areas had prevented changes in land use and cover in 50 per cent of cases analysed, compared to land use change and deforestation in other regions.

## 3.5 Challenges to biodiversity conservation

### 3.5.1 Awareness and monitoring of biodiversity

An awareness of the state of biodiversity is the first step towards the conservation and sustainable management of natural resources but this is still a challenge in many respects. For example, the need for national forestry statistics was repeatedly pointed out during early stages of conservation policy (de Quevedo, 1923; Beltrán, 1964). Moreover, due to a lack of consistent data and also to the historical absence of an established comparable methodology, short-term information on forest coverage is wildly variable. Deforestation rates, for example, have been cited as anything between 329,000, 370,000 and 1,500 million hectares per year (Dirzo & Miranda 1996; Velázquez, Mas, Díaz-Gallegos, Mayorga-Saucedo et al., 2001). The National Inventory of Forest and Land estimates Mexico's total vegetation cover to be approximately 139.7 million hectares (CONAFOR, 2009). Lack of cohesion in methodology provides disparate results and makes comparison difficult.

Biodiversity information within a comprehensive framework that could be compared to observe patterns of progress towards effective analysis was the purpose of the System of Information, Monitoring and Assessment for Conservation (SIMAC) developed in 2004. It was only with the implementation of this mechanism that Mexico's natural protected areas began to share a standard planning and evaluation system (CONANP, 2006a).

### 3.5.2 Wildlife depletion

In terms of the exploitation of the natural environment, it has been argued that although subsistence hunting represents an important livelihood for local and indigenous communities, this activity has been the single biggest cause of the decline in wildlife populations since the 1950s (López & López, 1911 in Leopold, 1959). Nevertheless, in some rural Mexican communities, produce from hunting represents an essential dietary source, where it is estimated to provide approximately 70 per cent of protein ingested (Loa Loza, Cervantes Ábrego, Durand Smith & Peña Jiménez, 1998). Such dependence on subsistence hunting for dietary requirements is shared by other local communities in Central and South America (Redford & Robinson, 1997).

Recreational hunting in Mexico is considered to have less impact on wildlife (Leopold 1959; Loa Loza, Cervantes Ábrego, Durand Smith & Peña Jiménez, 1998). However, the severe depletion of certain species to a level at which they are considered to be locally extinct is associated with the sport, examples of affected fauna being bighorn, tapir and Desert Mule Deer (Leopold, 1959). The commercial exploitation of wildlife was declared illegal with the General Game Law of 1952, but due to a traditional hunting culture, it was a long time before there was any noticeable decline in trade (Leopold, 1959; Redford & Robinson, 1997).

The 1951 Law on Hunting (SEMARNAP, 1997) failed to adequately control the pursuit because, although it required publication of the various hunting seasons, it made no provision to regulate the different types of managed game park nor the trade in any species, which had the effect of giving free rein to the lucrative market in illegal hunting (Leopold, 1959). For example, Aranda's (1997) study from 1985 to 1987 found that there was still a high demand for the skins of big cats and bush meat in the region of Chiapas. Other vulnerable species are fauna such as parrot and tarantula, and flora such as orchid and palm (INE & SEMARNAP, 2000b; Reuter, 2009). Notwithstanding laudable efforts to protect wildlife, the MENR (2008) cites the traffic in various endangered species, and the associated industries, as the third most serious illegal activity worldwide.

Further challenges faced by Mexico are associated with biotechnology projects that put the sustainable management of genetic resources at risk and/or favour the piracy of traditional knowledge. In 2010, the Commission for Environmental Co-operation of North America (CEC, 2004) confirmed the suspicion that maize of Mexican origin had been damaged by pollution, which could have adverse consequences for local communities and biodiversity conservation alike.

Evidence based on deforestation figures shows that habitat loss far from having been extensively arrested has actually accelerated since the 1970s, a situation that is due in the main to changes in land use (Toledo, 1997).

Overall, despite efforts towards an integrated conservation approach, implementation has often failed to provide the expected results in many biosphere reserves, an outcome

that is largely due to unresolved challenges to the accommodation of conservation in a context of multiple local needs (Gómez-Pompa & Kaus, 1999).

Moreover, the construction of roads and motorways – even in areas already designated as protected – represents a significant threat to wildlife on account of the disturbance to the ecosystem, the isolation of the remaining small patches of habitat and the high degree of associated road kill (Primack, Rozzi, Freinsinger, Dirzo & Miranda, 1998). As an indication of the seriousness of the problem, it may be noted that between 1997 and 2007, Mexican road infrastructure was extended from 303,000 km to 360,000 km (SEMARNAT, 2008).

The system of protected areas in Mexico is being critiqued and considered to be inadequate for the protection of the country's biodiversity, as it fails to include 32 per cent of its endemic species and 48 per cent of the globally threatened species that it hosts (Brandon, Gorenflo, Rodrigues & Waller, 2005).

Therefore, the extension of protected areas needs to be increased in order to include a comprehensive system of biodiversity conservation (Brandon, Gorenflo, Rodrigues & Waller, 2005; Ceballos, Rodríguez & Medellín, 1998). They should be situated in regions of high concentrations of endangered and endemic species; the implementation of which represents a considerable challenge, as there is only a weak positive correlation between areas of high biodiversity and those of high endemicity in Mexico (Ceballos, Rodríguez & Medellín, 1998). In particular, more effort must be put into the establishment of coastal and aquatic ecosystems, as it is estimated that 77 per cent of protected areas are land-based, with only 23 per cent representing marine systems (CONANP, 2006).

### 3.6 Conclusion

This chapter has provided a detailed background to the historical context that has shaped Mexico's general innovations in environmental policy, its protected area policy in particular, and the actions that have resulted in the current direction of the national conservation strategy. It has characterised the different stages of the country's history that have affected the evolution of the conservation narrative, identifying a failure to

consider environmental principles at initial stages of national development where the pursuit of industrialisation and the development of railroads and mines meant economic gains in a context where development was assessed solely by financial gain at the expense of overexploitation of nature. A vision focused on production was reflected in constitutional changes that allowed for expropriation of unused land, dispossessing indigenous people from access to their patrimony land, creating more poverty and more environmental degradation by land use changes with poor regulation on forest management. The growth of social inequality under these conditions ignited claims for justice and fuelled a Mexican revolution in 1910. Post-revolutionary changes on property rights, including the creation of *ejido*, a communal system for land use, were discussed in the context of access to forest and development of local communities.

Initial reactions to the agrarian reform and a 1926 Forest Law included a "paternalistic stage.' identified by policy that, having returned forest land to peasants, and placing on *ejidos* the responsibility for forest destructions, was considered a threat to biodiversity. Claims that only experts could make responsible use of the forest moved to a 'restrictive stage' reflected in the 1940 Forest Law, where policies to access land by *ejidos* were denied in practical terms, focusing on educational programs to sensitise peasants about the importance of forest. *Ejidos* received only 'rent' benefits for their land from external companies who were allowed to extract wood and obtain large benefits. Expertise of the scientific community and capital from private companies was not, however, sufficient to stop the trends of deforestation. Poor regulations on forest management caused such high levels of destruction that, by the end of the 1950's, government had to establish a closure policy. As a consequence of this policy limitations for *ejidos* to access forest exacerbated poverty. A 'production stage' was to change the land use for agricultural and livestock production in order to allow access to land and local development. Programmes to deforest land in order to establish agricultural uses were subsidised. Reaction voices in the 1960s claimed that regulation of access, rather than restriction or change of land use, should be the strategy, as vast forest vocation areas could generate more economic benefits than agriculture if the forest was managed sustainably. However, given the limited role that local communities had in accessing forest and a policy atmosphere, where the general belief was that forest management was beyond local capacities, agricultural expansion prevailed. This vision increased and peaked with the 'green revolution stage' from the 1970s when, despite a growth in production, the

high input requirements for agricultural production resulted in a non-viable long term production model for *ejidos*. International policies supported subsidies that favored livestock production. Nevertheless, the widespread use of monocultures and cattle production did not favor local development. Eighty eight percent of livestock production was concentrated in private land and only 12% in *ejidos*. The reproduction of a USA model of extensive cattle farming practices, and the rapid extension of productive area during this stage, exacerbated environmental degradation and created pollution of soil and water. A new stage of 'community allowance' is documented in the 1980's when an economic crisis in the country and a reduction of social programs meant that local communities returned to the land to grow food crops for self-consumption. Under this context, the first allowance to *ejidos* to access the forest for non-timber extraction was granted. Low economic success was recorded within a context of liberalisation of the market, in which local communities did not have the same protected markets as private companies had enjoyed when massive extraction occurred during previous stages. However, allowing community access for non-timber extraction projects revealed that local management could contribute to fire prevention and the control of illegal logging through effective local mechanisms. Safeguarding of their own land proved to be more effective in practice than any external paper programme designated. The 1986 amendments on Forest Law gave the right to local communities to access forest with a management plan, and community based entrepreneurs were developed. An 'ethnoecology stage' from the mid 1980's advocated a new paradigm focused on recovering local knowledge and integrating forest management with other productive policies such as agriculture, aquaculture and livestock production. This vision claimed that predominance of an imported technological model from industrialised countries based on low ecological diversity is a major root of environmental degradation and marginalisation of local development. The integrative vision that this stage pursues has important influence for the integrated conservation approach that is the focus of this research.

The emergence of a modern vision of conservation that has grown in parallel with efforts to protect biodiversity by means of an integrated approach has been described identifying those elements from these ideas that have been incorporated into the conservation discourse. The institutional advances for conservation in protected areas, as described, show a growth trend in both the extension and effort to administrate them.

The consolidation of an environmental framework in the 1990's aimed towards an integrated approach in protected areas is described, identifying the main implementation critiques to these changes.

In spite of recent increases, funding for conservation is still limited and subject to tight financial restrictions compared with the agricultural development budgets (Merino & Segura, 2002). At a grassroots level this means that, although natural protected areas might be planned according to the principles of sustainable development, the pragmatic management of natural resources has often been insufficient to redress the negative impact of the growth of local communities, and voices and examples of social discontent in protected areas remained.

The practical links between conservation and local development are further explored in the remainder of the thesis through the analysis of two case studies of natural protected areas in the south of Mexico. These case studies will assess the extent to which the aims and objectives of the integrated conservation narrative in Mexico are being successfully pursued in the two selected reserves with the aim also of identifying how the aims and objectives might better be achieved.

# CHAPTER FOUR: "RESEARCH DESIGN"

## 4.1 Integrated Conservation Assessment: Aims and context

Two case studies were carried out in the south east of Mexico to analyse the implementation of integrated conservation in protected areas. The Integrated Conservation Assessment (ICA) adopted to assess the two case studies includes two main methods: Participatory Impact Assessment (PIA) adopted from Catley and collaborators (2008), and the Livelihood Impact Assessment (LIA) by Ashley & Hussein (2000) both of which are modified to adapt to the local context of this research. Aspects incorporated from the LIA focus on different dimensions of wellbeing attributed to local livelihoods, including; access to assets, influence on policies, food security, marginalisation, vulnerability (Ashley & Hussein 2000). Aspects incorporated from the PIA (Catley, Abebe & Suji, 2008)2008) are used to further analyse the cost and benefits transfer to local communities as a consequence of implementing conservation policies.

The objective of the ICA is to provide information on four main points:

5. Understanding the diverse livelihoods of the local stakeholders within the protected areas and the contributions / impacts of the livelihoods on the environment (direct or indirect).
6. Identifying the changes that local communities have experienced as a consequence of the establishment of the protected area,
7. Identifying which of the changes identified are attributable to the protected area policies and how those transformations affect their quality of life.
8. Understanding how different stakeholders participate with the biosphere reserve management.

The research design is developed from a literature review and the prior specialist knowledge of the researcher from her work in both of these locations. This knowledge includes previous involvement with a local NGO which focused on empowering young adults to promote local participation in conservation and foster sustainable livelihoods entrepreneurs for a period of three years. This local NGO was founded by the researcher before enrolling as a PhD student. Within this NGO role the researcher instigated

participative research with the local community in the areas of study. The researcher also took part in the advisory body of the protected areas, representing the NGO and was acquainted with community leaders and the managers of the reserve agency.

In the first stage of the research, the researcher contacted the agency of the selected biosphere reserves from the United Kingdom via e-mail with the purpose of informing the agencies about the research and to request support for the collection of data. Given the interest received from this request, the researcher commenced her study and spent one year in self-funded fieldwork.

Fieldwork for data collection was carried out between September 2006 and August 2007. Having already established relationships with the leaders of the community and shared languages (both Spanish and limited Mayan) resulted in effective communication flow. Members of the community were invited to participate in the research in the initial fieldtrip in 2006 with the purpose of identifying local stakeholders. During the first contact with local informants the researcher explained the aims and clarified the limits of the research and the role of the researcher in this study.

### 4.2 Selection of study areas

Comparative case studies are considered a research method that may be employed both pragmatically and theoretically in contributing to the scientific debate on conservation and local development (Stake, 1983 in Patton, 1990) and one that has been widely used by international development agencies for assessment purposes (Axinn and & Pearce, 2006; Flick, 2002; Patton, 1990; Sapsford & Jupp, 2006: Newing; 2011). Therefore, with the purpose of examining the levels of integrated conservation in protected areas, this study selected two biosphere reserves in Mexico as case studies: Ria Lagartos and Ria Celestun.

These reserves are located on the extremes of the Yucatan State coast, in the southeast of the country. Both reserves are important termination points for the underground hydrological system characteristic of the Yucatan. For that reason , the estuarine rivers of Ria Lagartos in the east and Ria Celestun in the west of the Yucatan sustain a significant amount of biodiversity including plants, migratory and resident birds,

mammals, endemic species and varied ecosystems particular to the Yucatan Peninsula. Nonetheless, the coastal landscape of the Yucatan, has undergone dramatic anthropogenic changes such as; port construction, industrial fishing infrastructure development, motorways construction, beach erosion, holiday home expansion, tourism related construction and other changes that have severely affected the survival of the coastal and estuarine environments on which Yucatan marine and terrestrial wildlife rely. Within this context, Ria Celestun and Ria Lagartos offer some of the best preserved coastal habitats in the coastal corridor of Yucatan where flag species of conservation find unique sites for feeding and breeding (INE & SEMARNAP, 1999; Herrera-Silveira & Comin, 2000; SEMARNAT, 2000b).

The social significance of the Yucatan Peninsula is based on the cultural legacy of a local population descendant from the Mayan civilization; and its economic importance derives from the commercial activities that have acted as points of attraction for rural migrants, mainly due to the fishing prospects as both areas contain major estuarine rivers that sustain commercial fishing activities.

A particular reason for focusing on Ria Lagartos and Ria Celestun is because both biosphere reserves offer sociologically varied and comparative features for research. For example, the residents of Ria Lagartos are well known for their high degree of social organisation when it comes to conservation initiatives, particularly in San Felipe where local fishermen adopted conservational practices well before the area came to the attention of the outside world in terms of the protection of wildlife (Chuenpagdee, Fraga & Euán-Ávila, 2001; Fraga, Gavaldón & Echeverría, 2004; Euán-Ávila, Fraga-Berdugo, Salas-Marquez, Robledo-Ramírez et al., 2006). In comparison, Ria Celestun is characterised by its lack of participation in environmental protection schemes and a high degree of pollution. Groups in Ria Celestun have publicly expressed disregard for and vowed not to conform to certain conservation policies (Parkswatch, 2002; Córdoba-y-Ordóñez, Fuentes, Córdoba-Azcarate & Ayala-Arcipreste, 2004). Nevertheless, the overlapping aspects of environmental protection within the context of a biosphere reserve and the local development of culturally important communities ensure that these two protected areas make ideal case studies for the comparative examination of efforts to implement an integrated conservation approach.

### 4.3 Data collection

The Integrated Conservation Assessment (ICA) designed for this research incorporates mixed methods for data collection (Axinn & Pearce, 2006; Flick, 2002; Patton, 1990) based on qualitative inquiry (Catley, Burns, Abebe & Suji, 2008) these are applied to local stakeholders, park rangers and officials of agencies associated with the biosphere reserves. For ethical reasons the information collected was kept anonymous which allowed the informants to share points of view and experiences in a confidential atmosphere.

The different methods utilised followed a patterned sequence as the information collected from one, complemented the design of the next information gathering process. Data collected from external community actors was drawn upon to obtain a balanced impression of integrated conservation within the research areas that in turn complemented and expanded upon the perceptions of local community groups. Data collection techniques include; participant observation, informal interviews, user group's meetings, structured interviews and semi- structured interviews (Axinn & Pearce, 2006; Flick, 2002; Patton, 1990; Newing, 2011). Given the varying dispositions of the informants, the most appropriate data collection technique differed from instance to instance, requiring customisation according to the specific source.

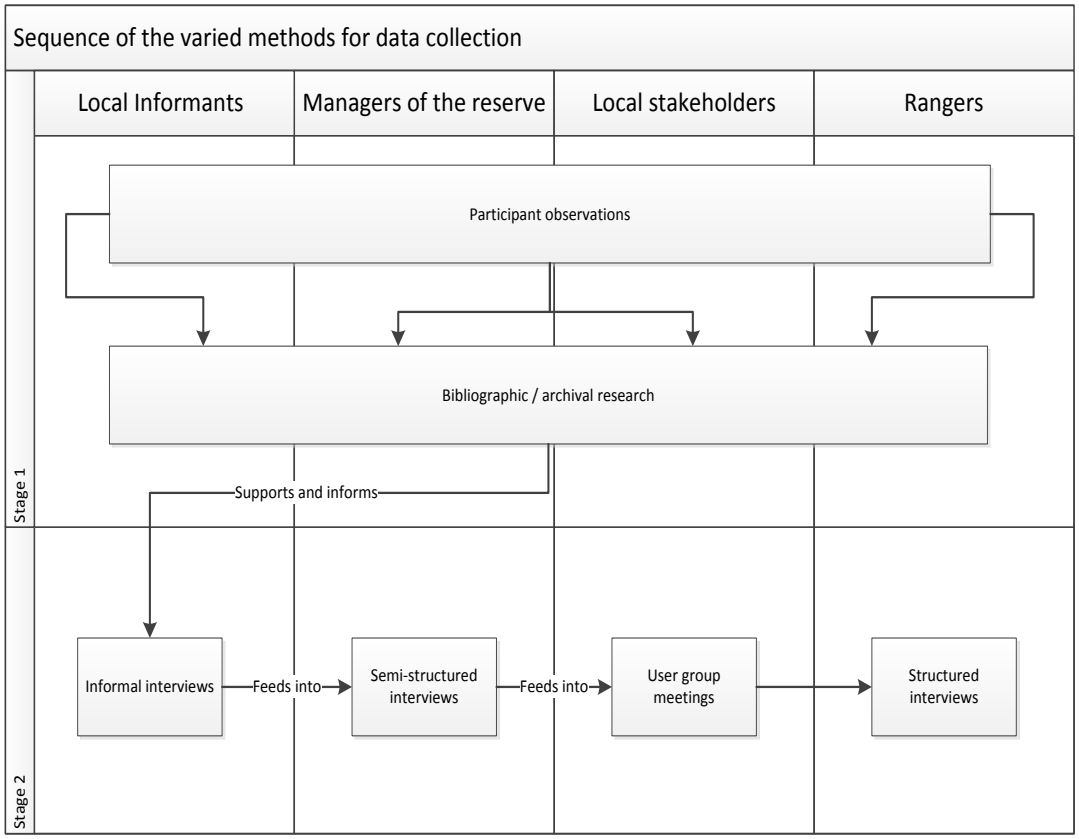



Figure 4.1Sequence of the use of varied methods for data collection. Source: The author.

### 4.3.1 The informal interviews

The first set of interviews conducted in the local communities was with key informants aware and interested in the protected area, and with respectable older people of the community. Varied stakeholders pointed out the respected elders of their communities and open-ended interviews were carried out with the purpose of collecting background information on the communities studied and the major social and ecological changes perceived by the elders since schemes of protection were implemented in the area. Although the main target for informal interviews was the local community, a few other informal interviews were carried out with key informants external to the local communities, such as representatives of NGOs or centres with working experience in the protected areas of study and from where archival or bibliographic information was requested (a list of centres are included in the bibliographic research section 4.3.6).

The main objectives of the informal interviews were:

1. To obtain knowledge of the history of conservation in the area by collecting descriptive narratives of the ecosystems from 50 years ago, before there was a conservation agenda.
2. To obtain information on the structure and organisation of the community and the cultural aspects of life 50 years ago.
3. To identify the major changes in the community and surrounding ecosystems attributable to the establishment of protected area regimes.

### 4.3.2 Characteristics of the informants

The informants were elderly fisherman, between 78 and 94 years old who used to participate in community groups such as board members of fisheries cooperatives, heads of an '*ejido*', or performed leading roles in local government, or were external members of the community with important experience and knowledge in the communities and area of study. Appendix 7 contains the format for the informal interviews.

### 4.3.3 The semi-structured interviews

Semi-structured interviews (Flick, 2002) were conducted to collect data from official managers of each protected area, with the objective of interpreting the managers' perceptions of how protected area policies were designed to integrate conservation with local development. They also included questions that sought to identify relationships with other development policies. The format of the interviews consisted of six main subjects; the historical context, the management of the protected area, social costs and benefits, cultural and social development, participation and monitoring. Data collected from these interviews fed into the user group meetings to determine indicators of assessment and political narratives to enquire into further at a local level.

A total of ninety questions were clustered under subject sections. Rather than structuring the interviews in a rigid 'question by question' format, the interview was conducted verbally allowing for the organic flow of topics whilst the lists of questions were used to prompt the respondent to ensure that all subjects were covered during the interview. Interview information was captured by audio-recording with prior consent from the informant and note taking. Each interview took place in the offices of the

NCPA in an arranged appointment and lasted for approximately one and a half hours. Appendix 8 contains the format for the semi-structured interview.

#### 4.3.3.1 Characteristics of the informants

Information was gathered from officials at the Government of Mexico's agency for conservation - the NCPA - whose offices were located in cities some distance from the protected areas under study. The profile of these informants included high-level environmental managers and planners, with an academic or technical background in conservation policies.

#### 4.3.3.2 Selection of informants

The following NCPA officials participated in the semi-structured interviews:

1. The National Director of Management for Conservation, based in Mexico City
2. The current director of Ria Lagartos, based in the city of Merida, Yucatan
3. The former director of Ria Lagartos, based in the city of Merida, Yucatan
4. The current director of Ria Celestun, based in the city of Merida, Yucatan
5. The former director of Ria Celestun, based in Campeche State
6. The director of the regional office for Yucatan Peninsula, based in the city of Cancun, Quintana Roo

### 4.3.4 The user group meetings

The purpose of the user group meetings was to collect qualitative information on the local perceptions of different social actors in each protected area in order to assess levels of integrated conservation. The format of the user group meetings included mixed methods of data collection (Axinn & Pearce, 2006; Flick, 2002; Patton, 1990) to foster discussion in varied topics. Qualitative enquiry was used by facilitating the meeting as a conversation across different subjects and ensuring that all key points were discussed by the informants. Open ended questions introduced a topic in the user group meetings followed by questionnaires where pre-defined answers (obtained from the results of the initial informal interviews with local informants and from the semi-structured interviews with officials of the agencies of conservation from each protected area of study) were included to compare opinions. Closed questions including; checklists which allowed for the possible expansion of more aspects; a differential scale for assessments;

rating and ranking scales (Newing 2011) were used for 'before' and 'after' comparisons and for assessing the frequency of engagement, and to target the assessment of certain variables such as social cost / benefits and participation. Local communities, addressed as sub-units of analysis, were studied by approaching the major stakeholders of each community. Forty four user group meetings were conducted in the communities of Ria Lagartos and Ria Celestun; which were attended by representatives of social organisations (usually board members), with up to five representatives at each one.

User group meetings were conducted in the following manner; face-to-face, held in a local space familiar to the stakeholder (either; their building, beach area where they gather to sell tours, or their homes), the researcher facilitated the involvement of the informants and all participants agreed with the answers selected; note taking was used to capture the minutes of the meeting and discussions to reach agreement and no audio recordings were made in order to promote a safe atmosphere and to encourage open discussion of the topics. User group meetings duration was up to two hours. Appendix 3 contains the user group meeting format.

The format for the meetings was made up of six sections presented in the following order:

| | |
|---|---|
| Section 1: | Livelihood profiles: uses of biodiversity |
| Section 2: | Level of local participation in conservation |
| Section 3: | Enforcement and implementation through institutions |
| Section 4: | Attribution of local benefits and costs from conservation policies and programmes |
| Section 5: | Social indicators of conservation of culture of local communities |
| Section 6: | Before and after the protected area programmes comparisons on the state of biodiversity and the access to specific natural resources |

In order to promote the free answering of questions related to the extractive uses of biodiversity and livelihoods, the first section addresses the frequency of engaging in certain activities such as; fishing in the river, fishing in the sea, hunting and other activities (regardless of whether the activity is forbidden or not by the reserve). As no conservation topics were addressed up to that point participants did not feel judged

about it. Further on, the meeting addressed levels of knowledge of the prohibited activities, which provided significant insights.

The decision to structure the questions in this manner was made after learning from informal interviews. Questions remained open-ended, regarding livelihood profiles (such as; how did you learn the activity? And do you want your children to do the same activities as you do?) rather than seeking to reach a consensus on that matter. This was intentional in order to understand general patterns about the activities continuing from generation to generation, to identify possible changes, and if changes were identified to analyse whether that change was attributable to the protected area status. Appendix 4 provides the format and further details of the user group meetings.

#### 4.3.4.1 Characteristics of informants

The user group meetings constituted members of local communities, such as leaders or representatives of organisations who were long-term residents of the study area, and who had experienced changes in the level of biodiversity through the regulation of access to natural resources arising from protected area policies. (Figure 4.1 shows the range of organisations targeted).

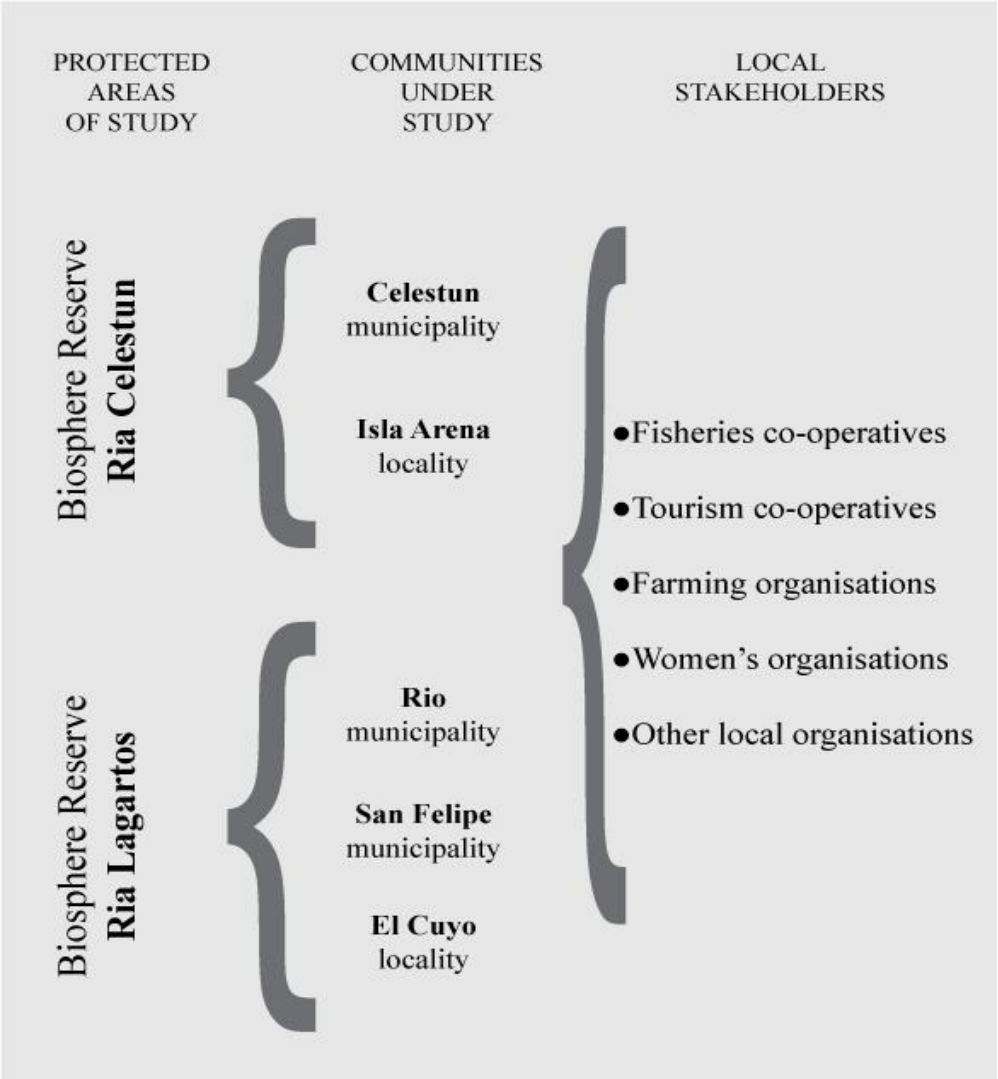



Figure 4.1 Profile of user groups of study and sublevels of analysis.

#### 4.3.4.2 Selection of informants

Homogeneous, purposeful samples (Patton, 1990) were selected at community level in order to conduct user group meetings with representatives of local organisations identified as stakeholders. This technique is based on the selection of information-rich cases to be examined in detail, as exemplified by co-operatives and various other local groups. Figure 4.2 specifies the number of user groups meetings conducted in each community.

| Biosphere Reserve Ria Lagartos | |
|---|---|
| Community | Local organisations |
| San Felipe | 11 |
| Rio | 8 |
| El Cuyo | 7 |
| Biosphere Reserve Ria Celestun | |
| Community | Local organisations |
| Celestun | 10 |
| Isla Arena | 8 |

Figure 4.2 Number of user groups meetings per community. Source: The author

### 4.3.5 The structured interviews

Questionnaires to be conducted with rangers were designed as a fourth component of the information gathering approach. The structure and content of the questionnaires was developed after information was gathered from the agencies of conservation and local stakeholders. The purpose of the questionnaires was to obtain further complementary information regarding particular indicators. The questionnaires included closed checklists in order to enquire further into specific aspects of local livelihoods and participation. Differential scales of assessments, rating and ranking scale techniques were included in the questionnaire (Newing 2011). Appendix 5 contains the format of the questionnaire designed for rangers.

The questionnaires include four main sections:

Section 1: Local participation and enforcement

Section 2: Livelihood diversification and institutional co-ordination

Section 3: Transfer of local benefits and costs from conservation policies and programmes

Section 4: Cultural indicators of the communities within the biosphere reserve

Section 5: Before and after the establishment of the biosphere reserve comparisons on the state of the biodiversity.

#### 4.3.5.1 Characteristics of informants

Rangers gain practical, first-hand knowledge of the state of protected areas' natural resources through observation while on patrol. Although they represent the conservation agencies, their frequent and continual interaction with communities (some are local people) means that they constitute an important link between local stakeholders and central conservation management.

#### 4.3.5.2 Selection of informants

Informants comprised three existing Ria Lagartos rangers who were individually interviewed at field stations of Rio and El Cuyo and two existing Ria Celestun rangers based at Celestun field station. Appendix 6 gives details of rangers' profiles and the dates of interviews. Names have been withheld.

### 4.3.6 Participant observation

Participant observation is a social research method used in conservation studies to document interactions between local communities and the conservation agency (Newing, 2011). One year of fieldwork was required to reach the diverse informants who were located in varied local communities and distant cities. The majority of time spent on fieldwork was in local communities where the researcher lived for extended periods of time staying at homes with local communities of San Felipe, El Cuyo and Rio Lagartos. The time spent in the villages offered opportunities for participant observation and informal interviews where data and notes were kept in a fieldwork diary. This included joining in their routines, sleeping in hammocks, cooking and eating

with the local community. The main target of observation was their livelihood activities, attendance at meetings which promoted participation and rangers patrols. Participant observation with local stakeholder's included joining in fishing trips, farming, filleting, eco-tourism, mangrove restoration, local monitoring and wildlife production. Participant observation with rangers was carried out by staying at the El Cuyo ranger station and joining ranger patrols in the buffer and nucleus areas of Ria Lagartos. Managers of the agency were observed in meetings of the advisory council of the reserve.

### 4.3.7 Bibliographic research

In order to obtain contextual information on the area under study (including information on communities and biodiversity) bibliographic research was conducted as an initial stage of the fieldwork in order to inform the design of interviews. The most important sources of bibliographic data include a literature review of resources at local libraries, a trip to research national literature in Mexico City at the archives of the Commission on Biodiversity and the National Autonomous University of Mexico and National Commission of Protected Areas, among other centres. At the local level, the literature review also included previous research and conservation projects in the study area; archival examination of conservation agency annual reports from each protected area and a review of conservation organisation documents. Indicators from bibliographic research were included in initial informal interviews to identify common costs and benefits of the protected areas.

## 4.4 Data processing

Qualitative analysis was the main technique of data processing. The transcribing of the material from different informant sources using different methods was aimed at understanding important changes that the communities have experienced or observed in the ecosystems since the implementation of the protected areas, identifying social patterns in response to conservation, identifying the access to biodiversity and to what extent changes around access to biodiversity and social organisation are attributable to the presence of conservation policies instigated by the protected area.

For the Integrated Conservation Assessment data is processed and organised in three main components: 1) Benefits and cost, 2) Local livelihoods and 3) Local participation. Each component has varied indictors for its analysis.

The techniques of data processing included (Newing, 2011)

- Descriptive statistics: Identification of relevant indicators and arguments that illustrate theoretical narratives, or that may complement, explain or contradict results.
- Comparisons: Processing of qualitative information into databases in order to establish comparisons between the two reserves with the use of checklists, ranking and linkert scales.
- Triangulation: Information gained from the different data sources to identify similarities and differences in the perception of different informants (Newing 2011): local communities (the varied group of stakeholders) and the agency in charge of the protected areas (including managers at different levels and rangers).

### 4.4.1 Benefits and costs

A descriptive use of the information from the conservation agency strategic plans and documents is presented to identify the political narrative on how to address local costs and benefits in the protected areas of study. This identified narrative is tested by comparing descriptive information from the semi-structured interviews conducted with official managers of each protected area and the user group meetings questions. Identification of answers are aimed at investigating if local costs and benefits, reported by the reserve are attributable to protected area policies. The transcriptions of field work diaries of direct observation provide important inputs in this analysis.

Local perception challenge or reinforce the picture of the flow of benefits and costs to local communities portrayed by the reserve agency. The presence or absence of seven indicators of local benefits attributed to conservation programmes which were compiled during the semi-structured and informal interviews are assessed by local stakeholders during each user group meeting in both biosphere reserves: 1)there had been an improvement of municipal services; 2) development of/improvement in supportive

community and cultural services; 3) better/introduction of regulation of tourism services; 4) greater diversification of livelihoods support; 5) improved infrastructure for economic development; 6) growth of employment linked to conservation; and 7) evidence of income from park entrance fees being invested in the community. The assessment of each indicator by a stakeholders user group was measured by a yes/no answer identifying or not the attribution of each indicator of benefits. Results of all user groups within a community were averaged to obtain the value of benefits at the community level. The community level values were averaged for each protected area to obtain the local benefits value of the area which determines the percentage of local benefits attributed to conservation programmes since the establishment of the reserve by local stakeholders. The average was calculated from a proportion of the population (incorporating population in the final variables score), as the total population of neither reserve was homogeneously distributed throughout its respective communities.

The indicator 'regulation of tourism services' could not be assessed for the Isla Arena community of Ria Celestun because no tourist development has yet been developed there and, rather than being regulated, has only very recently gained the interest of a few families. Therefore, only responses from Celestun community were assessed for this indicator.

Local costs were processed by taking the average of the presence or absence of seven indicators for local costs, as reported by user groups meetings for each biosphere reserve. The indicators accounted for in this variable are 1) restriction on land use; 2) killing of livestock by predators; 3) increase in crop-raiding animals; 4) denial of traditional rights; 5) sanctions; 6) reduced access to resources; and 7) displacement of people.

Indicators of local costs and benefits are processed in databases in order to establish comparisons between the two reserves. The assessment of each indicator by a stakeholders user group was measured by a yes/no answer identifying or not the attribution of each indicator of local cost or benefit. Results of all user groups within a community were averaged to obtain the value of local costs or benefits at the community level. The input community level values were averaged to obtain the value for each protected area which determines the percentage of local benefits or costs

attributed to conservation programmes since the establishment of the reserve by local stakeholders. The average was calculated from a proportion of the population (incorporating population in the final variables score), as the total population of neither reserve was homogeneously distributed throughout its respective communities.

The indicators 'killing of livestock by predators' and 'increase in crop-raiding animals' could not be assessed/included for the community of Isla Arena, as no agriculture or farming activities take place on the island. Therefore, for Ria Celestun, responses from Celestun community only were taken into consideration.

The overview description of local costs and benefits of conservation in the case studies is complemented by using the method of triangulation to compare the responses of the external actors (managers of the agency of conservation at different levels and rangers). Complementary quantifiable indicators from data collected from closed questions - including rankings, rating scales and checklists- (Newing 2011) are processed into databases and charts to establish comparisons between the two areas of study.

The data processing was designed to identify successful experiences involving the transfer of benefits and the reduction of costs to local communities in order to obtain an in depth understanding of the approach to integrating conservation in the areas of study.

### 4.4.2 Local livelihoods

The political narrative on how to address local livelihoods is identified in the conservation agency high-level strategic plans and documents; this is sourced through bibliographic and archival research. The description of this narrative is tested through the semi-structured interviews conducted with official managers of each protected area.
Data collected from bibliographic research and user groups interviews were used to assess the main livelihoods on which the communities rely, including fishing in the sea, fishing in the river, cattle farming, agriculture, tourism, sustainable wildlife production, and salt extraction. An overview of livelihood activities within the reserves was obtained by asking local stakeholders; how often they engaged in those different activities and whether those activities increased, decreased or remained the same. This

is complemented by information collected in user group interviews, informal interviews and participant observation regarding the nature of the activities.

Data from the user group meetings was processed with the aim of identifying changes that livelihoods have experienced as a result of conservation policies, and whether these changes are attributable to protected area policies. The information obtained from the user group meetings is triangulated with other forms of data, particularly direct observation.

Questions on the conservation regulatory schemes that affect livelihood activities were introduced at a later stage in the user group meetings in order to ensure a free flow of information without bias or prejudice. Stakeholders were asked if they considered these regulatory schemes to be a positive or negative influence.

Research tools used to identify major changes in livelihoods, included enquiries about changes in the diet of local communities, changes in the use of construction material for housing, changes in frequency of animal attacks, and the perception of the presence of wildlife - all in the context of change over the last twenty years. Data on livelihood changes was presented by converting databases to bar charts for before and after comparisons and between case studies comparisons.

Complementary discussions in the user group meetings were transcribed and triangulated with other sources of data to identify trends in changes to livelihoods and allow for further investigation into whether those changes were attributable to the biosphere reserve policies.

### 4.4.3 Local participation

The political narrative on how to address local participation is identified in the conservation agency high-level strategic plans and documents; this was sourced through bibliographic and archival research. The description of this narrative was tested through the semi-structured interviews conducted with official managers of each protected area. Bibliographic and archive research provided important historical background information on local participation in the protected areas of study.

During the user group meetings questions were aimed at investigating how developed and comprehensive was local participation and whether the level of participation was attributable to protected area policies. The information obtained from the user group meetings was transcribed and complemented by direct observation and triangulated with other sources of data collected.

Qualitative indicators on participation based on frequency of attendance at meetings and the perception of inclusion of local opinions in conservation programmes are scaled and processed to obtain charts of comparisons between the areas of study. Other complementary indicators such as empowerment and cultural indicators associated with participation were collected using rating scales and checklists, and were processed in databases and displayed in charts.

### 4.4.4 Incorporating population in the final variables scores

When the data at community level was processed to obtain a value at protected area level to for comparisons among the case studies the data needed to take into account the size of the community to reflect the differential contribution of each of them in a protected area. A significant aspect in the allocation of values for each indicator is proportion, which is based on the size of the community. As the communities studied in the protected areas vary in size, the assessment of the indicators for each protected area were weighted to take into account the percentage of the total population of the community within the protected area (see Figure 4.3).

The equation used to incorporate responses in proportion to community size can be expressed in the following terms:

$$V(npa) = (V\ c1)\ (PP\ c1) + (V\ c2)\ (PPc2) + \ldots + (Vcn)\ (PPcn)$$

V= Variable
npa= Natural protected area level
PP = Percentage of the total population resident within a given natural protected area
c1 = Community 1
c2 = Community 2
cn = Number of community

The following table shows resulting weighting (proportional) factors for the study areas

| Distribution of the population in Ria Celestun | |
|---|---|
| Community | Percentage of the total reserve population (PP) |
| Celestun | 90% = 0.90 |
| Isla Arena | 10% = 0.10 |
| Distribution of the population in Ria Lagartos | |
| Community | Percentage of the total reserve population (PP) |
| San Felipe | 28% = 0.28 |
| Rio | 46% = 0.46 |
| El Cuyo | 26% = 0.26 |

Figure 4.3 Population per community as a percentage of the total population in the protected areas of study. Source: The author.

## 4.5 Conclusion

The methodological framework described in this chapter, is used to analyse the implementation of an integrated approach to conservation within the protected areas of study. The presentation of results combines findings from direct observation and data processing, collected from both internal and external actors of the local communities in which mixed methods of data collection were used with a strong emphasis in what the local stakeholders had to say.

Qualitative information is integrated to describe and compare information for three main variables or components: 1) local costs and benefits, 2) local livelihoods and 3) local participation. The organisation of the results in these three components allows significant scope for the assessment and finding of in-depth information to obtain better understanding of the concept of integrated conservation in the protected areas of study.

# CHAPTER 5: "CASE STUDIES: OVERVIEW"

## 5.1 Introduction

As described in the previous chapter, which reviewed the historical context of conservation in Mexico, the political approach to the country's protected areas is consistent with international narratives that follow the principles of integrated conservation. Indeed, the Strategy of Conservation for Development published by the NCPA establishes a clear vision for a shared approach to conservation with the inhabitants of local communities within protected areas (SEMARNAT & CONANP, 2007).

National policies and programmes recognise, in their formulation, both the ecological challenges associated with biodiversity depletion and the social challenges – including poverty within protected areas – and aim to address them with an integrated approach (SEMARNAT & CONANP, 2007). However, at the implementation level experiences in protected areas are extremely complex and varied for a multitude of reasons – from historical and political contexts and forces, to social and ecological differences. An analysis of case studies in Mexico is therefore a significant contribution to the international discussion on integrated conservation.

Chapter 4 has presented the research design for field work carried out for a year in Mexico during September 2006 and August 2007 to collect and process data from the study reserves. The results in Chapter 6 will present the findings and the analysis of indicators employed during the field work to draw comparisons between Ria Lagaartos and Ria Celestun. This chapter aims at providing an overview of the case studies, including background and general descriptions of the areas of study, their ecological significance, conservation challenges, and socio-economic dynamics. This includes an account of the main economic activities in the communities which focuses on the history and evolution of fisheries and their role in local development. Fishing was the major reason behind communities settling the areas and it continues to be the most important economic activity. The effect of coastal development policies that impact on ecosystems in the protected areas are also identified in this chapter. Analysis of historical socio-economic aspects of local development linked to the access to natural

resources aim to putt into context the challenges for conservation that will be identified and analysed in discussion of the current context.

## 5.2 Description and importance of the study area

Two of Mexico's protected areas were selected as cases studies for this investigation: Biosphere Reserve Ria Celestun (referred to as Ria Celestun), and Biosphere Reserve Ria Lagartos (referred to as Ria Lagartos). They are both located on the Yucatan State coast in the southeast of the country and include a variety of ecosystems (Figure 5.1).

The Yucatan Peninsula is a relatively flat karstic region consisting of a limestone platform made up of carbonate sedimentary rock through which rainwater percolates rapidly and feeds into an abundant subterranean hydrological system (Herrera-Silveira & Comin, 2000) whereby freshwater flows to the coast. Solution by underground streams has created a system of underground caverns with stalactites and stalagmites and a range of flow-stone features. In places sink holes and roof collapse has opened up the caverns to expose the underground water courses, sometimes forming large pools known locally as '*Cenotes'* (Herrera-Silveira & Comin, 2000). Light penetration into '*Cenotes'* is often restricted with parts always remaining in shadow, creating contrasting environmental conditions. They were vital sources of water for Mayans and places where religious ceremonies took place. '*Cenotes'* and '*aguadas'* (shallow ponds filled with rainwater that could dry up in seasons) are the major sources of water for wildlife (Herrera-Silveira & Comin, 2000). In a zone stretching inland from the coast for between 2 and 20 km the soils are characterised by the development of a hard caliche layer (Garcia-Gil & Graniel-Castro, 2010).

At the coast, the underground water discharges in to coastal lagoons which are enriched by the inflow of the nutrient-rich freshwater. Sand dunes act as barriers to the coastal lagoons, limiting the flow to the open sea (Herrera-Silveira & Morales-Ojeda, 2010a).

The coastal lagoons exhibit considerable environmental variability and sustain important hydrological and ecological functions for the entire Yucatan Peninsula basin. As a consequence of the good environmental quality, both the Ria Lagartos and the Ria Celestun lagoons (Herrera-Silveira & Morales-Ojeda, 2010b) are of high conservation

value. Both lagoons are included on the Ramsar List of Wetlands of International Importance – Ria Lagartos, was the very first Mexican wetland to be included on the list, in 1986 and Ria Celestun was added in 2004 (INE & SEMARNAP, 1999; SEMARNAT, 2000b; CONANP, 2006b, Ezcurra, 2010).

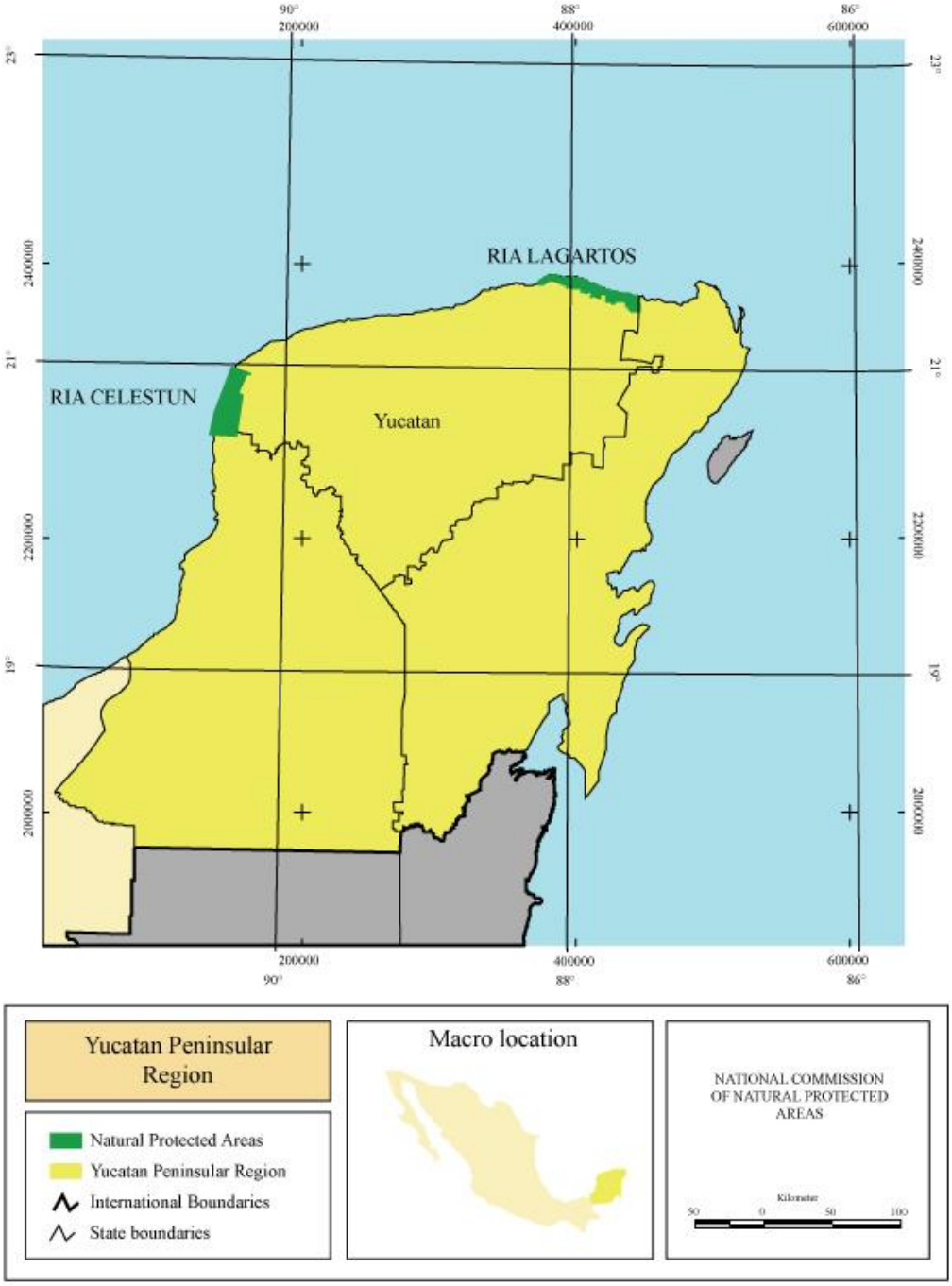



Figure 5.1 Geographic locations of Ria Celestun and Ria Lagartos on the Yucatan Peninsula, Mexico.
Source: CONANP, 2006b

Fresh spring waters in the lagoons, are interesting places (some of the touristic attractions). Like an oasis in the middle of a mangrove forest, the lush vegetation and the crystal clear water arriving from underground is distinct from the turbidity in the rest of the lagoon characterised by higher levels of salinity. They give rise to unique ecosystems characterised by distinct types of vegetation and are known as *Petenes* (SEMARNAT & CONANP, 2006; CONANP, 2006b:).

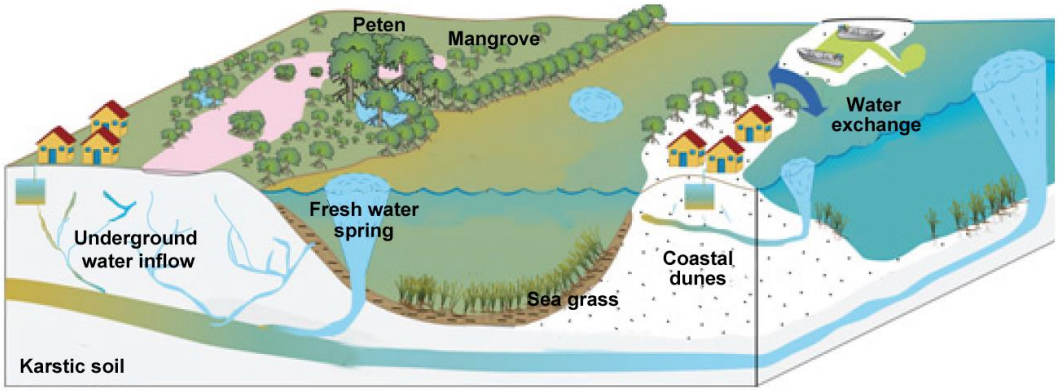



Figure 5.2 Diagram of coastal lagoons of Yucatan
Source: Adapted from Herrera-Silveira & Morales-Ojeda, 2010

The environmental services provided by Ria Lagartos and Ria Celestun include their role as a refuge for a variety of species of fish, mollusc and crustaceans that sustain important fisheries and depend on coastal lagoons for their reproduction and the development of larvae and juvenile stages. Additionally, their nutrient enriched waters provide habitat for a diversity of fauna, particularly birds, both resident and migratory species, and they help protect the coastal ecosystems through a barrier of mangrove forests (Herrera-Silveira & Morales-Ojeda, 2010b).

Comprising a 64,582-hectare region of northwest Yucatan, Ria Celestun was first placed under protection in 1979 as a 'Fauna Refuge Zone'. Following several legal disputes, it was eventually declared a biosphere reserve in 2000, with an extension in area to 81,482.33 hectares (SEMARNAT, 2000b). Covering 47,820 hectares in the northeast of Yucatan Peninsula, Ria Lagartos was also first designated as a 'Fauna Refuge Zone', in 1979; and, after several administrative modifications, was extended to

60,347.82 hectares and finally declared a biosphere reserve in 1999 (INE & SEMARNAP, 1999).

With an average annual temperature of $26^0$ C the two reserves are subject to marked wet and dry seasons (SEMARNAT, 2000b; SEMARNAT & CONANP, 2006). A dry season from March to May, rains from June to October and a '*nortes*' season, characterised by stormy weather influenced by cold fronts, from November to February (Herrerra-Silverira & Morales-Ojeda, 2010). In Ria Lagartos, the average annual precipitation is 616.4 mm, with the driest area in the south of the reserve (SEMARNAT & CONANP, 2006: 13). From 1952 to 1997, the average annual precipitation in Ria Celestun was 767 mm; but it varied widely between 395 mm in the driest year (1970) and 1,170.4 mm in the wettest year (1988), when a strong hurricane struck the peninsula (SEMARNAT, 2000b: 17).

Residential and migratory birds are particularly important to these reserves, their conservation being one of the initial objectives in placing the areas under protection (SEMARNAT, 2000b; INE & SEMARNAP, 1999). Three hundred and thirty-three species of birds have been recorded in Ria Lagartos (INE & SEMARNAP, 1999: 27) and 304 species in Ria Celestun (SEMARNAT, 2000b: 27).

The pink flamingo (*Phoenicopterus ruber ruber*) is an emblem of conservation campaigns in both Ria Celestun and Ria Lagartos, as 82 per cent of the flamingo population of the entire Yucatan Peninsula is dependent on these two areas (Tabasco, 2005). The birds migrate between Ria Celestun and Ria Lagartos over two distinct seasons of the year (CONANP, 2006b: 39). Ria Celestun contains the most important feeding grounds and Ria Lagartos the most important reproductive habitat for pink flamingo in the whole country with 93 per cent of the population being born there (Tabasco Contreras, 2005). Rich feeding conditions in Ria Celestun are linked to the higher inflow of fresh water found in Ria Celestun where high levels of nutrients are discharged (Herrerra-Silveira & Morales-Ojeda, 2010). Higher levels of salinity found in Ria Lagartos, particularly in the centre and east side of the lagoon, create extreme environments where particular aquatic species have adapted to survived (Herrerra-Silverira & Morales-Ojeda, 2010).

Historically, hunting of flamingos for meat and the constant raiding of nests for eggs resulted in a seriously diminished population. The creation of a Program of Conservation for the pink flamingo in 1999 with the establishment of the reserves of studied has had enormous effect on population recovery (Migoya von Bertrab & Tabasco-Contreras; 2010). In 1954, the estimated population of pink flamingos in Yucatan was approximately 6,000 (SEMARNAT & CONANP, 2006: 20) but with conservation actions the population had increased to 27 227 in 1999 and to 43 602 in 2005 (Migoya von Bertrab & Tabasco-Contreras; 2010).

Another priority species of these reserves are sea turtles. Of the eight species of sea turtle that exist worldwide, Mexico is home to seven, all of which are on the national Red List as in danger of extinction (DOF, 2001). Sea turtles were exploited in Mexico for their meat, skins, shells and eggs from ancient times until 1990s when, due to the levels of over-exploitation the population collapsed and the first national fishing closure act was passed (INE, INP & PROFEPA, 1999).

The Yucatan Peninsula coastline is an important nesting ground for sea turtles. Changes in land use have negatively affected their nesting habits. For example, the removal of sand dunes to build summerhouses and tourist infrastructure has reduced their habitat, increasing vulnerability. Beach erosion from harbour-related construction has also transformed dunes into ‘sand walls’ that impede the sea turtles’ access for nesting purposes (Cuevas, Guzmán-Hernández, González-Garza, García-Alvarado et al., 2007).

These changes along extensive stretches of the Yucatan coastline have radically decreased the habitat for sea turtle nesting, which has been detrimental for the sea turtle population (Cuevas, Guzmán-Hernández, González-Garza, García-Alvarado et al., 2007). Therefore, the maintenance of beaches in Ria Lagartos and Ria Celestun, which contain some of the best preserved dune ecosystems left in Yucatan, are essential if the reproductive cycle of the species represented in the reserve is to be ensured in Mexico.

Species of sea turtles nesting in these protected areas are the Hawksbill (*Eretmochelys imbricata*), the Green (*Chelonia mydas*), the Loggerhead (*Caretta caretta*) and the Leatherback (*Dermochelys coriacea*) (SEMARNAT, 2000b; INE & SEMARNAP, 1999). In 1979 Ria Lagartos and Ria Celestun coastlines were designated zones of

animal refuge for the protection of sea turtles (INE, INP & PROFEPA, 1999: 23). Common conservation challenges for the sea turtle are linked to the high concentration of nests to which invasive predators such as feral dogs, raccoons and Grey Foxes are attracted. Local communities that have traditionally consumed turtle eggs and plundered nests for illegal trade also represent a threat to sea turtle populations (INE & SEMARNAP, 1999). Efforts put in place to address these threats and protect sea turtle, since the 1980's (before the biosphere reserve was established) and strengthened with funds through the reserve status, have had an enormous impact on stabilising the sea turtle population.

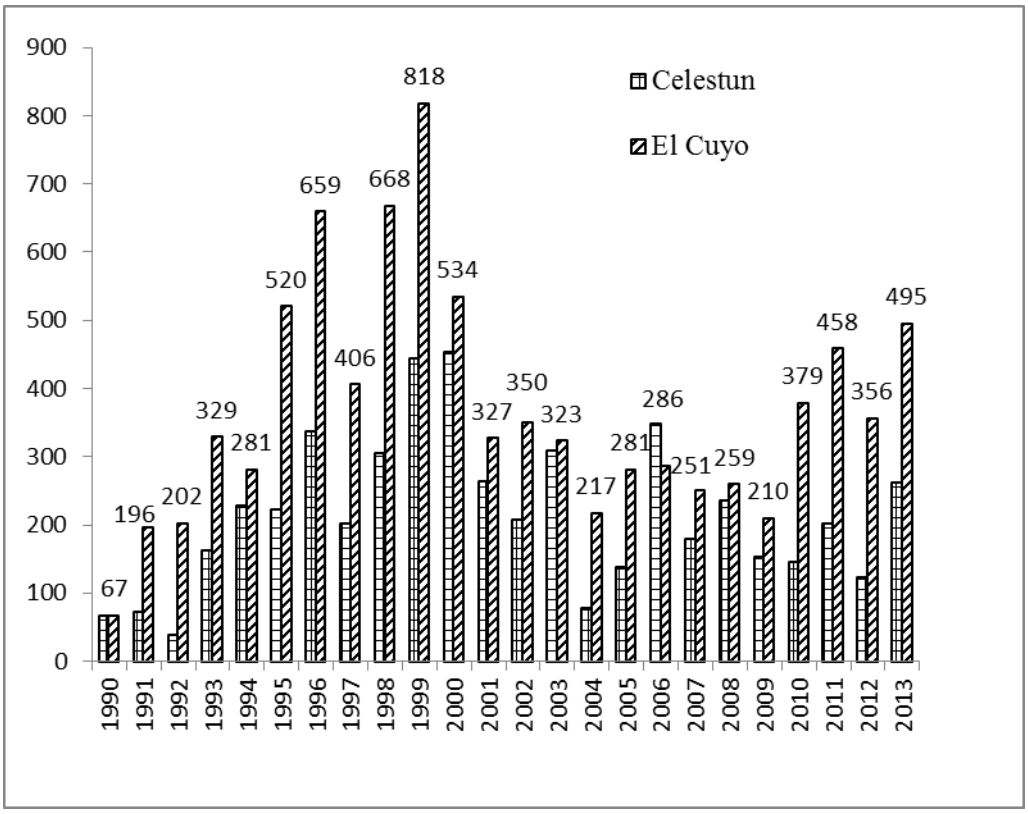



Figure 5.3 Nests of Hawksbill (*Eretmochelys imbricata*) registered in Celestun monitoring site (in Ria Celestun) and El Cuyo monitoring site (in Ria Lagartos) between 1990-2013.Source: Pronatura Peninsula de Yucatan, 2013.

Figure 5.3 present data between 1990 and 2013 on Hawksbill nesting trends from two monitoring sites established in the reserves. From an initial number of 67 nests in 1990, records of the Hawksbill population have naturally stabilised at over 350 nests in the last four years (Pronatura, 2013), after a peak in the late 1990s that was related to the

coincidence of sea turtles of the same generation all breeding together (cohorts) and favourable environmental conditions (Cuevas, 2013).

From 67 Green Turtle (*Chelonia mydas*) nests registered in El Cuyo (Ria Lagartos) in 1990 the number has grown to over 3000 nests in 2013 (Pronatura, 2013). Nowadays, over 5000 nests of the four species registered in the reserves are annually recorded in beaches of Las Coloradas and El Cuyo turtle monitoring site within Ria Lagartos (SEMARNAT, 2012).

Sea turtles play a complex role in ecosystem dynamics, as they are very selective regulators of the food chain in coral systems and sea grasses (Cuevas, Guzmán-Hernández, González-Garza, García-Alvarado et al., 2007). Therefore, any contribution to the conservation of this animal in the study areas is of significance to the entire turtle population of the peninsular.

Coastal dune ecosystems are important for other wildlife species. Sand dune vegetation offers habitat for 70 to 80 per cent of migratory birds (Duran-Garcia, Torres-Avilez, Espejel-Carvajal, 2010). Coastal dunes in Yucatan differ markedly from those in the rest of the country due to the semi-arid weather and the transition of ecosystems from mangroves to low land semi-deciduous forests. Two hundred and seventy one species of vascular plans are recorded for coastal sand dunes of Yucatan, the second highest level of endemism in Mexican coastal dunes (Duran-Garcia, Torres-Avilez, Espejel-Carvajal, 2010). The coastal sand dune ecosystems within the study reserves are well conserved and important representatives for the Yucatan, because elsewhere vegetation has been largely removed or transformed by construction work and beaches have suffered significant level of erosion as a consequence of port infrastructure developments (CINVESTAV, 2007). Sand dune vegetation is used for, food, medicinal purposes, ornaments and construction materials (Duran-Garcia, Torres-Avilez, Espejel-Carvajal, 2010). A rare species of palm known as '*kuka'* (*Pseudophoenix sargenti*) is characteristic of this ecosystem. Beach and coastal dune ecosystems cover 2.93 per cent of Ria Lagartos reserve as described in the management plan (CONANP, 2006). No estimation of beach and coastal dune ecosystems is described for Ria Celestun. Conservation of these ecosystems within the reserves is crucial for wildlife.

Varied inland ecosystems such as savannah, flood-prone sub-deciduous lowland forest and medium semi-deciduous forests are also contained in the areas of study.

The savannahs are characterised by the dominant presence of long grass and the presence of widely dispersed trees on clay-based soils prone to flooding in the rainy season. Marshes and *tule* vegetation are present in this ecosystem. Savannahs cover 3.51 per cent for Ria Lagartos biosphere reserve (CONANP, 2006). No mention of savannahs for Ria Celestun is present in the management plan.

The lowland forest in the reserves (known as *Monte*) is characterised by deciduous trees between 8 and 12 metres high that are naked for about 5 to 6 months of the year during the dry season when 100 per cent of the trees lose their foliage. Cacti and spiney vegetation are also characteristic of this forest. The flood-prone lowland forest, on less rocky soils, is comprised of trees between 5 to 7 metres in average height that are permanently flooded during the rainy season. Fifty per cent of flood-prone lowland forest tree species lose their foliage during dry season. The lowland forests (including flooded forest) cover 16.43 per cent of Ria Lagartos reserve (CONANP, 2006). No estimation of the extension of lowland forest is given in the management plan for Ria Celestun but according to CINVESTAV (2007) it covers 24 per cent of Celestun municipality, making Celestun the municipality with the second most well conserved lowland flood-prone forest in the coastal zone of Yucatan.

The medium semi-deciduous forest, characterised by trees between 18 to 25 metres high, occurs only in Ria Lagartos. Twenty five per cent of them loss their foliage during the dry season. The medium semi-deciduous forests cover 22 per cent of the Ria Lagartos reserve (CONANP, 2006). Over one third of it shows signs of degradation and less than a half is considered to be in good state of health (CONANP, 2006).

Elders interviewed in Ria Lagartos described vast areas of high forest. The forest in Ria Lagartos, known by locals as ‘The Mountain’ was a place where gigantic trees and the ‘*tigre*’ lived (as the jaguar is called), but this was a perception based on the height of the trees rather than from an accentuated rise in the topography. No one would go there after 3 pm because of the darkness caused by the lush the forest. High forest is not acknowledged in any current reserve management plan.

The biodiversity found within the range of habitats in these two areas is exceptionally varied, with approximately 1,149 species in Ria Celestun (SEMARNAT, 2000b: 19) and over 1,500 species in Ria Lagartos (SEMARNAT & CONANP, 2006: 7). Many of the species are endemic to the Yucatan Peninsula. Mammals include the spider monkey (*Ateles geoffroy*) and three felids, the jaguar (*Panthera Onca*), the ocelot (*Felis pardalis*) and the '*tigrillo*" (*Leopardus wiedii*); the white-tailed deer *(Odocoileus virginianus*), the wild turkey (*Agriocharis acellata*) and the crocodile (*Crocodylus moreletii*), all of which are classified as in danger of extinction (Andrade, 1997; SEMARNAT, 2000b; INE & SEMARNAP, 1999).

The jaguar is the largest cat and mammalian predator in tropical America, whose relationship with humans is rooted in the pre-colonial Mayan culture, in which it was considered to be a sacred animal. The jaguar or '*Balam,*' (as called in Mayan) has disappeared from over 60 per cent of the areas in Mexico that it used to occupy (Ceballos & Chávez, 2005: 10), and is classified as a threatened species on both the national Red List (NOM-059-SEMARNAT-2001) and on that of the CITES (DOF, 2001; SEMARNAT & CONANP, 2006). However, the importance of this predator to the reserves reaches beyond the conservation of the species alone, as the jaguar is an indicator of the health of an ecosystem due to its position at the top of the food chain (Faller-Menendez, 2009).

There are three priority regions for jaguar conservation in Mexico, of which Ria Lagartos and the surrounding area is one (Ceballos & Chávez, 2005). Unfortunately, Ria Lagartos is in a region of cattle-ranching which puts severe pressure on the survival of the predator (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006). In contrast, although the jaguar exists within Ria Celestun this reserve has not been cited as an important regional habitat for the species.

These two protected areas play an important role within a biological corridor along the coast of the Yucatan Peninsula, which allows not only for the conservation of species (particularly birds) but also the maintenance of the evolutionary processes of nature (CONANP, 2006b).

### 5.3 Conservation challenges

The condition of the natural ecosystems in Ria Lagartos and Ria Celestun are rated as fairly good when compared with the condition of the rest of the coastal zone of Yucatan that has experienced rapid development of infrastructure for international trade ports, fishing ports, the removal of vegetation to build holiday homes and the filling in of flooded savannahs and forest for urban development (CINVESTAV, 2007).

The coastal zone land use management study for Yucatan made by CINVESTAV (2007) identifies high levels of ecosystems degradation in the central area of the coastal zone of Yucatan where the major city port '*Progreso*" is located, due to its relative closeness to Merida, the capital of Yucatan. The magnitude of development decreases in the littoral zone of Yucatan as one moves away from '*Progreso'*, although some of the environmental threats continue along the coast. For instance, coastal lagoons show the highest levels of water pollution in the central zone. This is due to urban, agricultural and industrial discharges (including the abandonment of water bodies after industrial extraction of stone for construction materials (*sascabera*s); organic pollution from open sky rubbish sites established on the savannahs; chemical pollution from vessel oils and boat cleaning products and lead pollution from sport shot hunting activity. Removal of sea-grasses due to constant propeller traffic and overfishing are documented in coastal lagoons of Yucatan. Much of the low-forest in the central area has been lost for urban and industrial development. Along the central coastal area half of the coastal dune vegetation has been removed for construction purposes, and between 1988 and 2004 2,832 hectares of mangrove have been lost in Yucatan. Vast areas showing signs of drying up and salinity increase are the consequence of water flow interruption from the roads (including new motorways in the central area of the coast) (CINVESTAV, 2007). Severe beach erosion is also higher in the central zone due to the construction of ports, including the main trade port '*Progreso'* and the main fishing port '*Yucatpeten'* both of which are located in the central zone of the coast. Construction of breakwaters as an immediate solution to combat beach erosion extends erosion along the coast (CINVESTAV, 2007).

Ria Lagartos and Ria Celestun have been somewhat protected from much of the degradation observable in the coastal zone. Their location at the extreme ends of the

coastal zone of Yucatan, where relatively small towns are located with less road access and a lower levels of construction than in the central area of the coast. The designation of these areas as biosphere reserves increases their significance within the coastal development context in Yucatan. The areas of study, however still face challenges for conserving biodiversity at a high magnitude. These challenges have been examined in the light of data gathered from a multidisciplinary analysis conducted by Andrade (1997).

### 5.3.1 Biodiversity depletion

Due to an increase in fishing caused by immigration and illegal angling techniques, most of Yucatan's aquatic species have declined dramatically in the protected areas and indeed throughout the Peninsula (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998). Overfishing is identified as one of the main threats in Ria Celestun (Herrera-Silveira & Morales-Ojeda, 2010b).

Habitat loss, fragmentation and hunting has contributed to the reduction of fauna and overexploitation has caused the disappearance of the manatee (*Trichechus manatus*) and birds such as the King Buzzard and the Toucan (*Ramphastos sulfuratus*) (SEMARNAT, 2000b; INE & SEMARNAP, 1999).

Moreover, approximately 122 of the flora and fauna listed in these protected areas are included on the national list of threatened and endangered species (DOF, 2001); and approximately 97 of them are included on the list of endangered species cited by CITES (SEMARNAT & CONANP, 2006: 7). Figure 5.4 shows details of the number of species listed in Mexican NOM 059 which classified categories of protection for species of animals and plants. An update on this information was made only by Ria Lagartos after modifications on NOM 059.

| | |
|---|---|
| In danger of extinction | 4 |
| Threatened | 7 |
| Rare | 3 |

Number of vegetation species listed on NOM-059-ECOL-1994 in Ria

| | |
|---|---|
| In danger of extinction | 18 |
| Threated | 37 |
| Special protection | 12 |
| Rare species | 48 |

Number of species of fauna listed on NOM-059-ECOL-1994 in Ria Celestun

| Celestun (INE & SEMARNAP, 1999) | (INE & SEMARNAP, 1999) |
|---|---|
| Special protection: 8<br>Threatened: 8<br><br>Number of vegetation species listed on NOM-059-SEMARNAT-2001 in Ria Lagartos (CONANP, 2006) | In danger of extinction: 18<br>Threatened: 25<br>Special protection: 62<br><br>Number of fauna species listed on NOM-059-SEMARNAT-2001 in Ria Lagartos (CONANP, 2006) |

Figure 5.4 Number of species listed under a category of protection under Mexican NOM 059 in Ria Celestun and Ria Lagartos. Source: NOM- 059-ECOL-1994 & NOM-059-SEMARNAT-2001 in INE & SEMARNAP, 1999, & CONANP. 2006

Examples of priority species in the NOM 059 were illustrated by pink flamingos, sea turtles and jaguars. The most important threatened species of trees are the sapodilla (*Manilkara zapota*), *chechem* (*Metopium brownei*), piich (*Enterolobium cyclocarpum*), and *amates*, (*Ficus spp*). Among the palms of the sand dunes the *kuká* (Pseudophoenix sargentii), *chit* (*Thrinax radiata*) and *nakax* (*Coccotrinax readii*) are the most vulnerable species (SEMARNAT, 2000b; INE & SEMARNAP, 1999).

### 5.3.2 Habitat fragmentation and transformation

Habitat modification, fragmentation and loss are caused by the development of ports, roads and other tourism-related construction, including summer homes in the coastal dunes. Such construction has been undertaken on a large scale throughout the Yucatan coast and, to a lesser extent, within the study areas. Some of the effects of construction outside the study areas has also adversely affected the reserves. Infrastructure development not only replaces natural vegetation but also interrupts the natural flow of sediment and water creating beach erosion (Capurro, Euán & Herrera, 2002).

The development of motorways to allow communities inside the protected areas to gain access to the rest of the state, but built to unsatisfactory design standards that would allow free water flow in the coastal lagoons has led to reduced circulation of water causing increased levels of salinity and high rates of mangrove mortality along extended areas of wetland forests (Capurro, Euán & Herrera, 2002; Andrews, Migoya Von

Bertrab, Rojas, Sastré Méndez et al., 1998). It has resulted also in the creation of areas of devastated landscape along one side of the motorway where the road obstructs water flow. This has occurred with greatest magnitude in Ria Celestun where approximately 50 per cent of the lagoon has dried up as a result of motorway construction (SEMARNAT, 2000b). Other transformations to the landscape such as the erection of electricity pylons along the roads represent a significant cause of bird mortality, as they are located across their flight paths and are not always equipped with buoys or lights to prevent collisions (Andrade, 1997; Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998).

The high rates of deforestation were initially the result of logging to clear land for commercial coconut plantations, urban development and domestic usage (Andrade, 1997). Deforestation in Ria Lagartos is also linked to industrial salt extraction, as the large evaporation lagoons required for the process have replaced mangroves and other natural vegetation (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998; Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006). The management plan of Ria Lagartos talks of approximately 2,800 hectares of wetlands being modified for this purpose (SEMARNAT & CONANP, 2006: 27). The construction of artificial navigation channels is another feature that contributes to landscape transformation, hydrological change and loss of sea grass coverage (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006).

Additional habitat fragmentation is caused by forest fires. The effect of hurricanes also plays a part by removing the primary canopy to expose the more vulnerable lower strata of vegetation to the full force of the wind and increase the accumulation of branches and other organic material that dry out and easily ignite in the high temperatures of the region (SEMARNAT, 2000b; INE & SEMARNAP 1999). Fires are classified as one of the main causes of forest loss in Ria Lagrtos where use for agriculture and livestock production is often uncontrolled (SEMARNAT, 2012). Fires have a strong impact on reducing habitat and mortality for wildlife such a monkeys, jaguars, and small mammals, especially those with relatively slow mobility such as tepezcuintle, armadillos and tortoises.

Agriculture and particularly cattle ranching has also exacerbated deforestation, especially in Ria Lagartos where substantial government promotion for livestock production has been registered (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006; Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998). In Yucatan, each head of cattle requires between 2 to 5 hectares, but in Ria Lagartos the estimations are higher due to the floodable soils with averages of between 5 to 10 hectares per head of cattle (Alcerrega-Aguirre et al, 2010). This activity represents the most serious risk of ecosystem loss in the reserve (SEMARNAT & CONANP, 2006), but it sustains an important livelihood for some local inhabitants.

### 5.3.3 Pollution

Lack of management of both domestic and tourist waste results in it being burnt or dumped in open, floodable spaces causing polluted living conditions (Córdoba Ordóñez, Fuentes, Córdoba-Azcarate & Ayala-Arcipreste, 2004). This has tainted the image of Celestun and the problem is also evident, albeit to a lesser extent, in one community in Ria Lagartos. In Celestun, the fisheries also constitute a significant source of organic waste and exposed faecal matter, given that 41 per cent of homes lack sanitary toilets (SEMARNAT, 2000b). Exposed faecal matter is also a source of pollution in Ria Lagartos but, again, to a lesser extent. These insanitary conditions represent a health risk as the proliferation of flies encourages the spread of disease and infection in the communities, particularly among children.

Agriculture and cattle farming are identified in Ria Lagartos as an important source of diffuse pollution based on water quality monitoring reports. In the coastal lagoon signs of eutrophication have been found and presence of pollutants associated with agrochemicals (Herrera-Silveira & Morales-Ojeda, 2010)

Chemical pollution levels in the reserves have not yet been documented, but there is a continuous discharge of oil, petrol and bleach from the use, maintenance and cleaning of fishing and pleasure boats (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006). In the future, the area is likely to become more exposed to petroleum spills and accidents as the Yucatan Peninsula has been subject to government interest in oil

exploration, although no project on has been confirmed to date (Andrade, 2010 & Dzunum, 2010).

### 5.3.4 Natural disasters

Ria Lagartos and Ria Celestun are located within a broad band of hurricane and tropical storm routes. The destructive power of hurricanes affects local communities and biodiversity, both during the initial storm and afterwards. Additionally, long-term flooding is caused by the heavy precipitation and the ocean's intrusion into the estuarine system, which modifies salinity levels and has a devastating effect on the estuarine ecosystem (Herrera-Silveira, Zaldívar-Jiménez, Teutli Hernandez, Chi Chan et al., 2005). This can result in significant levels of post-hurricane wetland mortality. Flooding is also a factor that affects the prospects for survival of flamingo chicks (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006). As described before, post-effects of hurricanes increase the magnitude of fires in the area due to the accumulation of dead vegetation material drying up.

## 5.4 Biosphere reserve management

Administration of the biosphere reserve is carried on by the NCPA reserve office. The director of the reserve has an office in the city of Merida, capital of Yucatan. Ranger stations are located inside the reserves. The reserve offices of Ria Lagartos and Ria Celestun are contained within the Peninsula of Yucatan regional office of the NCPA, based in the city of Cancun. The main offices of the NCPA are located in Mexico city where national administration of protected areas takes place.

In order to implement the protected area management plan, reserve officers follow an Annual Operative Plan in which conservation, restoration, monitoring, participation and patrolling projects are described and targets defined. Reserve officers establish partnerships with external and internal organisations to carry on projects included in their annual plan.

Monitoring of water quality and sea-grass in the coastal lagoons, identification of water flows that need restoration, unblocking of sediments in water channels along roads built in floodable ecosystems, and the monitoring and reforestation of mangrove areas, are

projects carried out by the Primary Production Laboratory Team of the Research and Advanced Studies Centre of the National Polytechnic Institute of Mexico – Yucatan (*CINVESTAV*).

The Conservation Program for the pink flamingo was created in 1999 with the collaboration of the NGO *Ninos y Crias* (Rubio, 2010). *Ninos y Crias* has carried on the monitoring programme which includes air census and bird ringing to study the population demography and the mobility patterns of birds between the two reserves. They also contribute to the identification and restoration of nesting sites and feeding grounds for the flamingo population. Environmental education regarding the conservation of this species is an important component of *Ninos y Crias*.

*Pronatura Peninsula de Yucatan* has had a leading role in the conservation program of sea turtles since before the establishment of the biosphere reserve offices. Sea turtle monitoring sites were established in 1988 in Ria Lagartos and in 1990 in Ria Celestun. To avoid plunder and raiding of nests, night patrols take place during the nesting season. To ensure safe arrival to the ocean without predation of the newly hatched turtles monitoring sites are established to assist with the release and monitor their journey to the sea. In order to obtain information to design conservation priorities, data is collected at monitoring sites and population studies developed. To create awareness among local communities, education activities are carried out by the team engaged in sea turtle conservation. Social research and trainee projects are also carried out by *Pronatura*, including capacity building for local ecotourism guides, support for local youth group initiatives and local nurseries growing dune vegetation. In addition, varied programmes of bird and mammal conservation are carried out by *Pronatura Peninsula de Yucatan.* These include the jaguar monitoring program established in 2001. To support conservation of ecological regions *Pronatura* has important work in areas located next to the study reserves, where it supports conservation initiatives along federal (such as the biosphere reserves) and state managed protected areas. Of high profile is the acquisition of 2,650 hectares of well conserved forest containing several water reservoirs next to Ria Lagartos, and registering it as a Certified Area for conservation known as '*El Zapotal*'.

Since 2000, the NGO *Biocenosis* has worked in Ria Lagartos supporting programs for the restoration of cattle farming areas and management to reduce human-jaguar conflicts. These projects involve working with farmers within the reserve, and the surrounding area, in order to promote sustainable farming practices. Resources for irrigation systems, electric fences and other infrastructure have been obtained by these projects (Biocenosis, 2002).

Since 2000, research projects from the *CINVESTAV* -Human Ecology department have supported the local organisation, *Actam Chuleb* in San Felipe, a local initiative for a community based marine protected area in the vicinity of the sea in Ria Lagartos (Fraga, Gavaldon & Echeverria, 2004). The 'Women Fishers of the Sea' organisation, have drawn attention to the management of crabs caught as a preferred bait for octopus fisheries, have also been supported by this research team.

The organisation Duck Unlimited de Mexico (*DUMAC*) has a field station in Ria Celestun supporting wetland conservation programmes with particular emphasis on migratory and resident birds.

Since 2002, the environmental youth network of Yucatan has carried out capacity building projects to strengthen young adults participation in sustainable living. As a result local youth organisations in San Felipe and Rio have raised and gained access to funding to carry out projects on ecotourism and waste management.

The census and monitoring of plants has been carried out by the Scientific Research Centre of Yucatan. Varied biodiversity and social conservation related studies have been carried out in collaboration with other institutions such as the Autonomous University of Yucatan and other academic and conservation organisations.

International organisations such as The Nature Conservancy, the Program of United Nations Development Programme and the Japan Agency for Environmental Cooperation have also contributed with funding to the biosphere reserves of study.

Reserves officers administrate the Program of Temporary Employment (PTE) to provide local communities with a benefit while contributing to conservation. Between

2007 and 2012 the PTE invested 3,301,937.00 Mexican pesos in Ria Lagartos and 2,459,828.00 Mexican pesos in Ria Celestun, funding salaries for erecting and maintaining signs along the reserves, for the removal of sediments from water channels along the roads built on the coastal lagoons, for building and maintaining fire breaks, and for other varied restoration or monitor projects for which labour is required.

In the Programme for Rural Sustainable Development, (PRODERS), reserve offices have funded local initiatives for conservation and development. In 2009, 1,692,814.00 Mexican pesos (equivalent to approximately US$153,892.2) were invested by PRODERS community projects in Ria Celestun and 1,282,215 Mexican pesos (equivalent to approximately US$ 116,565) were invested in Ria Lagartos (CONANP, 2013). Examples of projects funded in the reserves are, eco-tourism initiatives such as the acquisition of petrol efficient marine motors for ecotourism co-operatives; training to certify guides and tour operators; the construction of tourist board walkways in mangrove areas; running management trainee courses for local organisations to develop beach trial initiatives designed to observe sea turtle nesting; monitoring bird migratory patterns, and the supply of equipment to support ecotourism activities (including binoculars, books, lifejackets and boats). Ecotourism has been the major strategy employed to diversify people's livelihoods from fishing activity. Other alternatives to traditional work found in the villages funded by PRODERS are bee production, aquaculture, and units of wildlife management. Funding is provided to acquire beehives and equipment in both reserves, and to support aquaculture projects, including the infrastructure for crab production and the funding for studies to support initiatives for shrimp production. Initiatives supported for sustainable wildlife production (such as crocodiles, pheasant, deer and palms) include funding for fences and hydraulic infrastructure. Other developmental projects supported within the framework of PRODER's support programs embrace women's handicraft organisations and equipment for energy efficient stoves for homes.

In order to reduce fires, the reserve offices have initiated campaigns to encourage local stakeholders to follow the fire calendar established by the state government. This regulates the control and supervision of fires; the construction and maintenance of fire brakes, the coordination between rangers and civil defence early responses in event of

fire and the organisation of community watchers committees to prevent fires in the reserves (SEMARNAT, 2012).

Reserve offices give priority to reforestation programmes, particularly in 'nuclear' zones. This program includes the production, in nurseries, of threatened species representative of the different ecosystems included in the reserves. In order to reduce the impact on sea grass and mangroves, the reserve offices have placed signs with buoys in the coastal lagoons to create navigation routes.

Coordination between other institutions that work in the protected area is part of the agenda of reserve offices. Negotiations and advice from reserve offices to local councils cover a variety of topics such as,. the creation of policies to implement an Ecological Territory Plan which requires continuous work, and the search for sponsor partnerships to carry out projects such as waste management -which, with the support of the reserve, has been improved.

Coordination with animal control, animal rights and health institutions have been established to manage feral dogs and cats. The reserve project on pest control includes actions for dog census, dog management, sterilisation campaigns and euthanasia facilities. Synchronization with other governmental departments, such as institutions responsible for fishing, tourist, mining and road constructions to establish dialogue and ensure actions carried out follow the management plan policies. Coordination with other environmental departments such as the National Forest Commission, the Ministry of Environment and Natural Resources and the Federal Attorney of Environmental Protection are also essential to promote social and conservation programs in the reserves.

Patrolling in the reserve by rangers is a systematic activity. Rangers in Ria Lagartos reserve monitor the sighting of birds and crocodiles. The patrol reserve registers are used to update maps of land usage and biodiversity. These are used over-time for monitoring purposes.

Environmental education is an important conservation strategy carried on by reserve offices. They engage in primary schools programs, community events for the world

environmental day, the day of the Earth, public meetings with the communities' information boards to raise conservation awareness, receive feedback from the community and discuss initiatives. Ria Lagartos's environmental education follows a program based on a conservation calendar where different conservation topics are addressed and introduced according to the local and international interests. For example, the programme covers seasons of fishing closures, season of fires, and conservation week. Culture for conservation is the name of an environmental education approach in Ria Lagartos in which conservation programmes, based on identified needs, outline desirable conservation efforts for priority species in the reserve (such as flamingo, other birds, sea turtle, jaguar, wetlands and palms). A total of 738 activities of environmental education in the local communities of Ria Lagartos have been implemented between 2007-2012 (SEMARNAT, 2012).

While other operations and responsibilities are part of the reserve office work, the activities outlined in this section illustrate some of the most important interactions between stakeholders and officials in order to give a picture of the range of activity in which the agency of conservation of the protected areas engage.

### 5.5 Local communities

The present communities of both regions under study date from at least the 17$^{th}$ century. Their populations are descended from Mayans who settled in the area due to its potential for salt extraction and the associated trade, particularly in salt and salted meat; but also to a lesser degree in feathers, shells and seafood (INE & SEMARNAP, 1999). From colonial times, Mayans appear to have become mixed to some extent with people of Spanish decent. In Ria Lagartos, the Spanish influence may have been specifically enhanced by immigration from the Canary Islands during the 19$^{th}$ century (SEMARNAT & CONANP, 2006).

The two local communities under study in Ria Celestun are the township of Celestun, where 90 per cent of the total population of Ria Celestun lives; and Isla Arena, which is home to the remaining 10 per cent. The three communities under investigation in the Ria Lagartos are San Felipe, Rio Lagartos (hereby referred to as 'Rio' as it is commonly known and to avoid confusion with the name of the reserve) and El Cuyo. In Ria

Lagartos, the population is distributed more evenly, San Felipe containing 28 per cent; Rio (including the salt mining community called '*Las Coloradas'*) containing 46 per cent; and El Cuyo containing 26 per cent (INEGI, 2000). When information is presented at biosphere reserve level, data for Ria Lagartos is a combination of that collected separately from the townships of San Felipe, Rio and El Cuyo. With regard to Ria Celestun, information includes the combination of that collected from Celestun and Isla Arena, except when official information from Isla Arena is unavailable due to its population being below the norm for the generation of official statistical information; this, is noted accordingly.

As shown in Figure 5.5, except for Isla Arena, all the coastal communities under study experienced significant population growth in the last three decades of the 20th century. For example, Ria Celestun town increased 140 per cent from 2,520 to 6,065 inhabitants during the period 1980–2000 (INEGI, 1980, 1990, 2000), and the communities in Ria Lagartos increased on average by 56 per cent over the same period, from 4,226 to 6,620 inhabitants (INEGI, 1980, 1990, 2000).

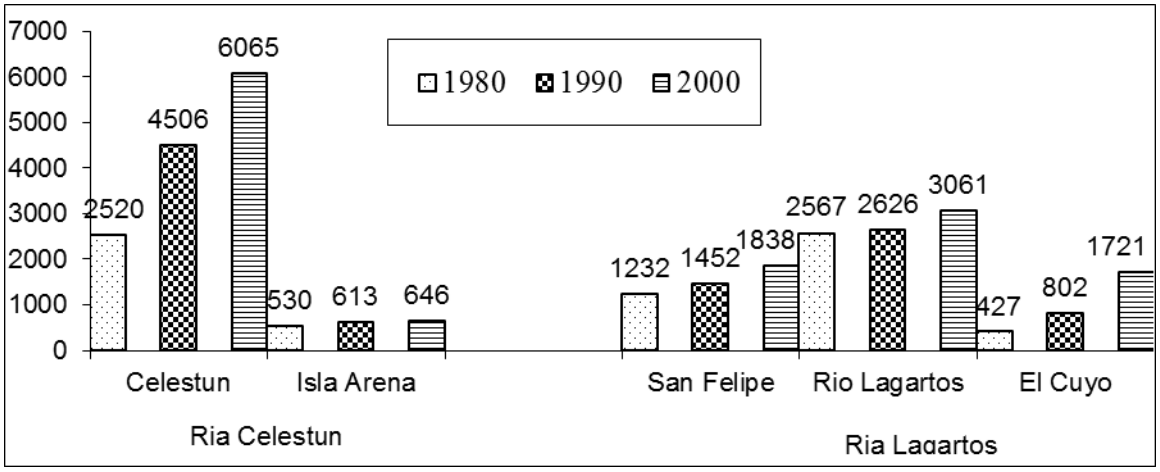



Figure 5.5 Changes in the populations of the communities under study for the years 1980, 1990 and 2000.
Source: INEGI, 1980, 1990, 2000.

Decades of high levels of population growth in Celestun resulting from the expansion of the fisheries industry have had significant consequences for local development. Figure 5.6 illustrates the poor living conditions in Celestun. This is evidenced by the fact that approximately 20 per cent of houses are built of discarded waste materials (INEGI, 2000). This is significantly higher than in Ria Lagartos where only three per cent of

houses are made of such materials (INEGI, 2000). Basic services are, "deficient but widespread," in Celestun, with 93 per cent of households enjoying an electricity supply and 96 per cent drinking water (SEMARNAT, 2000b: 32). However, houses are very crowded, with 47 per cent having only one room for the multiple occupancy of an average of 4.4 people (INEGI, 2000).

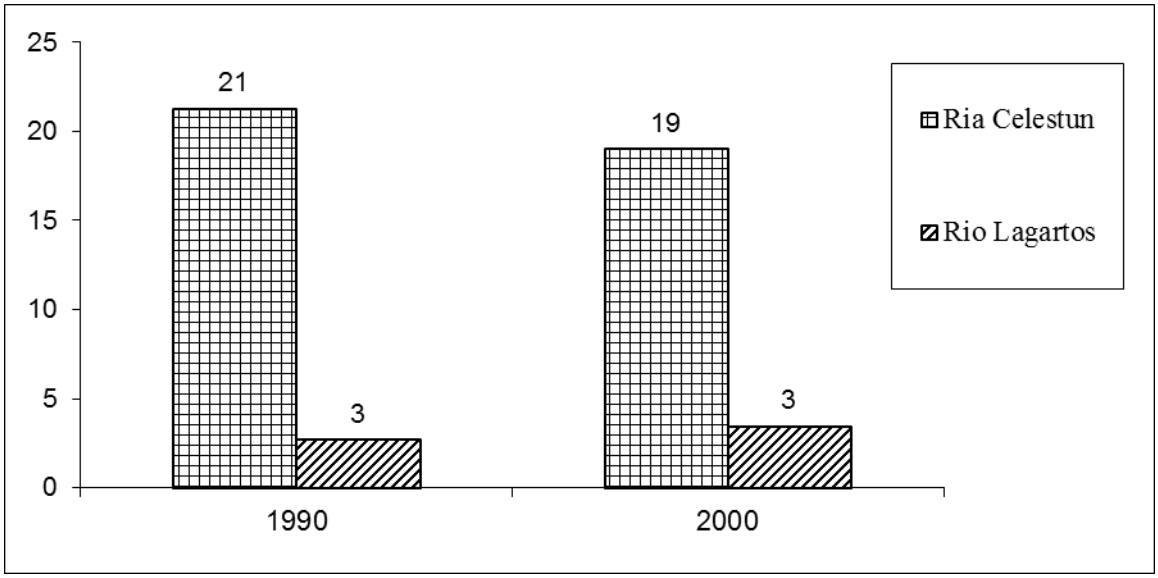



Figure 5.6 Percentages of housing constructed from waste materials in Ria Celestun and Ria Lagartos respectively. Source: INEGI 1990, 2000.

Housing in Celestun is unplanned and in some areas of the town appears disorganised. As a consequence of 60 per cent of houses being built on flood-prone land, hygiene is poor, with 41 per cent of families having no sanitary toilet and the resultant exposed faecal matter is a source of pollution (SEMARNAT, 2000b). Thus, the development of irregular settlements has resulted in an accumulation of waste that adversely affects the landscape and the water quality, and diseases such as cholera and gastrointestinal infections proliferate (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998).

All the communities under study are provided with health centres, but from 1995 to 2000, the child mortality rate increased in Celestun. In contrast, in Ria Lagartos, child mortality rates remained constant in the communities of Rio and El Cuyo, and actually decreased in the community of San Felipe (CINVESTAV, 2007).

The physical appearance of Ria Lagartos suggests that local communities here are not subject to the same degree of mismanagement as Celestun town. Whilst the

communities of Rio Lagartos and El Cuyo experience problems with waste management and water pollution, San Felipe stands at the opposite end of the aesthetic spectrum and the village is proud of its tidiness having received awards for the cleanest municipality in Yucatan in 2003 (Local government, 2007).

The education levels of all the communities under study are generally low with a slightly higher rate of illiteracy in Celestun. As Figure 5.7 shows, during the period between 1980 and 2000, an average of nine per cent of the population of Celestun could not read or write. This is higher than the average illiteracy level in Ria Lagartos for the same period of seven per cent of the population, but the difference between the two study areas has narrowed significantly since 1980 (INEGI, 1980, 1990, 2000).

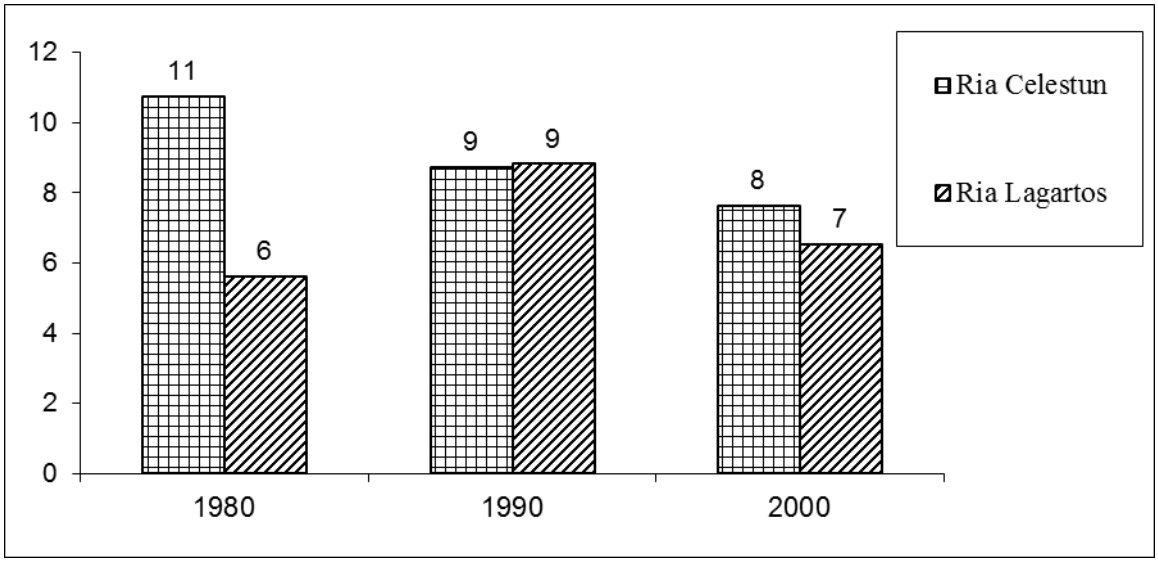



Figure 5.7 Percentage of illiteracy in people older than 15 years.
Source: INEGI, 1980, 1990, 2000.

Higher levels of education in Ria Lagartos are illustrated by the health centre census of 1997, showing 53 per cent of the population of Ria Celestun could read and write, but only 24 per cent finished primary school, and only 2 per cent finished high school or other technical studies (SEMARNAT & CONANP, 2006). In Ria Lagartos, 58 per cent of the population over the age of 15 years could read and write, but only 14 per cent completed primary school, although 7.4 per cent completed secondary school (INEGI, 2000). An update from the 2010 Census shows illiteracy levels in the population of 15 years old and over at municipal level. This shows Celestun having the highest level of illiteracy of the municipalities, with 9.6 per cent Municipalities in Ria Lagartos show

6.9 per cent illiteracy in Rio and 6.0 per cent in San Felipe (INEGI 2010). Online official information (accessed for an update of information) is provided at municipal level only.

The dynamics of formal education being interrupted at a young age to engage in fishing activities has traditionally been a common occurrence in the coastal communities of Yucatan, where fish stocks were abundant and practices largely unregulated. However, as a result of the depletion of fish stock and the consequent restriction of the activity by regulation, this dynamic seems to be changing. Local communities now encourage their children to continue with their schooling in order to explore other livelihood possibilities (Fraga, Echeverría, Ricci, Herrera et al., 2000).

Alongside poor living conditions, negative social indicators such as high levels of alcoholism and drug abuse have been documented in the local communities. Such indicators are highest in Celestun and lowest for San Felipe in Ria Lagartos (Fraga, Echeverría, Ricci, Herrera et al., 2000). In Celestun, the main cause of death is related to alcoholism-induced illnesses and other hepatic problems (CINVESTAV, 2007).

### 5.6 The expansion of the fisheries

The economic expansion that the coastal communities of Yucatan began to experience from the mid 1990s is closely linked to the collapse of the sisal (*Agave fourcroydes*) plantations of the inland region (Gómez-Escobar & Ortiz-Alvarez, 1999). Yucatan's unfavourable ecological and topographic conditions for agricultural development were nevertheless ideal for the sisal and other forms of agave cultivation that were suited to rocky soils. Prosperity based on the sisal industry positioned Yucatan as Mexico's richest state at the beginning of the 19$^{th}$ century. However, the rise of synthetic fibres affected the industry and the market declined from the mid 20$^{th}$ century following the Second World War (Méndez-Contreras, Dickinson & Castillo-Burguete, 2007). Indeed, sisal production dropped from 201,000 tons in 1916, to 23,859 tons by 1993 (INEGI, 1998 in Eastmond, 1999).

The collapse of the industry and failed attempts at crop diversification meant that by 1970, Yucatan's economic ranking had plummeted to one of the poorest states in

Mexico, a position it occupies to the present day (Eastmond, 1999). This decline resulted in widespread unemployment amongst the Mayan population and, as a consequence, large numbers of peasants moved to the coastal zone in search of the potential alternative livelihoods offered by its ecosystem.

As a consequence, the coastal communities of Yucatan – including those constituting the case studies – have experienced accelerated population growth in recent decades. Figure 5.8 shows the rates of immigration to Yucatan's coastal communities, with Celestun as the most attractive destination of those under study.

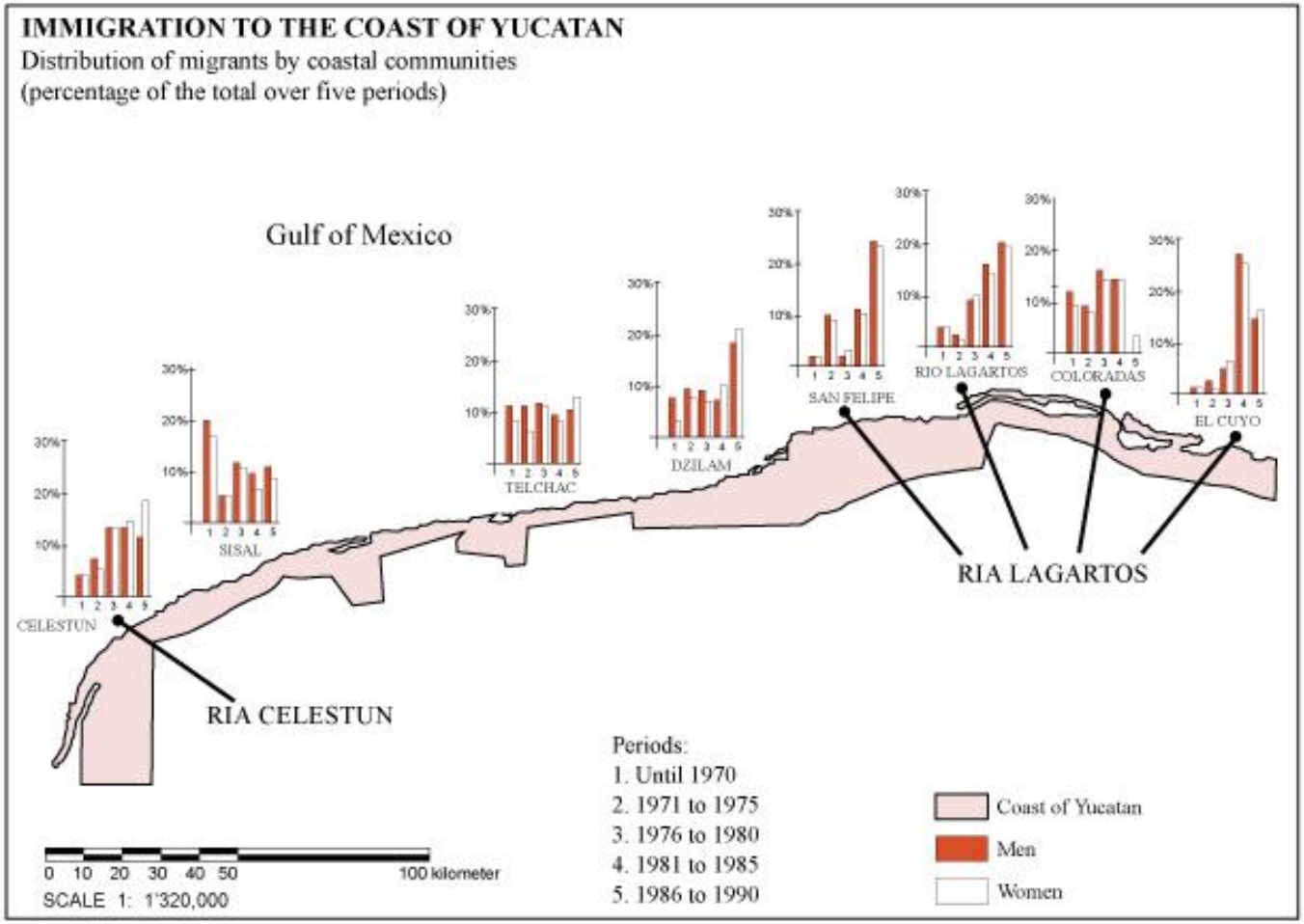



Figure 5.8 Immigration to the Yucatan coastal communities under study.Source: Adapted from Fraga and Maas, 1999.

Fishery dynamics have not only shaped economic and social growth, but also the wider pattern of development of the local communities under study. In the 1950s, the emergence of the fisheries occurred in parallel with the crisis in the sisal agro-industry. Fifty per cent of the immigration from this initial influx is considered by Fraga (2004) to be due to individual and group survival strategies rather than macroeconomic speculation. However, to begin with, fisheries played a fledgling role in the local economies of Ria Celestun and Ria Lagartos, and did not significantly affect the macroeconomics of Yucatan State. Indeed, public livelihood diversification programmes, including fishing training courses, had a very low success rate (Fraga, 2004).

It was not until the 1970s that Yucatan's fishing industries started to be of economic importance to the region. In this decade, local government policies seem to have contributed to the strengthening of the fisheries. Evidence of public and private investment can be seen in the extent of infrastructural work carried out, such as, for example, ice production and cold storage rooms to maintain the end product, and the construction of paved roads to facilitate communication between ports and market centres (SEMARNAT, 2000b; Sánchez-Salazar & Fraga, 1999).

Yucatan's annual fisheries production shows a marked increase over the two decades 1976 to 1996, from 26,000 tons to 46,000 tons (Castro-Suaste, Cíntora & Defeo, 2000). The state hosted the largest fishing fleet in Mexico and acquired national importance on account of its production – 60 per cent of the national volume of lobster (*Panulirus argus*), 80 per cent of its octopus (*Octopus maya* and *Octopus vulgaris*), and 100 per cent of the country's grouper (*Epinephelus morio*) (Sánchez-Salazar & Fraga, 1999). As Figure 5.9 shows, Celestun is the second largest producer of fish in Yucatan (Sánchez-Salazar & Fraga, 1999). The communities of Rio Lagartos produce significantly less than Celestun, but fishing is still the principle economic activity in these communities. For example, in the 2 largest townships of Ria Lagartos – San Felipe and Rio (Rio community is called by its full name Rio Lagartos in the diagram) – fisheries are typically 5.3 times more lucrative than livestock production and 2.3 times more than agriculture (SEMARNAT & CONANP, 2006: 27).

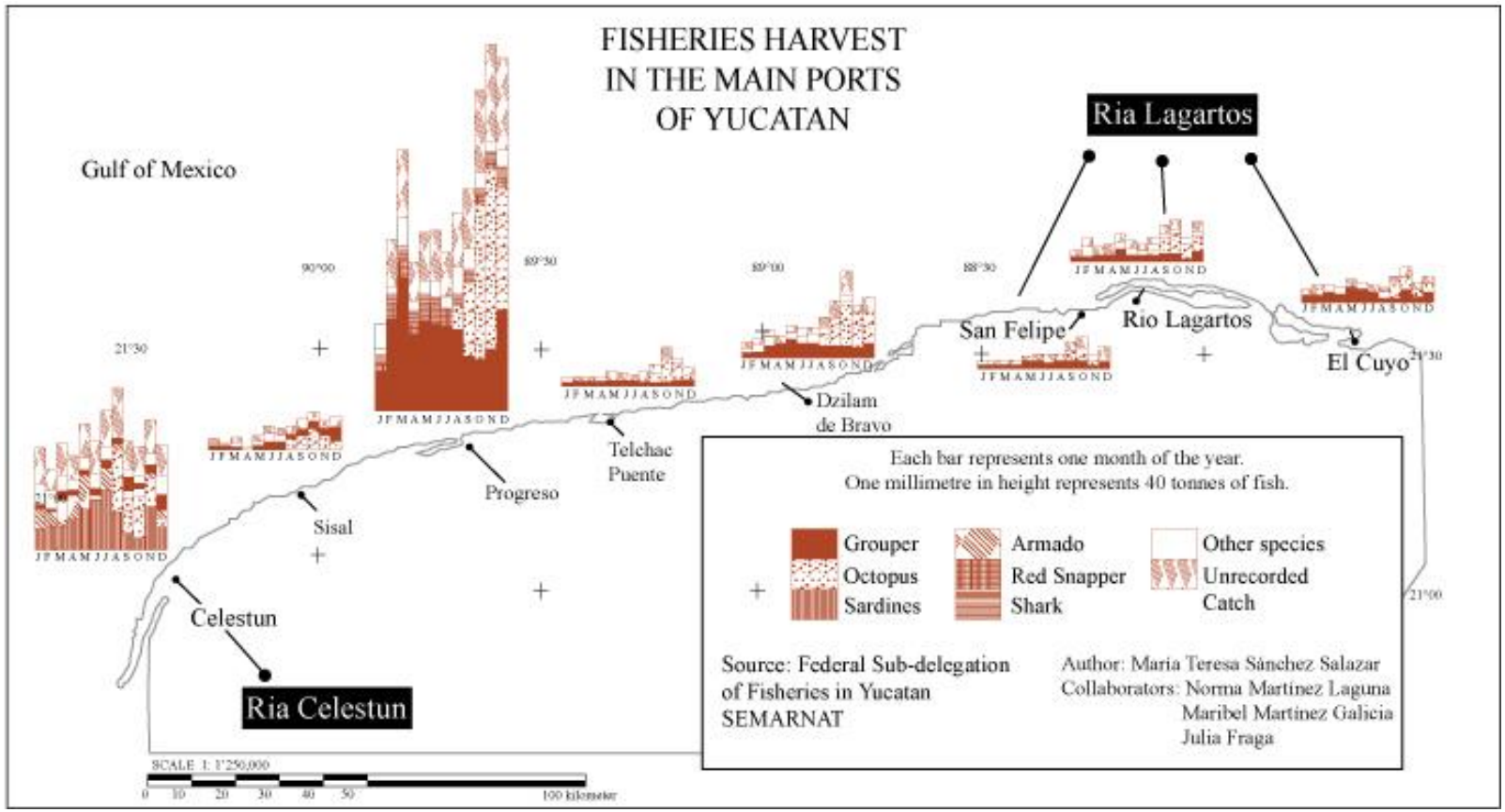



Figure 5.9 Fisheries production in Yucatan in 1994. Celestun occupied second place after Yucalpeten, where the state's industrial fisheries were based. Source: Adapted from Sánchez-Salazar and Fraga, 1999.

Given the potential for large returns in terms of the socio-economic conditions of the time, local fisheries experienced a rapid increase in numbers from the 1970s to the 1990s, until they eventually reached – and some overcame – the maximum sustainable yield (Castro-Suaste, Cíntora & Defeo, 2000). Fraga (2004) identifies a peak in Yucatan's fisheries activities in the 1980s, considering this to be the most fruitful period. During this decade, the state registered a doubling of fishing activities (both in terms of individual effort and vessels); the establishment of fishing co-operatives, and the consolidation of credit schemes and other forms of fisheries investment. Following this time of prosperity, Fraga considers the period from the early 1990s until the present day to be the 'stagnation stage' of the fisheries in Yucatan (Fraga, 2004; Sánchez-Salazar & Fraga, 1999), as characterised by insufficient financial support, overexploitation of fish stocks, and the increased marginalisation of living conditions (Sánchez-Salazar & Fraga, 1999).

Given the significant expansion of fisheries in Yucatan, a proportional increase in development at a local community level might have been expected, and with it a clear improvement in living conditions. As fisheries expansion was notably higher in the Ria Celestun region than in that of Ria Lagartos, it follows that there should have been a higher level of well-being in the former than in the latter. However, social indicators in respect of Ria Celestun for housing, health and education each show no correlation between micro and macro benefits. Rio Lagartos was rated higher in terms of those indicators. There is a multitude of socio-political dynamics that could be used to explain this disparity; however, the present study focuses on an explanation based on the aspects of natural resources management and development.

This research identifies the 1980s as a period of abundance even though local benefits did not in reality increase at the individual level. On the contrary, they decreased, a phenomenon that was exacerbated during the following period of fisheries stagnation. As Figure 5.10 illustrates, from 1980 to 1990, there was fairly stable fish production compared with the steep increase in the number of fishing vessels in operation (between 1971 and 1999 the fleet increased by 600 per cent).

Therefore, even though production was relatively consistent during this decade, the increased number of fishermen (entries) meant a reduction in individual income if no changes in the fish price. However, increase on the fish price recorded between 1986 to 1994 would

allowed to sustain an increasing entry trend to the fisheries, but only until reaching the maximum sustainable yield (Castro-Suaste, Mexicano-Cintora & Defeo, 2000). Reaching this point during the period of expansion of the fisheries resulted in fishing becoming no longer economically viable for the majority of people engaged in the activity. Reduction of individual revenues by high rates of fishing entries contributes to an explanation of why economic gains made by the fisheries at the regional level were not reflected to the same degree at a local level.

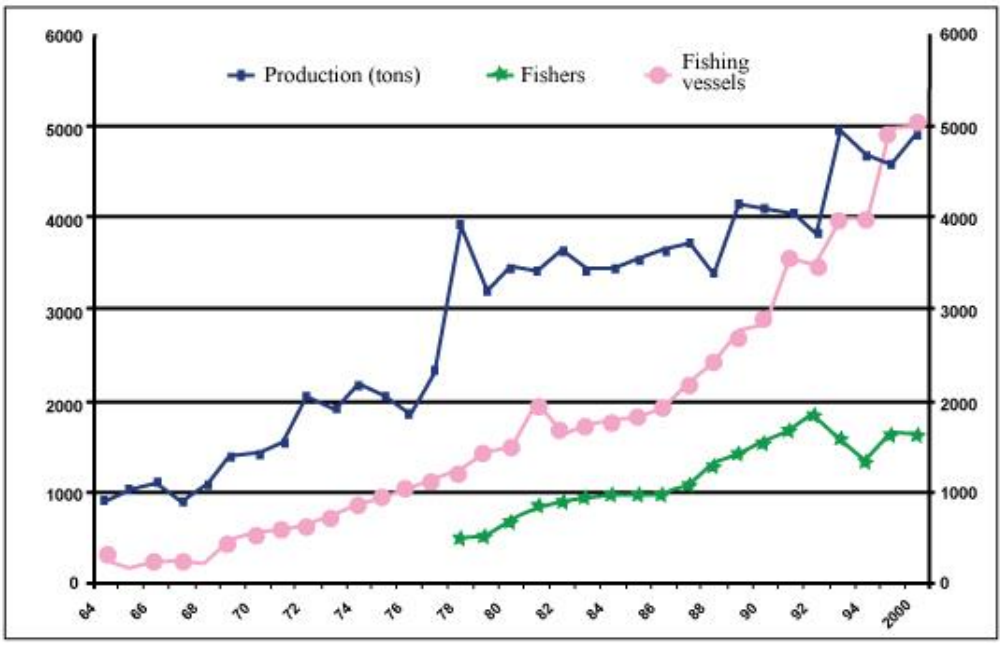



Figure 5.10 Evolution of the fisheries industry in Yucatan's coastal zone from 1964 to 2000.
Source: SEPESCA, SEMARNAT and SAGARPA in Fraga, 2004.

The expansion dynamic illustrated in Yucatan's fisheries is particularly common to open access fisheries and those that are poorly regulated (Seijo, Defeo & Salas, 1998). The withdrawal of fishermen owing to an initial reduction in net revenue – not necessarily due solely to the overexploitation of fish stock – has been widely discussed by Seijo, Defeo and Salas (1998). This phenomenon is clearly illustrated in the social dynamics of the communities under study. The delay in withdrawal from the industry by many of Yucatan's fishermen from 1993 onwards can be initially explained by an increase in the price). However extended delay in withdrawing from the fishing industry suggests resignation to the continued pursuit of an activity that provides mere subsistence rather than any real opportunity for development, a syndrome that offers an explanation for the worsening of fisher families' living conditions.

This phenomenon is most evident in Celestun, where the recent history of the community seems to show a clear correlation between immigration and entry into the fishing industry. Building a broader analysis on this perspective, Fraga's 'period of stagnation' could actually have commenced a decade earlier in Celestun. If individual benefit is included as an additional variable of production, the stagnation occurred as an immediate response to uncontrolled fisheries expansion during the 1980s when fishing policies, rather than restricting usage through regulations that incorporated the long term sustainability of the activity; promoted free entry to fishing as a solution to solve immediate unemployment caused by the decline in agriculture.

A closer analysis of the contribution of fisheries production is essential to any understanding of its potential effect on local development. As data, at state level shows, Celestun's fish harvest has dropped to an amount comparable with Ria Lagartos. It is thus relevant to compare the production trends of the former in relation to that of the latter. Information at a local level is limited, but the available data displayed in Figure 5.11 shows that between 1986 and 1991, while Celestun was a major producer, output slowly decreased from 5,610 tons in 1986 to 4,061 tons in 1991. In contrast, over the same period, production from the communities of Ria Lagartos, although lower in total output, increased from 3,208 tons to 3,892 tons.

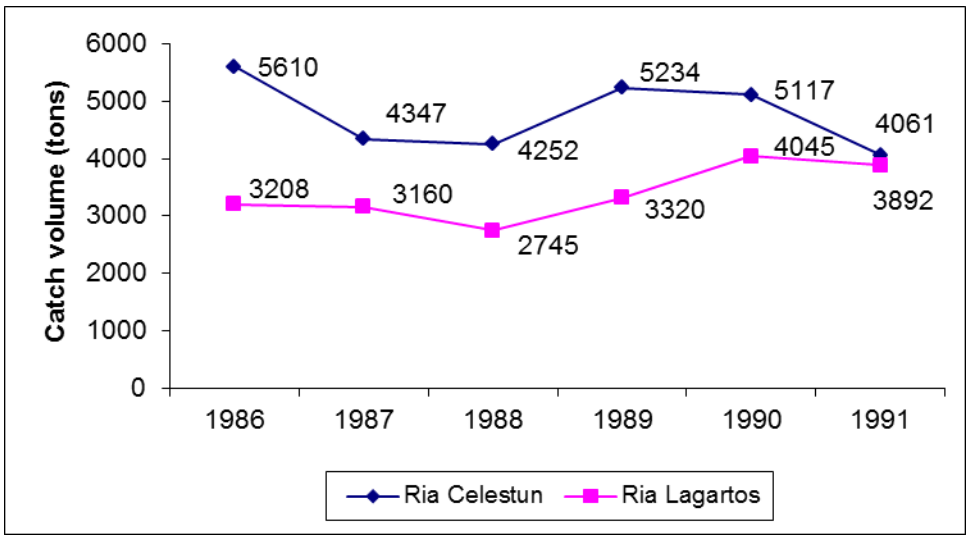



Figure 5.11 Total fishing production in Ria Lagartos and Ria Celestun from 1986 to 1991.
Source: INEGI, 1992.

The falling trend in Celestun's production could be explained by a general reduction of stock and poor fisheries management leading to overexploitation. However, further research into this hypothesis is required in order to identify particular fishery stocks.

Ria Lagartos' fisheries development shows a slowly rising trend in total production. From the 1980s to 2000, the region experienced an average population growth of 56 per cent. This was significantly lower than Celestun's rate of growth by 140 per cent for the same period. Ria Lagartos enjoyed a clear advantage over Celestun in its ability to obtain greater benefits from fisheries expansion. It had fewer entries into the industry. From this we can infer that there were greater individual benefits in Ria Lagartos than in Ria Celestun. In other words, despite Celestun maintaining second place in fishing production at a State level, their reduced catching trend and their higher entry of fishermen meant lower individual benefits while Ria Lagartos, despite having more modest catching trends, less entries into the fisheries contributed to greater individual benefits and improvements reflected in the local economy.

A closer examination of the distribution of benefits in the communities under study is also essential to any understanding of the potential contribution to or detraction from local development that may be attributed to fisheries expansion. In Celestun, in 1986, only 4 per cent of the total fisheries production of 5,610 tons was funnelled through social co-operatives and 1 per cent was produced by publicly owned fisheries, which left 95 per cent for the private sector (INEGI, 1992). Five years later, during the 'golden age' of fisheries, this dynamic had not changed substantially: just 5 per cent of the total of 4,061 tons caught in Celestun came from social fisheries, whilst the majority of catches (95 per cent) continued to be provided by private companies (INEGI, 1992).

In contrast, in Ria Lagartos, community-organised social co-operatives drove local development. In 1986, 40 per cent of the 2,745 tons produced by the 3 local communities under study were caught by social co-operatives, 44 per cent were provided by privately owned fisheries, and 17 per cent came from public fisheries (INEGI, 1992). By 1991, the contribution of social co-operatives to the total production of 3,892 tons had increased to 56 per cent of the total catch; the contribution of the private fisheries remained constant at 44 per cent (INEGI, 1992) (Figure 5.12).

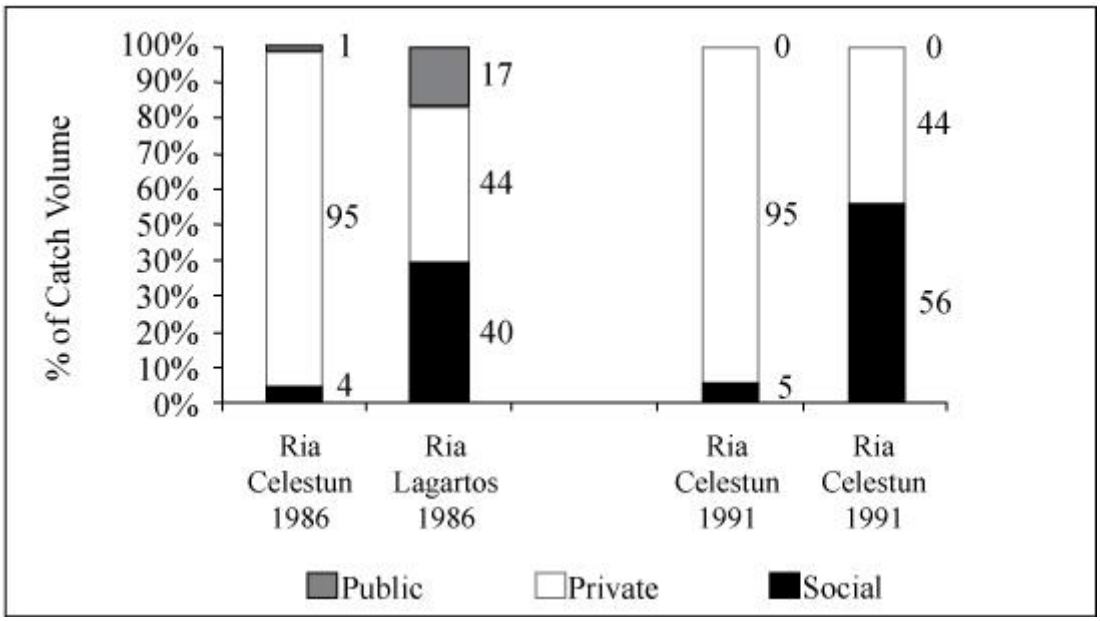



Figure 5.12 Composition of fisheries production in Celestun and Ria Lagartos for 1986 and 1991. Source: INEGI, 1992.

Moreover, the present study has found that the private sector in Celestun operates under a monopoly that is governed by a handful of individuals. An analysis of data from the state census of fishing vessels in Yucatan (SAGARPA, 2008) confirms that at least 31.25 per cent of fishing licenses issued in Celestun are controlled by one family. This family also owns the largest cold storage facility in town and has provided credit to a number of fishermen for the purchase of boats and equipment. The fact that fishermen are indebted to a commercial partner puts them in the vulnerable position of being obliged to sell solely to that cold storage facility. This places them at a disadvantage in terms of the capacity to negotiate a fair price for their product. As an additional follow-on effect, other cold storage facilities have no incentive to offer a more competitive price and so the distribution of benefits becomes even more polarised.

Nowadays, Celestun has no fishing social co-operatives. Fishermen reported internal conflicts that resulted in the business model not having operated sustainably for a significant period of time. On the other hand, the communities of Ria Lagartos have healthy fishing co-operatives and in situations in which conflict has emerged, local fishermen reported that they have divided and regrouped. In this way, social co-operatives have evolved and thrived rather than disappeared. Interviews with local communities revealed the importance of this model in strengthening the position of the fishermen. The organisational capacity of local communities

will be widely discussed in the results and discussion chapters of this study as this chapter aims at providing contextual elements for further analysis.

Another important aspect of natural resource management in relation to the decline of the fisheries is fish stock conservation. Fraga (2004) refers to the overexploitation of fishing stock in the stagnation stage during the 1990s. From an examination of Yucatan's main fishery, we can infer that there is poor management of fish stocks, such as, for example, the grouper (*Epinephelus morio*), a species whose national processing is concentrated in Yucatan. In 1983, there was a catch of 6,890 tons, which rose to a maximum of 13,698 tons in 1991; but since then, the volume has steadily decreased to 7,178 tons in 1996 (Castro-Suaste, Cíntora & Defeo, 2000) and an even lower average catch volume of 6,791 tons – between 2001 and 2005 (DOF, 2006b). This fishery was clearly overexploited. Despite delays on its regulation, a closed season from the 15$^{th}$ February to the 15$^{th}$ March was established in 2006 (DOF, 2006b).

This slow rhythm experienced in regulating fisheries shows a poor development strategy, focused only on a short term vision, whereby fishing activities were considered a panacea for the solution of broader socio-political concerns linked to the collapse of the sisal trade, rather than promoting a long term vision for the industry by incorporating monitoring and exploration of other economic alternatives to fishing. The short-term vision that characterised the expansion of the fisheries in Yucatan has resulted in incapacity to sustain growing local economies. As a response, higher pressures on inland ecosystems to access and extract sources of food and satisfactors are identified in this research and addressed in the discussions.

The decline in the total production of the fisheries at a state level has been noted. The contribution of the fishing industry to Yucatan's economy has dropped from 38 per cent to 31 per cent between 2002 to 2007 in spite of a 45 per cent increase in the value of the product from 1989 to 2004 (CINVESTAV, 2007). This might indicate the collapse of the fisheries, not only as an economic activity in Yucatan but also as a global industry that affects local prices based on the law of supply and demand. Nevertheless, a rise in fish prices would go a long way to sustaining larger numbers of entries into the sector; although it is questionable whether fishermen would see a rise in income in proportion to prices offered on international markets, or whether most benefits from an increase in fish prices would disproportionately

benefit the commercial fish markets. This question is more relevant in respect of Celestun due to the unequal distribution of fisheries, as previously noted.

The decline of the fisheries has in turn led to a new migratory dynamic affecting the local communities – particularly young people – who are emigrating to larger cities such Cancun, Merida, and the northern states of Mexico, often with the ultimate purpose of crossing the frontier to seek employment opportunities in the United States of America (Fraga, Echeverría, Ricci, Herrera et al., 2000).

A social assessment of the northern coast of Yucatan has also identified increasing rates of alcoholism and drug abuse that could be related to the limited scope for employment (Fraga, Echeverría, Ricci, Herrera et al., 2000). These problems reveal the need to reconcile social development and conservation policies in the reserves.

### 5.7 Local economies

This section introduces the most important activities in the local economy. A detailed analysis of all livelihoods will be addressed in the results and discussions chapters.

Figure 5.13 illustrates the overall trends in the main occupations of the economically active populations of the communities under study. Over half the population is employed in the primary sector even though this presents a decreasing trend. The chart also reveals the tertiary sector to be an emerging area of occupation in the local economy, followed by the secondary sector.

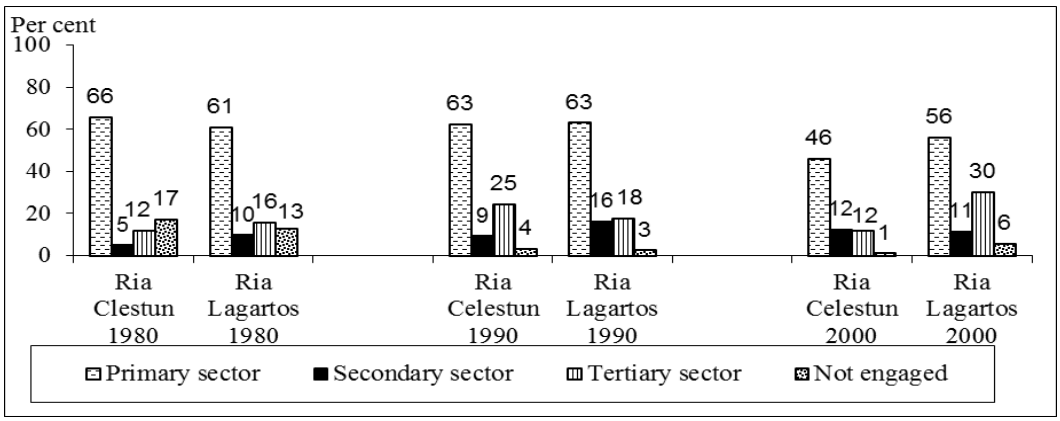



Figure 5.13 Sectoral distribution of the economically active populations of Ria Lagartos and Ria Celestun for the years 1980, 1990 and 2000. Source: INEGI 1980, 1990, 2000.

### 5.7.1 Primary sector

This sector includes fisheries, agriculture and livestock production. Even though the primary sector has historically provided a major contribution to the local economy (mainly sustained by the fisheries), it has declined over recent decades. As shown in Figure 5.10, between 1980 and 2000, the contribution of this sector to Ria Celestun's revenue fell from 66 per cent to 46 per cent of overall economic activities; although over the same period in Ria Lagartos the reduction was only from 61 per cent to 56 per cent of economic activities (INEGI 1980, 1990, 2000).

As has been widely discussed, the fishing industry represents the main primary sector activity and its historical dynamics have guided the extent of development in the communities. Livestock production is minimal in Celestun, but it has greater influence in Ria Lagartos (Gómez-Escobar & Ortiz-Alvarez, 1999) as it is located in a livestock production area of Yucatan (Ramirez-Cancino & Rivera-Lorca, 2010). Sixty per cent of the livestock in Yucatan is located in the north east side of the Yucatan where it has experienced an important growth in the last fifty years (Andrade, 2010 & Eastmond & Garcia de Fuentes, 2010).

Cattle are the most important livestock production in Ria Lagartos despite it being a land located in vast areas of floodable ecosystem where farming is impossible in rainy season. Farming activity in savannahs and low forest (called *Monte*) is characterised by extensive grazing with low management practices posing serious threats to natural habitats (Eastmond & Garcia de Fuentes, 2010). The rocky soils of the reserve (*tsekel*) mean that a large areas of between 5 to10 hectares of land is required per head of cattle, one of the most inefficient rates in the country. Nevertheless farming exists in these conditions because in comparison to other possible ventures on these poor soils, no major investment is required (Ramirez-Cancino & Rivera-Lorca, 2010 & Eastmond & Garcia de Fuentes, 2010).) In addition to high levels of deforestation associated with this practice soil erosion by induced by cattle reduces the regenerative capacity of ecosystems (Vega-Moro, Cepeda-González, Durán, Méndez et al., 2006). Deforestation to create paddocks through slash and burn techniques has been supported by regional policies designed to support cattle farming (Ramirez-Cancino & Rivera-Lorca, 2010). Poor practices of farming in the reserve allow for free grazing of cattle anywhere rather than encouraging forage production. Thus, cattle invasion in low forest (*Monte*) is allowed and due to the animal's selective feeding patterns the reproduction of

weeds is exacerbated. Cattle invasions in to '*nuclear*' areas of the biosphere reserve have been reported as a challenge in Ria Lagartos archival information and during interviews. Cattle intrusions into forests are accentuated during the dry season as local farms are rarely provided with irrigation systems (Biocenosis, 2002). Cattle farming in the reserve is a major threat to biodiversity as it has led to the deforestation of 7,341 hectares in the Ria Lagartos biosphere reserve between 1976 and 2001. This corresponds to 12.2% of the total protected area (CONANP-FMCN, 2005 in Andrade, 2010). Agrochemicals used in farming practices cause soil and water pollution which affects birds, rodents and fish (Duran et al 2006 in Andrade, 2010); and pesticides have been found in costal lagoons and in sea-turtle eggs in Yucatan (Andrade, 2010)

Agriculture in the area is a minor activity as most of the soil is thin and carbonate-rich, with poorly developed horizons typical of karst. Due to close proximity to the estuarine river systems, there are high levels of salinity in the savannas and marshes closer to the coast, and the shallowness of the inland soils makes agriculture production impracticable (SEMARNAT & CONANP, 2006). However, small subsistence *milpas* (vegetable gardens based on the traditional cultivation of maize, pumpkin, chilli peppers and beans, and characterised by traditional cycles of slash-and-burn soil preparation) are still maintained by the communities under study (Eastmond, 1999).

Forestry does not figure as an important economic activity in the literature used to describe the two areas. However, during the 19$^{th}$ century and the first half of the 20$^{th}$ century, inland forest from El Cuyo in Ria Lagartos was an important extractive zone of precious wood, particularly in the area known as *Colonia Yucatan* (Biocenosis, 2002). Locals recounts of 'The Mountain' refer to the existence of a high forest that might have disappeared as a result of limited planning of their extraction as is documented generally for Yucatan (Martinez-Caballero, Sabido-Zetina & Salas-Vargas, 1999).

### 5.7.2 Secondary sector

The slump in the economic contribution of the primary sector due to limited opportunities as the population increased has led to diversification into the secondary and tertiary sectors, each of which have experienced slight growth. In Ria Lagartos, the secondary sector increased from employing 10 per cent of the active economic population in 1980, to 16 per

cent in 1990, and then fell again to 11 per cent in 2000 largely due to the improved mechanisation of salt production (CINVESTAV, 2007). The secondary sector in Ria Lagartos principally comprises the salt industry, which represents 21 per cent of overall coastal industrial activity (CINVESTAV, 2007).

Given the climatic and geological features of the Yucatan's coastal lagoons, which are characterised by an absence of surface rivers and high rates of evaporation, salt extraction has been practiced in both reserves since ancient times (INE & SEMARNAP, 1999). In Ria Lagartos, salt mining was industrialised in 1946 and fell under the control of the private sector. Yucatan's salt industry was established 12 km from Rio Lagartos town through the granting of government concessions before the region was registered as a protected area.

The controlled evaporation and crystallisation lagoons developed for this purpose were increased in area from approximately 20 hectares in 1945 to 1,200 hectares by 1977, despite the area already being designated as a protected area. From 1979, its expansion continued, reaching 2,400 hectares in 2006 within a total concession of 5,000 hectares (SEMARNAT & CONANP, 2006). According to the Management Plan, the company is estimated to currently cover an operational area of 24, 000 acres (approximately 9,715.4 hectares) (COSYSA, 2010), which is greater than the already questionable large size of concession. The annual production of 500,000 tons of salt is sold on national and international markets. Given the high volume of production, salt is considered to be the second most important natural resource exploited on the coast of Yucatan (CINVESTAV, 2007).

Local inhabitants employed in the salt industry comprise approximately 225 families (Ortiz, 2006 in SEMARNAT & CONANP, 2006). According to the number of homes in Ria Lagartos (INEGI, 1995), this benefits approximately 28 per cent of households. Income is low, but residents in the settlement of Las Coloradas are permitted to reside on land granted to the industry (INE & SEMARNAP, 1999). However, wealth generated by the salt mining sector, measured in value added to local gross domestic product, dropped by 71 per cent between 1989 and 2004 (CINVESTAV, 2007).

In Ria Celestun, the secondary sector increased from 5 per cent of the local economy in 1980 to 12 per cent in 2000 (CINVESTAV, 2007). In Celestun, 92 per cent of the secondary sector is represented by seafood packaging, which comprises 7.4 per cent of Yucatan's coastal

industrial sector (CINVESTAV, 2007). Salt extraction in Ria Celestun is only practiced on a small scale by local producers (SEMARNAT, 2000b).

### 5.7.3 Tertiary sector

The tertiary sector of the economy is mainly represented by tourism, which in recent years has increased in local importance. In 2000, 12 per cent and 30 per cent of the economically active populations of Ria Celestun and Ria Lagartos respectively were engaged in this sector (CINVESTAV, 2007).

The main attraction in both reserves is a cruise along the estuarine river to observe birds and swim in the *Petenes*, which contain crystal-clear spring water from underground aquifers. The large colonies of flamingos make a dramatic visual impact along the estuarine river where they feed. Another popular tourist attraction after the cruise is to enjoy fresh seafood in local restaurants. Other minor tourist activities that have recently been promoted include open-sea cruises; catch-and-release fly fishing (in Ria Lagartos); bird watching in the jungle; and crocodile spotting by the river at night (in Ria Celestun).

## 5.8 Conclusion

The two protected areas under study are of highly significant biological value given that they sustain enormous levels of biodiversity and represent crucial hydrological functions for the Yucatan peninsula basin. A cultural background of Mayan heritage with a rural/coastal tradition is characteristic of the communities under study. The geographic location of the reserves; their ecological properties; historical backgrounds; and their socio-economic dynamics all present an important context for the analysis of integrated conservation.

Local communities in the research areas have traditionally exploited diverse natural resources from coastal and inland ecosystems to supplement their livelihoods. In terms of economic development, these natural protected areas contain the second most important region for salt production nationwide (Ria Lagartos) and Yucatan’s second most important fishing port (Ria Celestun).

A history of the development of coastal communities’ under an analysis of sustainable development show the impact of economic and social policies on the state of fisheries, the

main reason for the foundation of the communities of study. The effect of state level developmental policies to promote fisheries in Yucatan as a response to the agricultural collapse of sisal shows a correspondingly negative impact on the development of local communities studied. However, lessons learnt from the limited management of the fisheries can provide important input for future conservation policy. Aspects such as the inequitable distribution of benefits from fisheries; low levels of local organisation in accessing resources (the absence of co-operatives), and the higher levels of immigration, higher levels of poverty, and lower levels of education in the communities of Ria Celestun, compared with that of Ria Lagartos should not be overlooked. These factors are identified in the present study as elements that need to be understood and addressed in implementing an integrated conservation and development approach.

Tourism has recently increased in popularity. This has resulted in an intensification in the reliance on certain ecosystems. Ecotourism has been a major initiative to address livelihood diversification since the fisheries reached their maximum level, and offers attractive livelihoods. Tourist infrastructure has grown in popularity with affluent visitors since the establishment of reserves, an interesting area of focus when analysing sustainable livelihoods encapsulated in this research.

Policies to promote farming have emerged as an alternative activity to the overexploitation fisheries. Cattle farming policies however in Ria Lagartos have not provided the good results due to the inadequacy of soils and creates high rates of land degradation. Cattle farming is considered a major threat to forests cover, soil and water pollution, and conflicts with the efforts to conserve native mammal species.

Mining in the area existed before the reserve was established. However, it is questionable whether such an expansion as that of the Salt Industry should have been permitted under policies of conservation once the biosphere reserve was established, given that their operation had been identified as impacting markedly on biodiversity. It is also important to point out that the expansion of the industry not only negatively affected the ecosystem but in social terms it provides only minor benefits to the local communities, as shown in the employment rates and low salaries.

The creation of the reserves has attracted resources that are required to carry out important functions that could contribute to the reversal of trends of environmental degradation and wildlife depletion as demonstrated by examples of hydrological restoration actions to stop the process of drying up of coastal lagoons and conservation programs for pink flamingo and sea turtles that have contributed to the population recovery of those emblematic species. The reserve offices, in collaboration with a variety of institutions and local actors, have an essential role in implementing the management plans designed for reserve conservation. The establishment of the reserves has set the agenda to enable the exploration of strategies for the monitoring and managing of priority species and ecosystems. A base line of information to create and assess conservation programmes has been initiated. The challenges of implementation as established in the reserve principles, is the topic of this research.

# CHAPTER 6: "RESULTS"

## 6.1. Introduction

This chapter presents the results of the Integrated Conservation Assessment (ICA) carried out in the case studies conducted in Ria Lagartos and Ria Celestun biosphere reserves. Three main components are analysed through the ICA:

1. Local cost and benefits,
2. Local livelihoods, and
3. Local participation

The evaluation for each component starts by presenting a brief overview of the major political and academic narratives identified in official documents and interviews with the managers of the protected areas. It then assesses the efforts of local stakeholders who discuss these topics in focus groups. Triangulation of information obtained by mixed methods of data collection and from a variety of informants including local stakeholders, rangers, protected area managers, and conservation policy makers are then compared.

## 6.2 Benefits and costs

### 6.2.1 Background and narratives

Policy officials at both national and regional (Yucatan Peninsula) levels acknowledged that some of the very first experiences of conservation management did inflict significant social costs upon local communities as, in some cases, the policy was used to drive land expropriation in order to establish protected areas. Managers from the national offices of the Commission for Protected Areas recognised the existence of some cases in Mexico, where affected communities were not offered the appropriate level of compensation. They argued that since the 1980s, policy had evolved to ensure that no further cases involving the displacement of people occur in Mexico. Therefore, such experiences were rare. A major aspect in the policy to avoid expropriation in the process to establish regions for conservation is concentrating on areas in which the vast majority of the land is publicly owned. A complementary strategy focuses on promoting biosphere reserve schemes, as this type of protected area designates 'nuclear' zones (those of restricted access) and buffer zones (those in which sustainable livelihood activities are promoted). Therefore, "nuclear zones' instead of

displacing people, aim to be designated mostly in public land. Buffer zones aim to cover private property and *ejido* land in local ownership. Thus, national policy has relied on the designation of biosphere reserves to implement protected areas with an integrated approach by allowing larger areas to be protected as well as having the potential to reduce social costs and generate local benefits.

Changes in the current policy for protected areas focus on providing communal benefits by integrating the approach of conservation with local communities development (CONABIO 2000; CONANP 2001, CONANP 2002 & INE 2000). This approach has promoted regulation rather than prohibition of local livelihoods. The agency of conservation, for example, reported that they work with the community to regulate livelihood related activities in buffer areas in order to avoid creating a negative perception amongst the local community. For instance, they established areas of wood collection and instigated a regulatory approach to extractive activities rather than a prohibiting approach.

Nationwide policy efforts to transfer local benefits to inhabitants of protected areas include, the allocation of social funding to involve local participants as advisory bodies, diffuse environmental education in the local communities and promotion of sustainable livelihoods to compensate local costs. The financial instruments PTE (Program of Temporary Employment) and PRODERS, (Program for Sustainable Rural Development) were highlighted in interviews with national and local officials of conservation as concrete examples of funds offered to local stakeholders in order to access financial resources to implement grassroots conservation and development initiatives. National conservation officials emphasised the role that local ecotourism has had as a major strategy for conservation and sustainable development in communities that are located in protected areas. This was also reported by head managers of the protected areas of study as an example where local benefits from protected areas are promoted.

### 6.2.2 Local benefits: user groups perspectives

In order to identify local benefits which are attributable to the conservation policies from the biosphere reserves of study, seven indicators were identified and measured in order to establish the variable ‘local benefits’. As discussed in the previous chapter, this indicator principally addresses benefits derived from the protected areas that flow directly to the

communities resident in them, such as 1) improvement of municipal services; 2) supportive community and cultural services; 3) regulation of tourism services; 4) diversification of livelihoods support; 5) infrastructure for economic development; 6) employment linked to conservation; and 7) income from park entrance fees invested in the community.

Figure 6.1 shows, benefits acknowledged on the part of local stakeholders in both reserves tend to be more substantial in respect of Ria Lagartos, where 76% of the possible benefits recognised to exist, while in Ria Celestun, only 57% of the benefits were recognised by local stakeholders.

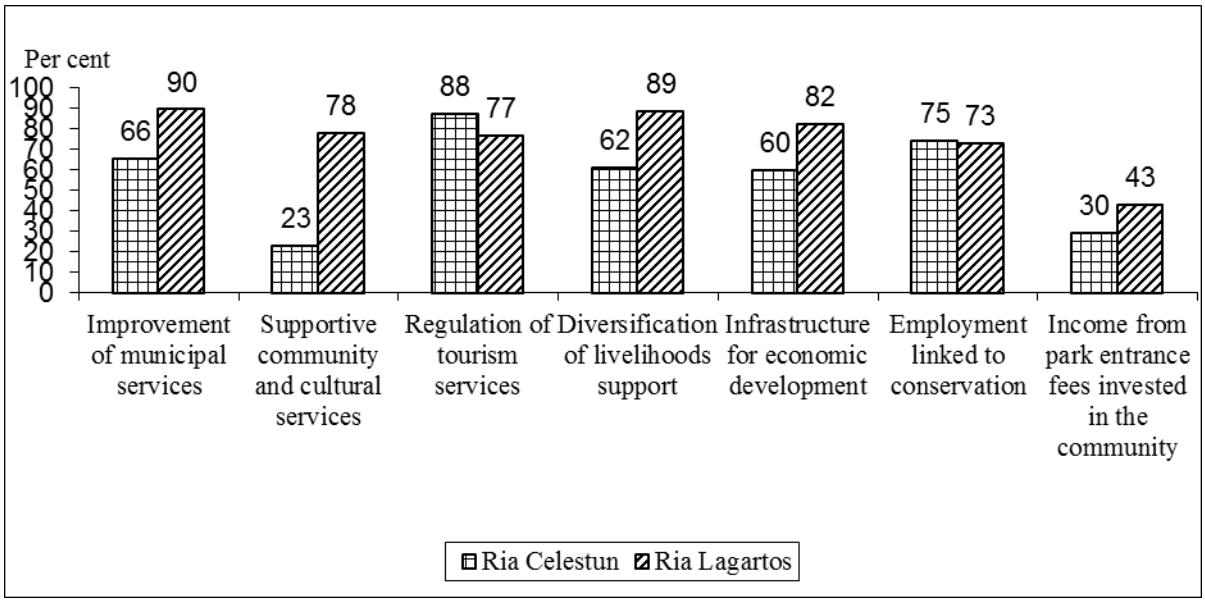



Figure 6.1 Percentage of stakeholders citing the presence of each of seven local benefits in the protected areas under study. Source: The author.

With the exception of gains directly related to tourism, all the indicators of local benefits are higher in Ria Lagartos than in Ria Celestun.

Figure 6.2 shows the individual assessment of each indicator used to assess the variable ‘local benefits’, the input values being averaged for each protected area. The average was calculated from a proportion of the population (see Chapter 5 Section 5.3.1.3 Incorporating population in the final variables score), as the total population of neither reserve was homogeneously

distributed throughout its respective communities. Input value data for each indicator was as follows:

| | Improvement of municipal services | Supportive community and cultural services | Regulation of tourism services | Diversification of livelihoods support | Infrastructure for economic development | Employment linked to conservation | Income from park entrance Fees invested in the community | Overall local benefits |
|---|---|---|---|---|---|---|---|---|
| Celestun | 70 | 20 | 88 | 60 | 60 | 80 | 30 | 58 |
| Isla Arena | 25 | 50 | n/a | 75 | 63 | 25 | 25 | 44 |
| Ria Celestun | 66 | 23 | 88 | 62 | 60 | 75 | 30 | 57 |
| San Felipe | 100 | 73 | 91 | 73 | 100 | 55 | 91 | 83 |
| Rio | 86 | 86 | 71 | 100 | 86 | 86 | 14 | 76 |
| El Cuyo | 86 | 71 | 71 | 86 | 57 | 71 | 43 | 69 |
| Ria Lagartos | 90 | 78 | 77 | 89 | 82 | 73 | 43 | 76 |

Figure 6.2 Data inputs and process to obtain the score for local benefits. Source: The author.

*Notes: Indicators multiplied by a percentage of the population of each community as follows:*
*Ria Celestun = (indicator Celestun *0.9) + (indicator Isla Arena *0.1).*
*Ria Lagartos = (indicator San Felipe *0.28) + (indicator Rio *0.46) + (indicator El Cuyo *0.26).*

The indicator 'improvement of municipal services' was highly rated by 90 per cent of Ria Lagartos stakeholders, but by only 66 per cent of stakeholders in Ria Celestun. The stakeholders of Ria Lagartos cited examples broader than the issue of refuse collection alone, including solid residue management; workshops on waste management held by conservation personnel; the promotion of the separation of solid waste residues; and the creation of a new waste disposal facility. Improved management had meant a reduction in obnoxious odours,

and less soil and water pollution. In Ria Celestun, the acknowledgement of benefits was limited to refuse collection and no other examples where noted by local stakeholders. It is important to note that pollution from waste remains a visible problem in the town of Celestun and, to a lesser degree, is also visible in Isla Arena.

Seventy-eight per cent of informants in Ria Lagartos considered that reserve activities had led to an 'improvement in community support and cultural services' since its inception, while only 23 per cent of informants from Ria Celestun considered this indicator had improved since the establishment of the reserve. Ria Lagartos stakeholders mentioned the establishment of community events, such as concerts, music and dance tuition associated with the yearly town celebration and the flamingo festival as examples of community support and cultural services that had improved in the last decade. Ria Celestun stakeholders mentioned the yearly town celebration in isolation without mentioning any opportunities associated with other conservation events.

'Regulation of tourism services' as an indicator was assessed to be ten per cent higher in Ria Celestun than in Ria Lagartos (88 per cent compared to 78 per cent). This indicator, and the next 'employment linked to conservation', were the only two ranked higher in Ria Celestun than in Ria Lagartos, findings that are consistent with information provided in Chapter 5 (see 5.6 Local economies), where it was found that the generation of employment from tourism in Ria Celestun was higher than in Ria Lagartos. The improvement and regulation of tourism services in Ria Celestun was acknowledged by 88% of local stakeholders as the major local benefit attributable to the biosphere reserve. A broader analysis of tourism is provided in the next section concerning livelihoods.

In Ria Lagartos 89 per cent of informants stated that there had been 'community support for livelihood diversification' since the inception of the reserve, but only 62 per cent of informants in Ria Celestun agreed. Ria Celestun informants cited a local development programme for funding small businesses which had explored aquaculture potential, but could provide no successful examples of new economic activities that had been operational for more than two years. They reported ecotourism as the main alternative livelihood supported. In Ria Lagartos communities various initiatives that indicated a broader degree of diversification were reported including ecotourism; women's organisations for the

establishment of bait fisheries; sustainable wild bird breeding ventures; and community patrol programmes.

Seventy five per cent of informants reported the indicator 'employment linked to conservation' as a benefit in Ria Celestun. In Ria Lagartos the figure was slightly lower at 73 per cent. In Ria Celestun, the benefit was almost entirely related to jobs in ecotourism rather than other direct employment by the protected area agency. In contrast, in Ria Lagartos, although the percentage was slightly lower a greater range of occupations attributable to conservation were mentioned including jobs as rangers; and temporary employment as research assistants, environmental contingency leaders, and short-term jobs assisting on restoration projects.

'Infrastructure for economic development' was considered to be a benefit by 82 per cent of stakeholders in Ria Lagartos and by 60 per cent in Ria Celestun, where tourism infrastructure was mentioned in particular. The main infrastructural developments in both reserves were associated with tourism, which was promoted through heavy investment in park headquarters, and also through small grants for the construction of tourist facilities, such as marinas for easy access to boats, which were accessed from a local sustainable development fund. However, in Ria Lagartos there seems to have been a broader perception of such benefits, as informants included additional examples attributable to conservation efforts related with the reserve, such as infrastructure for waste management and support for erecting electric fencing to restrict cattle movement.

In 2002, the NCPA officially established an entrance fee of less than US$2 to some protected areas with tourist attractions for the purpose of contributing to management funding. However, the indicator 'income from park entrance fees invested in the community' was not generally perceived as a benefit from either area of study as only 43 per cent of informants in Ria Lagartos and 30% of informants of Ria Celestun perceived that the 'resources derived from entrance fees to the protected areas' represented a local benefit.

In Ria Celestun and some areas of Ria Lagartos, the entrance fee was paid at the visitors' centre, which was administered by the Ministry of Culture and Tourism (CULTUR). A common stakeholder belief was that the revenue thus earned nourished the CULTUR budget rather than that of the National Commission for Protected Areas. According to the

Commission, the resources obtained from the entrance fee were sent to the Tributary Administration Service. The ultimate distribution of this income did not directly benefit each protected area and, there was no clear information on the final allocation of resources. That is because some protected areas of high tourist destinations get huge incomes and protected areas that are as important but with less tourism attractive receive less, therefore the policy in Mexico is to collect all the fees centrally and then divide them across the national system based on a criteria of needs rather than directly returning locally all revenue received. Thus, not surprisingly, entrance fees were not widely considered to constitute a gain for local stakeholders. Nevertheless, even though less than half the informants of both protected areas failed to consider the entrance fee to be a benefit, there were important differences in their perceptions, a point that is discussed in further detail in the following chapter.

### 6.2.3 Transfer of benefits: triangulation

The political narrative presented in the initial section of benefits and costs is to a certain extent consistent with the assessment of local benefits made by stakeholders in both reserves. However there are some differences in the perception between the communities in Ria Celestun and those in Ria Lagartos, and the comparison of these perceptions with external participants are described in this section.

According to officials and managers of the biosphere reserves and in agreement with policy narratives emanating from the Commission for Protected Areas at local, regional and national levels, the seven indicators of local benefits listed are attributable to conservation policies related to the establishment of the protected areas. The local assessments of these indicators show interesting variations in perceptions between each area of study. In Ria Lagartos local stakeholders identified a higher level of overall benefits attributable to conservation related with the reserve, than local stakeholders from Ria Celestun. Over 70% of informants attributed six out of the seven indicators of local benefits to exist in Ria Lagartos whilst in Ria Celestun a lower percentage attributed only five out of seven indicators as local benefits in their area.

This assessment does not differ significantly from the view of rangers, although they seem to attribute fewer local benefits from conservation than local communities do. The majority of Ria Lagartos rangers agreed on five indicators of local benefits - improvement of municipal

services; cultural services; regulation of tourism; infrastructure development; and employment opportunities. In Ria Celestun rangers identified approximately half of the indicators of local benefits, namely, improvement of municipal services; regulation of tourism; and infrastructure development.

Even when the overall assessment of transfer of benefits from conservation to local communities does not dramatically differ between conservation officials, local stakeholders and rangers the perception of attribution of benefits seems to be higher for conservation officials, followed by local stakeholders and then by rangers. It is interesting to note that out of the three main participants analysed, rangers made the lowest estimation of local benefits attributable to conservation. The views of rangers need to be understood as they are the people who deal directly with the local stakeholders and see any failures to follow conservation rules in the area. While on patrol they witness activities which both benefit and cost the local community where they live. Therefore, the rangers opinions are embedded with less of a narrative factor than those of central managers and are more practical as far as implementing conservation policies. This needs to be taken into account in this analysis.

Specific indicators demonstrate a certain disparity between local stakeholders and rangers' views, in respect of Ria Celestun in particular. Indeed, perception of the indicator 'diversification of livelihoods' shows some inconsistency in terms of both reserves, a point that is addressed in the section on sustainable livelihoods.

Analysis of the indicator 'cultural services support' requires an understanding of aspects of the social context of Ria Celestun. When addressing this indicator, Head Office personnel identified and reported in interview, problems of alcoholism, intra-family violence, gender inequality, and drug addiction. Notably, they reported a recent initiative comprising an intervention that involved co-operation between various health institutions to address these issues. However, local stakeholders did not seem to identify this programme as a benefit attributable to the reserve management efforts. Only 23 per cent of local stakeholders of Ria Celestun attributed cultural support services as a benefit influenced by conservation policies. In Ria Lagartos, acknowledgement of 'cultural services support' by 78 percent of local stakeholders was consistent with the view held by managers and officials.

The head officers of the protected areas and the policy makers interviewed reported that an important benefit from conservation for local communities is the employment opportunities attributable to the biosphere reserve. There is a need for permanent and temporary workers to assist in the management of biosphere reserves on projects such as restoration, monitoring and patrolling. Seventy five per cent of local stakeholders in Ria Celestun associated increasing employment opportunities to the conservation policies linked to environmental protection. However, in assessing this in Ria Celestun, the majority of informants linked the benefits to ecotourism only. Rangers did not attribute this indicator to the reserve. One person from the local community is reported to be employed as a ranger. In Ria Lagartos a similar percentage of stakeholders (73%) attributed increased employment opportunities to conservation and several examples of this were recorded, including restoration projects, research assistance, management of contingencies, ecotourism and rangers. Four rangers had been recruited locally, including a very respected hunter, who possessed excellent knowledge of the forest and, at the time of the study, was a proud member of the conservation team in Ria Lagartos.

Regional and national conservation officials contended that entrance fees represented a significant local benefit. They explained that even though the revenue went to the federal government, 70 per cent was returned to the NCPA, which was consequently able to finance social development and conservation programmes. However, 70 per cent of Ria Celestun and 57 per cent of Ria Lagartos informants did not consider this indicator as a local benefit. This disparity in perception might show that even though the revenue raised supports conservation budgets, the final destiny of these resources was not clear to local communities and therefore the local population did not have a positive perception of the fee. Similarly, entrance fees were not identified as constituting a local benefit by rangers of either of the protected areas.

### 6.2.4 Local costs: user groups perspectives

Seven indicators were used to assess total local costs attributable to the biosphere reserve policies, as perceived by local stakeholders: 1) restrictions on land use, 2) killing of livestock by predators, 3) increase in crop-raiding animals, 4) denial of traditional rights, 5) sanctions, 6) reduced access to resources, and 7) displacement of people. As Figure 6.3 reveals, contrary to the case with local benefits, the overall assessment of the variable ‘local costs’ of protected areas was assessed higher on most indicators in Ria Celestun than for Ria Lagartos.

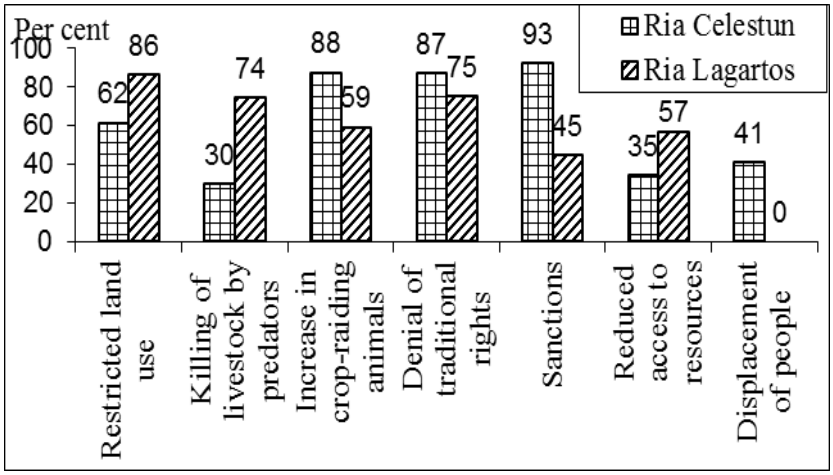



Figure 6.3 Percentage of local stakeholders citing the presence of each of seven local costs in the protected areas under study. Source: The author.

Figure 6.4 shows overall and individual assessment of indicators for the measurement of the variable 'local costs', the input values obtained for each indicator have been averaged to obtain a final value of local costs for each protected area. The average also includes a proportion of the population (see Chapter 4 Section: Incorporating population in the final variables score). Overall, 62 per cent of total costs in Ria Celestun and 57 per cent in Ria Lagartos were attributed to conservation efforts.

| | Restrictions on land use | Killing of livestock by predators | Crop-raiding animals | Denial of traditional rights | Sanctions | Denial of access to resources | Displacement of people | Overall local cost |
|---|---|---|---|---|---|---|---|---|
| Celestun | 60 | 30 | 88 | 90 | 100 | 30 | 40 | 63 |
| Isla Arena | 75 | n/a | n/a | 63 | 25 | 75 | 50 | 58 |
| Ria Celestun | 62 | 30 | 88 | 87 | 93 | 35 | 41 | 62 |
| San Felipe | 91 | 82 | 64 | 82 | 64 | 82 | 0 | 66 |
| Rio | 100 | 71 | 50 | 86 | 43 | 57 | 0 | 58 |
| El Cuyo | 57 | 71 | 71 | 50 | 29 | 29 | 0 | 44 |
| Ria Lagartos | 86 | 74 | 59 | 75 | 45 | 57 | 0 | 57 |

Figure 6.4 Percentage of local stakeholders citing the presence of each of seven local costs in the protected areas under study. Source: The author.

*Notes: Indicators multiplied by a percentage of the population of each community as follows:*
*Ria Celestun = (indicator Celestun *0.9) + (indicator Isla Arena *0.1).*
*Ria Lagartos = (indicator San Felipe *0.28) + (indicator Rio *0.46) + (indicator El Cuyo *0.26).*

The major cost to local settlers in Ria Lagartos attributed to protected area status, cited by 86 per cent of informants, was 'restrictions on land use'. This is 24 per cent higher than the corresponding assessment in respect of Ria Celestun, where it was cited by 62 per cent of participants. In both cases, most restrictions to land usage were related to farming.

Equally, the 'killing of livestock by predators' was rarely perceived as a local cost in Ria Celestun while in Ria Lagartos it was cited as a significant negative consequence of conservation. Indeed, such a perception was 44 per cent stronger in Ria Lagartos than in Ria Celestun. These figures are related to the extent of ranching activity, as cattle farming has undergone a period of growth in the Ria Lagartos region. Not surprisingly, jaguar attacks on farm animals are widely registered in this area (Ceballos & Chavez, 2005).

The negative effect of an 'increase in crop-raiding animals' was perceived to be higher in Ria Celestun than in Ria Lagartos. In Ria Celestun the use of land for the subsistence farming of *milpa* plots is more common than in Ria Lagartos where land previously given over to *milpa* has more recently been used for cattle farming. Thus, 88 per cent of Ria Celestun informants cited as a cost of conservation the increased intrusion of small predators such as raccoon, possum and deer, which feed on crops; while in Ria Lagartos only 59 per cent of informants cited crop raiding as a burden.

The 'denial of traditional rights' was considered to be a significant effect attributable to conservation in both reserves; but it was perceived to be more serious in Ria Celestun, where it was cited by 87 per cent of informants, as opposed to only 75 per cent in Ria Lagartos. In Ria Celestun this cost is closely related to the prohibition of a fishing practice known as *chinchorro*. This is a local fishing technique that trawls a small net from approximately 300 metres out to sea, to the shore, capturing as its passes almost all species of aquatic life, especially the young, as well as causing damage to the seabed. *Chinchorro* is considered to be an extremely unsustainable fishing practice and hence it has been banned (SEMARNAT, 2002b; Zapata, n.d.). *Chinchorro* was reported as uncommon in Ria Lagartos where fishing

traditions and knowledge systems were older, and it is not considered an acceptable practice. In fact, a community-based Marine Reserve called *Actam Chuleb* has existed for more than 15 years to protect the fishing species in the area through the initiative of San Felipe fishing cooperatives. Representatives of *Actam Chuleb*, all of them voluntary workers, mentioned that unsustainable fishing practices are often brought to the area by immigrants. For example, practices such as "*Lanza y red*," the shooting of arrows from a boat with a net attached to cage full groups of fish, are considered socially unacceptable. Members of *Actam Chuleb* were observed to act as local guards and photograph unsustainable activity to register and publicly expose unsustainable practices. This undertaking is evidence of local initiatives to promote sustainable fishing.

However, there was a denial of traditional rights cited in Ria Lagartos that was associated with the use of fire in farming and the collection of wood. The practice of slash-and-burn agriculture dates back to ancient Maya (Gómez-Pompa, 1987); thus, even though the Ria Lagartos community has agreed in principle to comply with the regulated control of the tradition, it often objects to the predetermined dates on which the deliberate lighting of fires is allowed. Farming stakeholders pointed out that such preset dates did not always coincide with the environmental conditions necessary to start a fire, some of them falling on very dry or very wet days rather than with the mild conditions that usually prevail a few days after the first rains fell.

As Figure 6.4 shows, 'environmental sanctions' were considered to be the most significant negative burden imposed on the community as a result of conservation practices. Overall in Ria Celestun, 93 per cent of stakeholders considered the imposition of penalties to be a serious cost attributable to the establishment of the reserve, within the actual town of Celestun, the biggest town in the reserve this rose to 100 per cent. Most disciplinary action involving sanctions, is associated with illegal fishing with some cases resulting in imprisonment or heavy fines. Even though the regulation of fishing is not a role of the protected area management agency, Celestun residents do not seem to distinguish it from the general administration of the reserve.

Sanctions were considered unfair by most stakeholders in Ria Celestun. Informants argued that local people had no choice but to exploit the resources they had always relied on or to utilize the existent resources to feed their families if they had emigrated from areas of famine.

In many cases, they claimed that they were not informed of the prohibition of activities that were formerly legal. There was general discontent in the communities regarding the prohibition of activities in the reserve, from eating endangered species to cutting down trees for firewood and timber.

In contrast, in Ria Lagartos, only 45 per cent of stakeholders considered sanctions to be a negative consequence of conservation. There were fewer cases of people being sanctioned in this reserve, and most disciplinary action was reportedly imposed on outsiders who entered the reserve to fishing. Accordingly, when sanctions were related to fishing, Ria Lagartos communities often regarded their imposition as an effort to protect local interests and the endorsement of a common good rather than a cost.

The indicator ‘reduced access to resources’ was identified by 35 per cent and 57 per cent of local stakeholders in Ria Celestun and Ria Lagartos respectively. Examples cited by Ria Celestun informants focused on fisheries regulations such as seasonal closure for a particular commercially valued species. It is questionable whether the lower score returned by Ria Celestun was due to lack of law enforcement and the consequent continued access to protected resources, or to less pressure associated with the protection of resources owing to alternative means of livelihood. Nevertheless, the effects of this indicator were perceived to be considerably more severe in Ria Lagartos where the qualitative information provided by informants indicated that the largest burden faced by the community was the opportunity cost of being prevented from developing extensive farming.

The last indicator associated with the costs of conservation is the ‘displacement of people’, which received low scores in both reserves. This was no doubt because the designation of the localities as biosphere reserves did not require the eviction or relocation of communities to surrounding areas. In Ria Lagartos none of the informants cited the displacement of people as a cost while in Ria Celestun, 41 per cent of stakeholders did. However, rather than a direct cost of the demands of biosphere management, displacement in Celestun seems to have been associated with people living in extreme poverty who had settled in cardboard shanties in marginal areas on the edge of town, and who lacked even the most basic services. These settlements were reported on in semi-structured interviews as illegal and, being located in floodable areas, are frequently relocated for safety reasons.

### 6.2.5 Transfer of local cost: Triangulation

Despite recent social support programmes and national narratives suggesting that local costs of conservation have been minimised through the development of a policy based on zonation rather than expropriation, the present study found that for local communities, social costs attributed to conservation still constitute a significant burden.

At slight variance with regional and national government agencies, the Ria Lagartos Head Office demonstrated a clear awareness of the social costs of restrictions on farming, fishing in the estuary, wood collection, logging activities, and limited access to traditionally hunted wildlife - a view consistent with local stakeholders' reports. Reserve managers also emphasised that institutional efforts to reduce costs and generate benefits were in accordance with compensatory policy. Attribution of costs within Ria Lagartos by local stakeholders and by rangers were very similar. The stakeholders considered 57 per cent of the listed local costs were generated by the protected area and the rangers approximately 50 per cent . Further data collected from Ria Lagartos Head Office on these restrictions and the strategies adopted to deal with them are outlined in the section on 'Local livelihoods' in this chapter.

A common perception of social cost was not shared amongst officials, rangers and local stakeholders in respect of Ria Celestun. While the local stakeholders expressed a high level of local cost, assigning it a rating of 62 per cent, reserve officials did not cite any negative consequences of conservation, pointing out that the majority of Celestun's *ejido* fell outside the boundaries of the reserve. Officials identified restrictions only to external private enterprise, such as for investors with planning permission for the construction of large hotels on Celestun beach. Ria Celestun rangers only cited a few negative indicators but, even though they were aware of more social costs than head office, they quoted fewer examples than did local communities.

A further analysis of the indicators of social cost provides evidence of contradictory and/or consistent perceptions being contested or shared amongst different actors in the protected areas of study. In Ria Lagartos, the indicator 'restrictions on land use' was acknowledged by the majority of local stakeholders (86 per cent), who associated such limitation with the prohibition of farming. On the contrary, only one out of three Ria Lagartos rangers considered restrictions on land use to be a social cost. The obvious resultant question is the

reason for this disparity in perception, especially given that this indicator did not attract the same level of variation in Ria Celestun, where it was cited by 62 per cent of local stakeholders and by 1 out of the 2 rangers interviewed.

In Ria Lagartos, animal attacks on cattle were agreed to constitute a cost attributable to conservation by a high proportion of local stakeholders (74 per cent), with the presence of the jaguar often conflicting with farmers' interests. All Ria Lagartos rangers also cited attacks on livestock as a cost of conservation practices. In Ria Celestun animal attacks were only cited as a local burden by a 30 per cent of stakeholders and never by rangers. This was due to animal husbandry not being a major occupation in Ria Celestun.

Crop raiding was a cost that rangers underestimated, compared to local stakeholders. In Ria Celestun 88 per cent of local informants but only half of the rangers identified it as a social cost; compared with 59 per cent of local stakeholders and 1 out of the 3 rangers in Ria Lagartos. This could have been due to the limited acreage of subsistence smallholdings in the latter, but as *milpa* provided complementary food to fish for a significant number of families, wildlife intrusion directly affected local livelihoods. The lower crop-raiding ratings in Ria Lagartos were also associated with changes to farming practices in the region, with traditional *milpa* extensively replaced by animal husbandry.

The denial of traditional rights was considered to constitute a cost by 75 per cent of local stakeholders in Ria Lagartos, but none of the reserve's rangers considered this to be a local burden. In Ria Celestun the underestimation of this indicator was less evident, with 87 per cent of local stakeholders citing it as a social cost and 1 out of the 2 rangers acknowledging it. The notion that conservation policy restrictions on hunting, fishing and other kinds of exploitation of forest resources constituted an infringement of traditional rights was, unsurprisingly, perceived less intensely by those whose livelihoods were not directly affected.

As previously addressed, sanctions were rarely imposed on Ria Lagartos stakeholders and were consequently only reported by 33 per cent of informants. Accordingly, none of the reserve's rangers identified this indicator as a social cost. In terms of Ria Celestun the indicator was revealed as another example in which the perception of stakeholders differed from that of the rangers, with 93 per cent of local informants citing sanctions as a cost but no

rangers believing that penalties were frequently imposed on local people. Indeed, Ria Celestun rangers argued, perhaps somewhat spuriously, that sanctions did not affect local people, because they (the rangers) did not have the authority to impose them.

Reduced access to resources was cited as a cost by all Ria Lagartos rangers and 57 per cent of local stakeholders. In respect of this indicator, the rangers acknowledged the restrictions on land for farming associated with conservation programmes. Nevertheless, they pointed out also, that many farmers continued to access the forest, transforming significant areas into pastureland, owing to the conservation agency's enforcement capacity being limited, and other institutions such as the municipal authority had the statutory responsibility to enforce such infringements. In Ria Celestun reduced access to resources was cited as a cost of conservation by 1 of the 2 rangers, but only by 35 per cent of local stakeholders, who highlighted limitations on access to marine and forest resources in terms of fishing, hunting, and firewood and timber acquisition.

As officers of the NCPA pointed out, the displacement of people in the interests of environmental protection had not been carried out in the reserves under study. However, in Ria Celestun, 1 of the 2 rangers and 41 per cent of local stakeholders stated that due to the prevailing confusion over the illegal occupation of flood-prone estuarine areas by local immigrants, efforts had been made by the municipal authorities to rehouse families away from this hazardous land. In Ria Lagartos, no rangers or stakeholders cited the displacement of people as a cost of conservation to local communities.

## 6.3 Local livelihoods

### 6.3.1 Background and narratives

Managers of national and regional conservation agencies state that environmental protection policy aims to affect a transfer from over exploitative livelihoods to sustainable livelihoods (CONABIO 2000; CONANP 2001, CONANP 2002 & INE 2000). For this reason, the PRODERS Program (as mentioned to address transfer of benefits) was created in 2001 to fund local initiatives for sustainable livelihoods.

Another significant instrument that supports sustainable livelihoods is the PTE (see Chapter 3, Section 3.3.2) (mentioned as well to address local benefits), which is aligned with the

conservation agency. With funding allocated to this programme, the agency is able to provide temporary jobs carrying out practical and logistical duties, including the restoration of water flows and mangroves; reforestation; sign maintenance; and other activities associated with conservation. PTE jobs are mainly assigned during the closed season for commercially important fish species in order to reduce incidences of illegal livelihood practices that are restricted due to conservation policies. PRSDS and PTE are the main instruments at policy level that facilitate the promotion of local livelihoods in protected area communities and are also viewed as compensatory programmes to reduce local costs.

A further programme is the Payment for Environmental Services (PES) scheme managed by the National Forestry Commission. In other areas of Mexico, programmes for the protection of mountain and ridge forests have been implemented with the utilisation of *ejido* generating annual remuneration for the hydrological services that these ecosystems provide in terms of water reservoir (Muñoz-Piña, Guevara, Torres, Braña, 2008). Despite successful examples of how this scheme operates in other areas of Mexico, no examples on PES were found during the fieldwork. However an update of information in 2013 by telephonic interviews with the reserve offices found PES projects covering 6.4% of Ria Lagartos territory, and none operated in Ria Celestun. This is discussed further in Chapter 7.

With resources from PRSD and PTE, Ria Lagartos Head Office supports the development of projects in the following areas:

- Apiculture and forest conservation for honey producers
- Diversification of ecotourism activities (including marinas, hiking trails, equipment provision, and training for guides)
- Use of fish skins in handicraft production
- Environmental sensitisation for community leaders
- Construction of fuel-efficient stoves to reduce wood consumption
- Refuse management through support for the creation of a waste disposal centre
- Waste materials recycling projects
- Establishment of wildlife management units for peccary (wild pig) and ocofaisan (wild pheasant)
- Establishment of nurseries for native plants in different communities
- Maintenance and restoration of mangroves and springs
- Organic agriculture projects

- Management of feral animals
- Intensification of farming, including support for the erection of electric fencing, never previously used by the communities under study.

Moreover, utilising the resources of these two initiatives, Ria Celestun Head Office has funded the following:

- Ecotourism activities (including training, marketing advice and support for the acquisition of boat motors)
- Crab breeding for gourmet markets
- Tourism infrastructure
- Establishment of a wildlife management unit for crocodile
- Apiculture for the production of mangrove honey
- Control of feral dogs
- Wood-saving stoves (a product developed in Ria Lagartos)
- Mangrove restoration
- Shrimp breeding (no longer operational)
- Caged marine fish breeding,
- Manufacturing and marketing support for handicrafts, including the identification of shell parts that are washed up on the beach, and the design of new products

However, despite managers' efforts to promote alternative livelihoods in parallel with conservation activities, rangers in both protected areas believed that support from the reserve office for the generation of sustainable alternative livelihoods was limited. This perception was reinforced by the extent to which local stakeholders violated the protected area, activities that were witnessed and constantly dealt with by rangers, who viewed the violations as evidence that local people often had no other alternative. Despite the list of varied projects to promote sustainable livelihoods, seven activities were found generally to remain the main livelihoods that local stakeholders rely on in the areas of study: 1) Fishing, 2) Tourism, 3) Farming, 4) Salt extraction, 5) Hunting, 6) Wood collection and 7) Sustainable wildlife management. The results founded on these seven activities are presented individually below.

### 6.3.2 Local Livelihoods Assessment

Employing different sources of data, the following subsections provide an overview of the links between local livelihoods and biodiversity, identifying the extent to which transformations of local livelihoods are attributable to conservation policies or other related or unrelated social or environmental factors. Frequency of local stakeholders engaging in local occupations provides a valuable insight into the customary livelihoods. Local stakeholders were free of judgment and were able to share information about their livelihoods given that no topics of conservation or forbidden activities were addressed by them during user group's interviews. Additional information, that complements the assessment of livelihoods, collected after obtaining frequencies, is also presented.

#### 6.3.2.1 Fishing

##### 6.3.2.1.1 Fishing in the estuary

Fishing is not practiced only in the open sea. Both protected areas rely on extensive estuarine rivers that nurture stocks of many commercial fish species. Estuarine rivers in both reserves – known by locals simply as 'the river' – constitute an important ecosystem which has sustained fisheries throughout the history of the communities. Fishing in the estuary targets a variety of fish species, shrimp and crustaceans such as the Purple Crab (*Menipe mercenaria*). It tends to be mainly young, undersized stock that are caught.

Communities persist in fishing the 'river' in spite of the fact that one of the key purposes of designating Ria Lagartos and Ria Celestun as biosphere reserves was to protect the reproductive and early phases of aquatic organisms. Figure 6.5 illustrates the frequency local stakeholders access the estuarine river for fishing purposes.

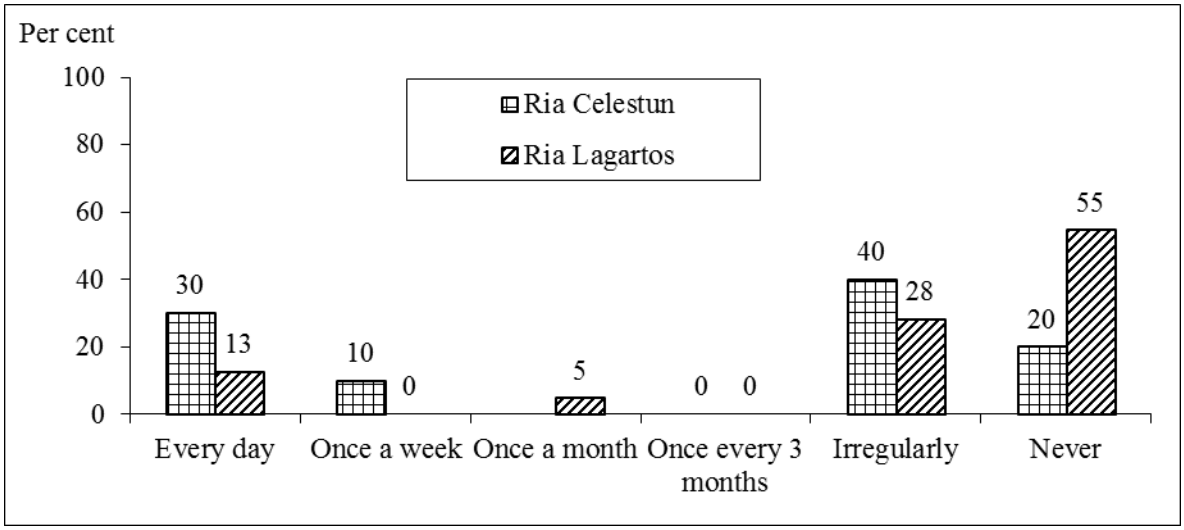



Figure 6.5 Frequency of fishing in the estuarine river reported by local stakeholders (values in percentages).Source: The author.

Despite the protected status of the river, 30 per cent of informants from Ria Celestun and 13 per cent of those from Ria Lagartos admitted that they relied on fishing in the estuary on a daily basis. A frequency ranging between once a week and once every three months was reported by 10 per cent and 5 per cent of respondents from Ria Celestun and Ria Lagartos respectively. With regard to Ria Lagartos 28 per cent stated that they irregularly fished in the estuary for subsistence purposes when weather conditions prevented them from going out to sea for prolonged periods. In respect of Ria Celestun, 40 per cent of stakeholders reported that they fished in the river irregularly. A notable proportion of 55 per cent of local stakeholder fishermen in Ria Lagartos reported that they never fished in the river due to reserve regulations, but only 20 per cent in Ria Celestun.

#### 6.3.2.1.2 Sea fishing

Small-scale fishing was the most important activity amongst the communities under study, and the force behind their development. As documented in Chapter 5, in recent decades the fisheries have begun to experience economic losses due to over-exploitation, and this has resulted in the reduction of individual incomes. Therefore, communities were faced with the challenge of finding new livelihoods to diversify their economy. Figure 6.6 shows the importance of fisheries to local livelihoods.

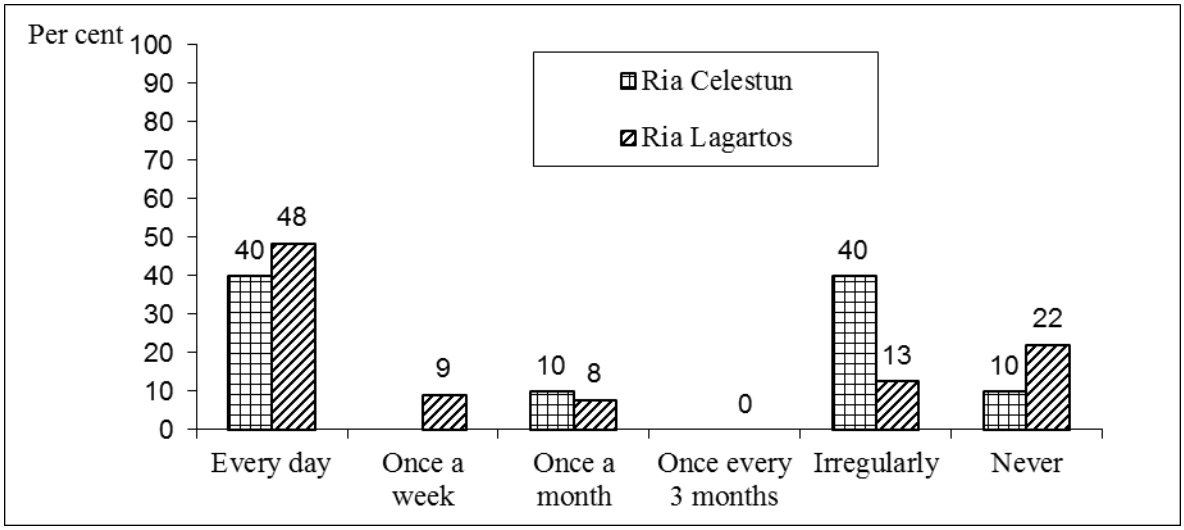



Figure 6.6 Frequency of deep-sea fishing reported by local stakeholders (values in percentages). Source: The author.

According to local stakeholders, fishing was still the economic activity that attracted the highest frequency of engagement. Forty per cent and 48 per cent of informants from Ria Celestun and Ria Lagartos respectively went out deep-sea fishing every day and 17 per cent and 10 per cent respectively went fishing between once a week and once every three months. In terms of irregular engagement, the proportions were 40 per cent and 13 per cent respectively. Twenty two per cent and a mere 10 per cent from Ria Celestun and Ria Lagartos respectively did not practice deep-sea fishing at all.

The regulation of fishing in the localities under study is not the responsibility of reserve offices but falls under the jurisdiction of the Ministry for Agriculture, Livestock and Fisheries (MALF). The fishing policy, along with conservation was administered as part of the duties of the Ministry of Environment, Natural Resources and Fisheries (as broadly presented in chapter 5) but it has undergone repeated restructuring, reflecting uncertainty of vision and management as how the industry should be managed (Fraga, Salas & Mexicano-Cíntora, 2008). From 2000 until the time of writing, fisheries have been managed by the MALF; however, the Law on Sustainable Fishing and Aquaculture was only published in 2007, when it replaced the previous 1992 Law on Fishing (DOF, 2007).

Even though fishing regulations had gained a degree of respect in the communities under study, reports of failures to adhere to legislation in certain circumstances were not uncommon, particularly in the case of Ria Celestun. Figure 6.7 shows local perception of

fishing regulations. Interestingly, 100 per cent of stakeholders were found to be aware of legislation, especially in respect of closed seasons for key species.

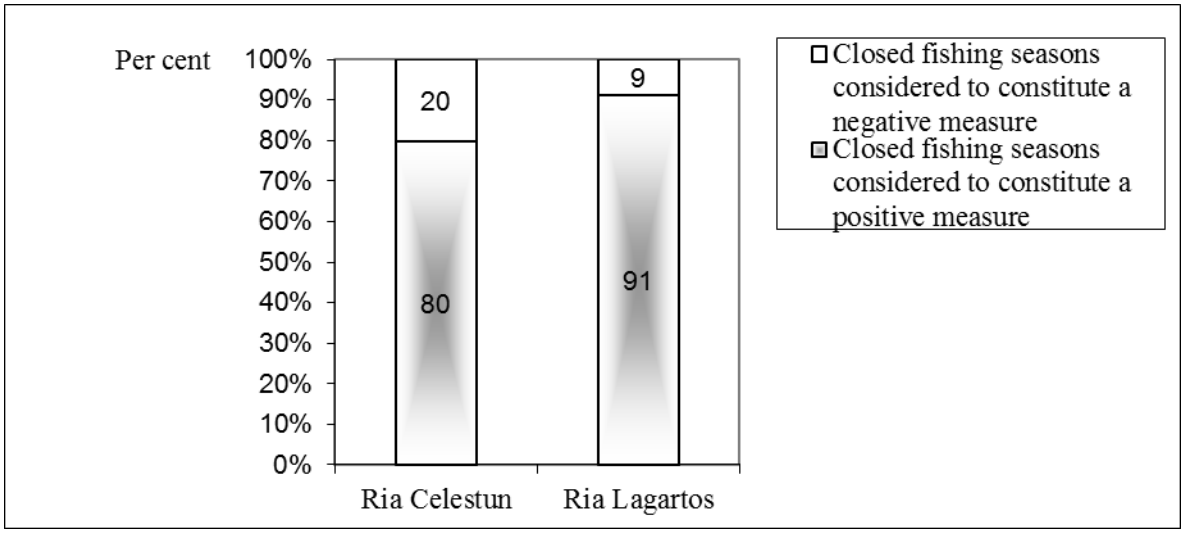



Figure 6.7 Local awareness of and reaction to fishing regulations. Source: The author.

At the time of the study, the majority of local stakeholders considered fishing regulations to be in the best interests of the communities and the maintenance of healthy long-term stock levels. Thus, although they perceived fishing sanctions to be unfair and excessive a large majority comprising, 80 per cent of respondents from Ria Celestun and 91 per cent from Ria Lagartos, considered existing legislation to be beneficial. However, 20 per cent of local informants from Ria Celestun did not consider fishing regulations constituted a positive policy.

According to rangers, fishing regulations were not fully adhered to by local communities. They were asked to grade from zero to five their perceived level of support within local communities of compliance with regulations concerning the most significant activities; where ‘zero’ was equal to no support and ‘five’ represented a high degree of support and respect for the regulations.

Rangers in Ria Lagartos assigned deep sea fishing a score of 3.3, mainly due to a low level of enforcement in the early stages of the implementation of fishing legislation. Management of the industry included closed seasons for commercial species, principally during the reproductive cycle. However, in Ria Lagartos rangers noted that most regulations were followed by the majority of fishermen. In Ria Celestun adherence to fishing regulations by

local communities was assigned the lower score of 2.5 with rangers reporting that the practice of *chinchorro* was still occasionally to be found in Celestun. Based on similar reports from rangers and local stakeholders, it may be concluded that fisheries regulations are more widely accepted in Ria Lagartos than in Ria Celestun.

Ria Lagartos rangers assessed support for regulations associated with fishing in the estuarine river as 3.0 whilst Ria Celestun rangers judged support for the activity to be 2.0. From local stakeholders and rangers' reports, it can be inferred that there was more local effort to protect the estuary in Ria Lagartos than there was in Ria Celestun. Restaurants in the latter openly serve locally caught prohibited species. It was identified that there were changes to the proportion of people living off fisheries. Whereas for previous generations fishing was the main activity funding communities, its importance has dropped in the current generation. They cannot rely on this activity to support future generations and they have therefore been exploring alternative livelihoods, placing more interest on the current study. This is reinforced by the bioeconomic analysis of fisheries in Chapter 5 where the fisheries studied show a reduction in fishing stocks over the last 50 years, driving the local community to explore different livelihoods. Conservation policies have contributed to changes in fishing as a source of employment, both directly and indirectly, offering and encouraging residents to engage in new forms of employment. Other aspects such as socio-cultural aspects such as poverty and tradition, also contribute to changes in fisheries work. For example, the fact that stakeholders from Ria Celestun were less willing to adhere to fishing restrictions in the estuary might be associated with the high levels of migration to the locality. Illegal fishing for molluscs and fish in the shallow estuary river is less dangerous than in the open sea, and represents an advantage particularly to immigrants inexperienced in swimming and lacking marine skills.

#### 6.3.2.2 Tourism-related activities

The decline of the fishing industry means that an increasing number of fishermen have been forced to find alternative means of earning a living. Tourism has proved to be a significant activity in this regard, with National Commission for Protected Areas managers at national, regional and local levels highlighting ecotourism as the most suitable activity for diversification of livelihoods. In order to promote ecotourism, conservation offices have focused on ensuring the sustainability of activities and, by the time of the fieldwork, some

18.5 per cent of stakeholders in the communities under study were engaged in tourism as their main source of livelihood. Figure 6.8 shows the frequency of engagement in tourism, which is slightly higher in Ria Celestun than in Ria Lagartos.

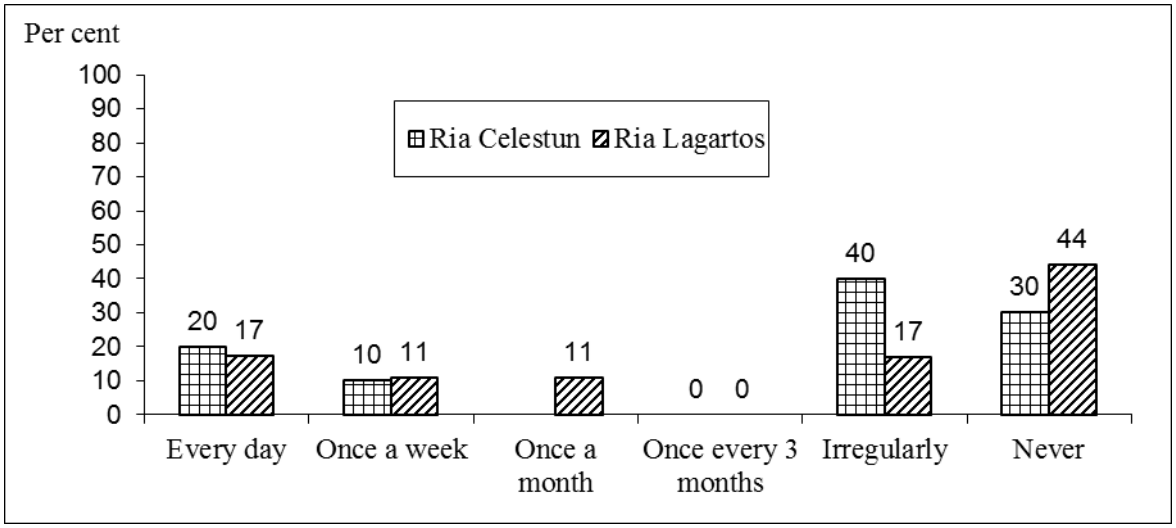



Figure 6.8 Frequency of engagement in tourism activities as reported by local stakeholders (values in percentages). Source: The author.

In Ria Celestun, 20 per cent of stakeholders reported that they relied on tourism, and 17 per cent in Ria Lagartos. Ten per cent and 22 percent respectively of stakeholders from Ria Celestun and Ria Lagartos reported that they engaged in tourism activities between once a week and once a month. Forty and 17 per cent respectively relied on tourism activities on an irregular basis. With regard to those stakeholders who reported variable engagement, tourism, represented complementary or seasonal activities undertaken, for example by fishermen during the closed season for their principle catches (grouper and octopus); and during the holiday season when tourist arrivals peaked. Finally, tourism activities were reportedly never practiced by 30 per cent and 44 per cent of local stakeholders from Ria Celestun and Ria Lagartos respectively.

The proportion of stakeholders engaging in tourism activities from between once a week to a daily basis indicates the considerable contribution of tourism to the local economy. There is a lack of data on the frequency of local stakeholder engagement in tourism before the establishment of Ria Celestun but, informants reported that the industry had grown since the reserve was initiated. The 2007 Official Coastal Land Use Plan, which addresses employment trends in terms of tourism and its constituent aspects – including restaurants, accommodation,

beach shelters, handicrafts and ecotourism itself – reveals increasing growth in Celestun. At the time of the study, the industry provided employment for 259 individuals, which was approximately 4 per cent of the local population (CINVESTAV, 2007). In Ria Lagartos, approximately 222 people were employed in tourism-related businesses, which is about 3 per cent of the local population.

In accordance with national policy, Ria Celestun and Ria Lagartos head offices have allocated small grants for the support of ecotourism, including courses for local operators and the establishment of partnerships to support the development of tourism infrastructure. As Figure 6.9 shows, tourism infrastructure facilities for visitors in the two reserves.

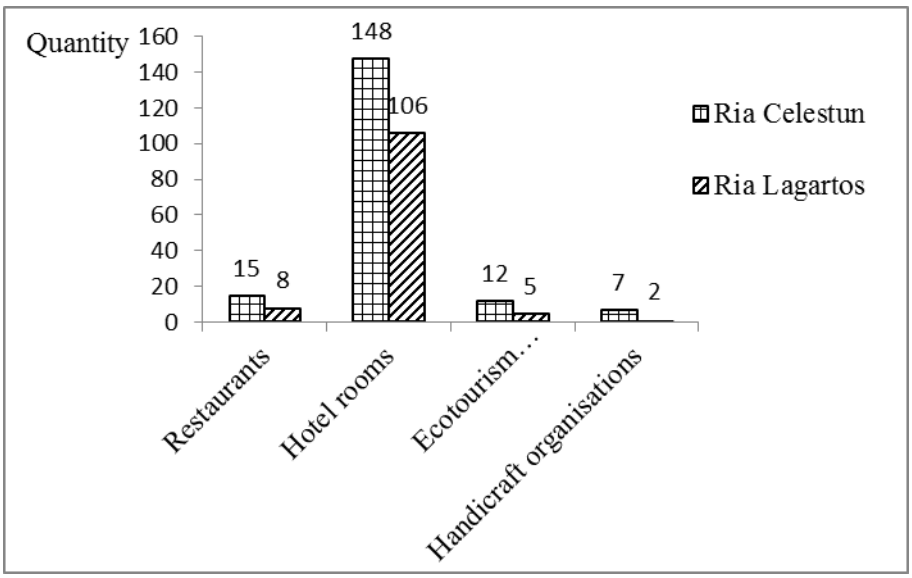



Figure 6.9 Tourism infrastructure in Ria Celestun (excluding Isla Arena) and Ria Lagartos. Source: CINVESTAV, 2007.

Of the two reserves, Ria Celestun has the superior infrastructure for tourists with15 restaurants, 148 hotel rooms, 12 ecotourism groups, and 7 handicraft groups; whilst Ria Lagartos, there are only 8 restaurants, 106 hotel rooms, 5 ecotourism groups, and 2 handicraft groups (CINVESTAV, 2007). Although Figure 6.9 only shows data from the community of Celestun in terms of Ria Celestun, the former houses 90 per cent of this reserve's local population.

Local group handicraft organisations represent an important effort to diversify livelihoods. Some of them, have used funds made available by the agency of conservation for the rural

sustainable development, to develop cooperatives creating varied quality handicrafts from shells, fish skin and other wildlife related products.

Many more tourists visit Ria Celestun than Ria Lagartos which might be due to the location of the former and its closer proximity to the region's main urban tourist destination of Merida. Celestun is less than one and a half hours' drive from Merida, whilst Ria Lagartos is two and a half hours away with no direct route between the rural community and the city. Figure 6.10 shows the upward trend in tourism figures for the protected areas under study between 2003 and 2008.

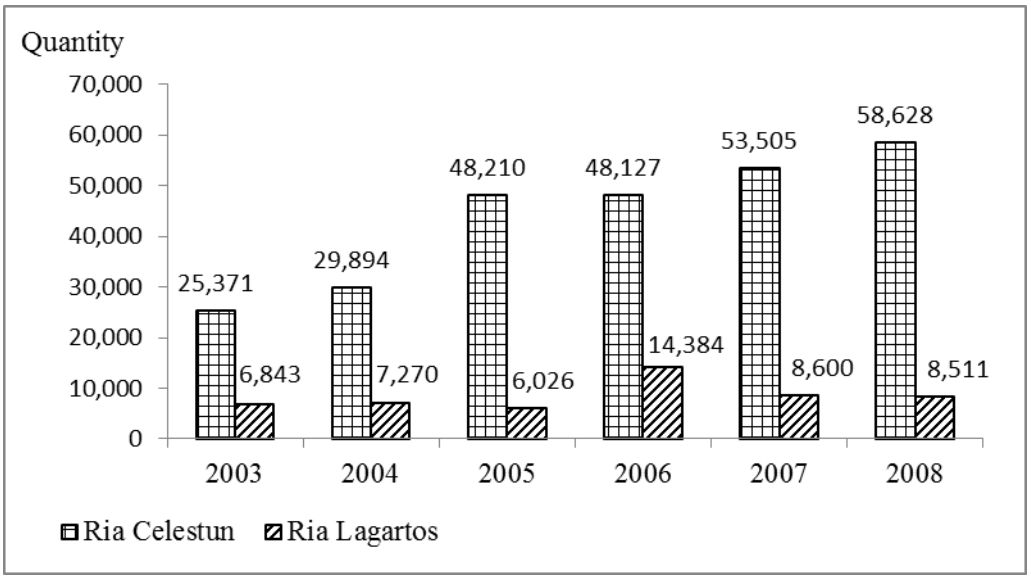



Figure 6.10 Numbers of visitors arriving by tour bus in Ria Celestun and Ria Lagartos.
Source: CONANP, 2009a.

The number of tourists visiting Ria Celestun more than doubled in the 5 years, from 25,371 in 2003 to 58,628 in 2008. In Ria Lagartos, the total numbers and upward trend were more modest: from 6,843 visitors in 2003, to a peak of 14,384 in 2006 before a decline to 8,600 in 2007 and a further small decline in 2008. Local stakeholders and rangers in Ria Lagartos pointed out that there was conflict between local tour operators and co-operatives due to unregulated tourism. It is important to note that the main tourist attraction in Ria Lagartos is viewing the flamingo colonies and the proximity of a community to the birds' feeding grounds therefore determines its share of benefits related to tourism.

In Ria Celestun, there is only one tourist centre where marinas have been constructed from which to begin estuary cruises. Other boat trips leave from the beach but this is at some distance from the estuary and they consist mainly of fishing trips. Even though there are conflicts between tour operators based at the beach and those at the tourist centre on the estuary, they tend to be minor on account of established arrangements for the sharing of business between them. On Isla Arena, Ria Celestun's other community, affluence from the proceeds of tourism is also a growing but derives mainly from recreational fishing. As it is a considerable distance between Isla Arena and Celestun, there is no major conflict between the two communities in terms of tourism, but there is rivalry in securing business for fishing trips.

In Ria Lagartos, the community located closest to the flamingo colonies is the town of Rio. There are a large number of operators, and no tourist centre to distribute business evenly between them. There is extremely stiff competition to win custom from tourists and this generates conflict. The torment that holidaymakers are subject to on arrival in Rio to see the flamingos is excessive. Hordes of operators approach tourists' cars and start knocking on their windows when they are still about a kilometre away from the river, exhibiting aggressive efforts to win their custom. Rio has become infamous for such hounding of tourists, which has made a bad impression on many people and may have contributed to the decline in the number of visitors. This issue remains to be resolved.

In San Felipe community, located further away from the colonies of flamingos, recent initiatives include general bird watching, hiking through the forest and wetlands to spring waters, recreational sea fishing, and fly-fishing on a catch-and-release basis in the estuary. In El Cuyo, the most popular attractions are the beautiful white sand beaches (since the other communities are located on the estuary) and recreational fishing.

In spite of the challenges confronting ecotourism in the reserves, this sector of the economy has grown in importance as a complementary industry, making a significant contribution to local development and representing the third most lucrative source of income for the communities. Indeed, the sector represents an area of successful experiences in the process of integrating conservation with local livelihoods. However, the growth of ecotourism has natural limitations after which activities begin to adversely affect the very ecosystem that

visitors come to view; thus, the industry cannot generate a substantial income for an unlimited number of operators.

Yet, regulations have recently become more widely accepted by operators, who now hold ecotourism certificates based on the training they have received. Even so, such regulations are more readily adhered to in Ria Celestun than in Ria Lagartos. For example, Ria Celestun Head Office has established navigation channels to reduce seagrass erosion from boats circulating randomly around the estuary. It also reinforces the importance of the need for tour operators to keep their boats at a distance from flamingo colonies. In order to please the tourists, operators used to sail as close as possible and provoke the birds to take flight, which created a visually stunning colourful spectacle. However, this continuous harassment disturbed the flamingos' feeding patterns and in particular, stressed their young not yet ready to fly. Thus, this practice has now been reduced and almost ceased on account of the influence of environmental sensitization on the part of the reserve and other institutions working in collaboration with the protected area agency.

Even with these measures, tourism regulations are still in need of modification. No studies to determine the maximum number of tourists that the area is capable of sustaining have been made, and this is particularly urgent in the case of Ria Celestun, where affluence associated with tourism has steadily increased. Consequently, great pressure is being put on ecosystems, and the monitoring of tourist numbers should commence as soon as possible in order to regulate the environmental impact. Reserve officials reported that they had been aware of a need to conduct such a study for several years but it had not been implemented owing to a lack of resources. Moreover, as ecosystems have their limitations, it is expected that the proceeds from tourism alone will soon prove to be insufficient to sustain the growing number of households and the necessary level of alternative livelihoods development.

According to Ria Celestun rangers, tourism was highly regulated and enjoyed substantial local support, and they assigned it a score of four out of five. This perception was markedly better than in Ria Lagartos, where rangers graded local respect for tourism regulations with a score of two out of five. The higher level of local mobilisation in implementing ecotourism in Ria Celestun is corroborated by the overall impression of the situation in terms of tourism as reported by local stakeholders. Conservation policies in the protected areas have positively contributed to create ecotourism initiatives and to regulate their standards with access to

training and funding. However the existence of other tourism policies, such as the CULTUR institution investing in the areas has also contributed to the development of ecotourism in the areas studied.

#### 6.3.2.3 Farming

Local stakeholders reported that livestock farming was the second most important traditional livelihood after fishing. Although less time seems to have been committed to it than tourism, it was still a highly significant occupation, particularly in Ria Lagartos. Figure 6.11 shows the level of engagement in farming activities by local stakeholders.

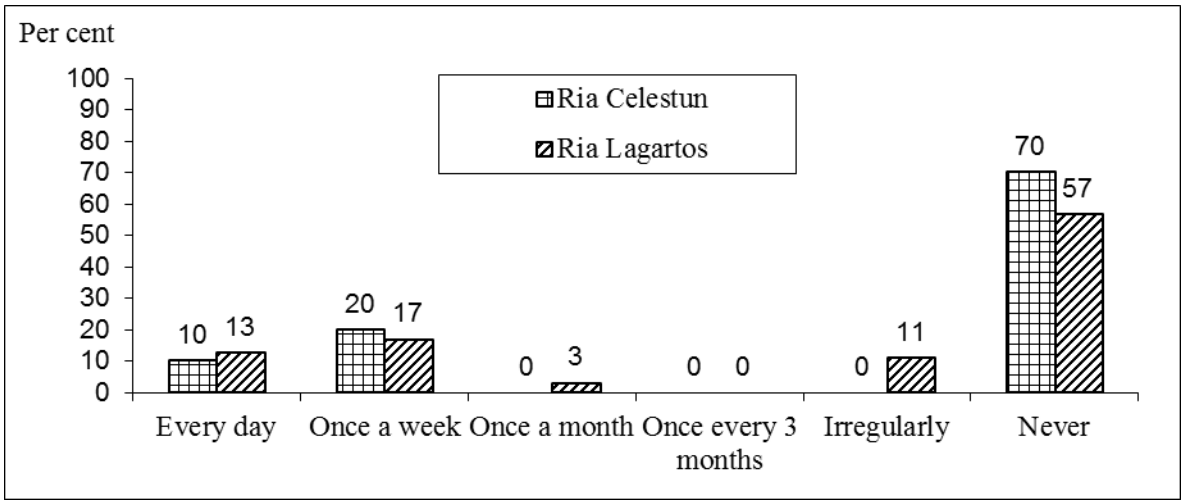



Figure 6.11 Frequency of engagement in livestock farming as reported by local stakeholders in Ria Celestun and Ria Lagartos (values in percentages). Source: The author.

Regular engagement in livestock farming (ranging from once a week to every day) was claimed by 30 per cent of local stakeholders from both Ria Lagartos and Ria Celestun. No local stakeholders from Ria Celestun, and 14 per cent from Ria Lagartos engaged in full day farming between once a week and once a month, or on a less frequent irregular basis. However, the most striking feature was the proportion of stakeholders who never engaged in farming which was 70 per cent and 57 per cent respectively from Ria Celestun and Ria Lagartos.

In spite of similar levels of engagement in farming amongst local stakeholders from both reserves, this does not involve comparable areas of agricultural land. *Ejido* in Ria Lagartos covers 22,315 hectares while in Ria Celestun covers only 4,661.70 hectares. The importance

of farming in Ria Lagartos is attributable not only to a larger proportion of the protected area included in *ejido* land, but is a result also of government efforts to promote agricultural development in the region (Gómez-Escobar & Ortíz-Alvarez, 1999). Consequently, extensive cattle farming poses a serious threat to terrestrial wildlife conservation in Ria Lagartos (INE & SEMARNAP, 1999).

Farming is not an important occupation in Ria Celestun. This is not only because of the comparatively small area given over to common property but also due to the low conversion rate of forestland to *ejido*. Figure 6.12 shows that livestock breeding is relatively insignificant in Ria Celestun but important in Ria Lagartos.

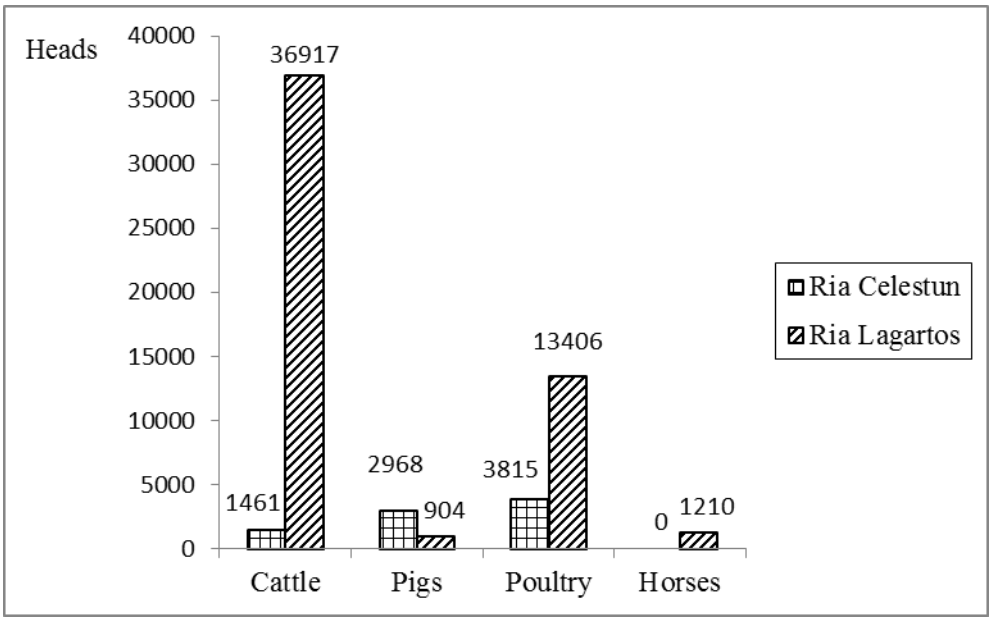



Figure 6.12 Livestock breeding by head (2003). Source: CINVESTAV, 2007.

Cattle are the most important livestock in Ria Lagartos, where 36,917 head were recorded compared to only 1,461 in Ria Celestun. After cattle, poultry breeding is the next most significant animal husbandry activity, with 13,406 birds in Ria Lagartos and only 3,815 in Ria Celestun. Pig breeding is limited, with less than 3,000 head and 1,000 head in Ria Celestun and Ria Lagartos respectively. Finally, 1,210 horses were recorded in Ria Lagartos, but none in Ria Celestun.

Ria Lagartos livestock production figures are important in explaining the impact of animal husbandry on the low and medium foliage levels of the forest, and the consequent threat to

wildlife conservation in the area. For example, the jaguar in particular is widely hunted by ranchers in order to protect livestock.

Agricultural development is extremely limited in both reserves. In Ria Lagartos, 218 hectares are given over to commercial plantations, which represent 0.36 per cent of the total land area. In Ria Celestun, only 7 hectares are utilised for commercial purposes, representing 0.0008 per cent of the reserve. The main crops in both reserves are maize and, to a lesser extent, citrus fruit (CINVESTAV, 2007). Agriculture is practiced mostly as only a complementary subsistence family activity.

According to reserve management plan regulations, extensive farming is not permitted. Local *ejido* members pointed out how this put them at a disadvantage to neighbours outside the reserve, who were able to develop agricultural activities with the aid of government subsidies. Another problem associated with farming is the practice of the slash-and-burn to prepare *ejido* grazing land, and the uncontrolled spread of fires into conserved areas of the forest.

An important by-law for the control of farming-associated deforestation is the establishment of a calendar to regulate burning, which is published annually by the state government rather than the NCPA. However, it represents a relevant conservation strategy as slash-and-burn agriculture is a traditional practice and uncontrolled fires are a significant cause of deforestation. Figure 6.13 shows the local perception regarding the burning calendar.

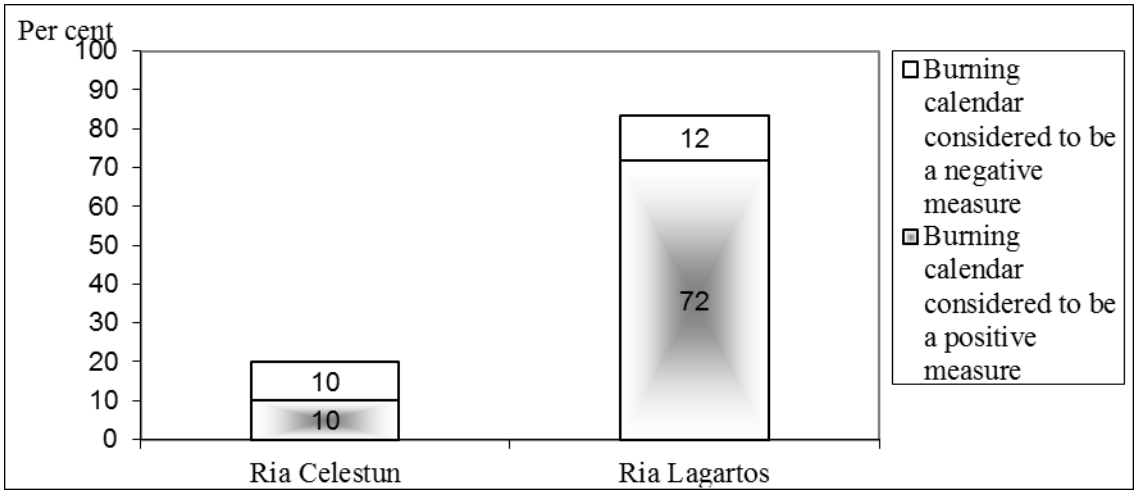



Figure 6.13 Percentage of local stakeholders with knowledge of the burning calendar, and their opinions on it. Source: The author.

In Ria Lagartos, 84 per cent of stakeholders were aware of the burning calendar and 72 per cent considered it to be a positive measure. In Ria Celestun, only 20 per cent were aware of it, 10 per cent believing it was a good thing. However, the comparative lack of awareness in Ria Celestun was at least partially due to a low reliance on farming. Moreover, local stakeholders who considered the burning calendar to be a negative measure based this opinion on the risks of presetting burning days because they believed that the climatic conditions necessary for starting fires could not be forecast so far in advance.

Rangers were asked to assess on a scale of zero to five the degree to which farmers complied with restrictions and regulations aimed at reducing environmental impact. In Ria Lagartos, farming was graded as 'two'. This low level of support was due to a lack of willingness to co-operate with the authorities amongst some members of the community. Rangers pointed out that many farmers continued to access the forest and transform it into pastureland. Another major area of conflict reported by rangers was farmers allowing cattle to wander into the 'nuclear zones' in which no activity other than research was supposed to be undertaken. On the other hand, Ria Celestun rangers assigned local respect for farming regulations a grade of 'four'. Such a perception is consistent with that of local stakeholders who confirmed that there was a more severe level of conflict in Ria Lagartos than in Ria Celestun. The next chapter expands on discussing challenges of farming *ejido*-managed land within the boundaries of each reserve.

#### 6.3.2.4 Salt extraction

Salt extraction has been practiced by the communities in the study reserves since ancient times. However, in Ria Lagartos local stakeholder engagement in this activity is limited to labour provision. Production is controlled by Mexico's second largest salt company, with an annual production of 500,000 tons of sea salt per year, which supplies over a third of national requirements (COSYSA, 2010). The industry is located in Las Coloradas, a settlement in Rio municipality.

In Ria Celestun, salt extraction is documented as an economic activity since 1927, but even at its peak only produced 2,730 tons per annum (SEMARNAT, 2000b). Nowadays, the comparatively small-scale production is handled by local co-operatives who use traditional methods. The operation occupies only approximately 68 hectares, which represents a mere

0.08 per cent of the area of Ria Celestun. The industry is underdeveloped due to organisational and technological shortcomings. However, community-based extraction represents the survival of valuable local skills and a source of livelihood that could potentially provide higher yields and the possible development of new businesses related to the industry.

Local stakeholders reportedly considered salt extraction to be a menial job and owners of land on which salt ponds were located were not interested in the occupation. In fact, they preferred to assign this task to immigrants and obtain a reduced return from their property. Informants termed it ‘donkey work’ as salt extraction, as it was practiced, requires intense physical effort involving long periods of exposure to the sun in unbearably hot conditions.

Ria Celestun conservation agency managers argued that local salt production co-operatives suffered from low levels of organisational capacity. Conflict over the geographical boundaries of ponds earmarked for salt extraction was the most common problem limiting expansion of the activity. However, in an attempt to mitigate the situation, the reserve management office assisted salt co-operatives to regulate production areas, and also supported the restoration of pond borders, which were periodically destroyed by hurricanes.

Associated with salt production, artemia breeding is another potential alternative livelihood in the protected areas under study. Artemia is the crustacean known as the Brine Shrimp, which lives in the estuary. Artemia are the staple food of shrimp and flamingos, and produce the pink pigment characteristic of these species. Attempts to breed artemia were recorded in Ria Celestun, officials pointing out that local knowledge indicated that there was a significant increase in the artemia population as a result of salt production, hence the local nickname for the crustacean, ‘mother of the salt’. However, owing to convoluted bureaucratic regulations associated with artemia breeding and the lack of a clear process for obtaining permission to legally harvest the crustacean, producers often sold it on the black market at a low price as fish food for aquariums. In this respect local stakeholders have perceived that conservation policies have stopped their efforts to develop this initiative.

### 6.3.2.5 Hunting

There are no systematic statistics on hunting in either reserve but in focus group discussions addressing diet, local stakeholders reported that their grandparents and to a lesser degree their parents' generation had relied on game meat to supplement their diet. Local stakeholders from Ria Lagartos stated that hunting had been a common activity up to approximately fifty years previously. At this time, the forest surrounding Ria Lagartos was not bisected by a road, the only method of communication between communities was by sea, the forest was teeming with wildlife. It was reportedly common to observe groups of wild turkeys, pigeons and wild mammals.

Local stakeholders explained that the interest in hunting for commercial purposes increased soon after the road was built, as this opened up access to city markets. Since then, they reported the increase in hunters from other inland communities had become uncontrolled. In addition, during the last two decades, fragmentation of forest had also occurred due to widespread farming of the *ejido* land. Consequently, the over-exploitation of wildlife had made hunting a less attractive prospect. Most informants were of the opinion that there was nothing left to hunt and only a few hunters remained in each community. Figure 6.14 shows the low level of engagement in hunting activities.

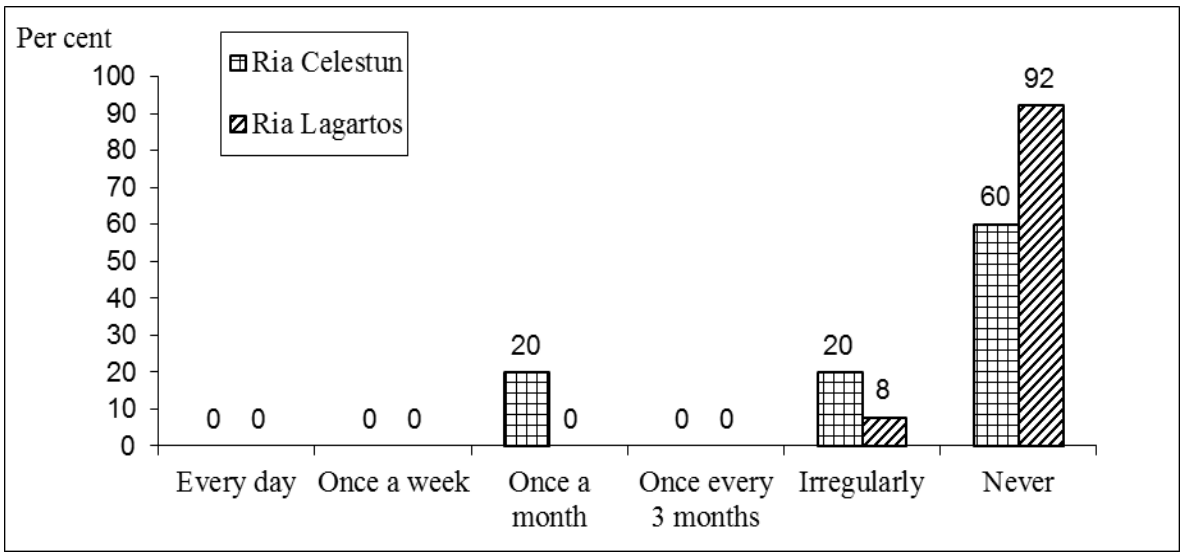



Figure 6.14 Frequency of engagement in hunting activities reported by local stakeholders (values in percentages). Source: The author.

In Ria Lagartos, the overwhelming majority of local stakeholders (92 per cent) reported never having engaged in hunting, and only 8 per cent admitting to hunting irregularly. In Ria Celestun, hunting was practiced by 20 per cent of local stakeholders once a month, and on an irregular basis by another 20 per cent. The majority of informants in Ria Celestun (60 per cent) claimed not to engage in hunting.

Even though the majority of stakeholders claimed they never engaged in hunting, the difference of 32 per cent between Ria Celestun and Ria Lagartos indicates that the practice was more important to livelihoods in Ria Celestun than in Ria Lagartos. This may be associated with the fact that the *ejido* in Ria Celestun had not undergone major restructuring in comparison with Ria Lagartos, where cattle production had decimated the forest.

All local stakeholders reported their grandparents' diet included high levels of deer, pheasant, peccary, wild pigeon, quail, caviar, white conch, and sea turtle meat and eggs. Other food reported as regularly consumed by their grandparents and parents included wild duck, flamingo meat and eggs, armadillo, coati, and even manatee. Although it may only be practiced on a limited scale, hunting continued to serve as a complementary livelihood in the communities under study, particularly in the closed fishing season; or at times of the year when hurricanes – known as the *Nortes* – were prevalent, when fishing becomes too dangerous or downright impossible. However, the only species local stakeholders admitted to still occasionally consuming were deer, white conch, and a type of caviar that was obtained from an extremely rare fish species called Liza.

In Ria Lagartos, most rangers were of the opinion that the reserve's game hunters lived locally, rather than entered from outside, and that they supplied markets in nearby cities with bushmeat. Similarly, Ria Lagartos Head Office managers believed that the majority of game hunters were local residents in spite of the interest in the reserve of a few hunters who came from nearby cities.

All Ria Celestun rangers also believed that game hunters were invariably members of the reserve's communities who engaged in the activity for purposes of self-consumption. In contrast, Ria Celestun Head Office managers considered that the majority of game hunters came from *ejido* located outside the reserve boundary. They drew this conclusion from the fact that the main source of protein in the diet of Ria Celestun residents was from fish rather

than from bushmeat. No symptoms of malnutrition had been found in the population, despite the existence of other poverty-related indicators, suggesting that sufficient protein is obtained through fishing.

Another form of hunting reported by rangers was the capture of wild birds, which were sold in cage bird markets or kept as pets by local households. This activity was perceived to be less environmentally damaging than game hunting; however, there are no studies or monitoring reports to corroborate this theory.

Half the rangers in Ria Celestun judged that hunters who captured songbirds were local community members, and that these species remained mostly in the locality as pets. The same proportion of rangers also believed that it occurred only sporadically, in order to procure a house pet, rather than being a regular commercial enterprise that supplied the markets. However the Ria Celestun Head Office disagreed with this view and bird capture was identified as an economic activity for a few families who engaged in selling their capture locally.

Ria Lagartos rangers were of the opinion that the capture of birds was rare, and when it did occur it was at the hands of hunters from outside the local communities who sold them in the markets. Thus, the rangers did not believe that the activity represented a local livelihood for reserve communities. The capture of song and exotic birds in Ria Celestun as a livelihood might have been related to a greater abundance of forest birds than was the case in Ria Lagartos where deforestation rates were reported to be higher due to commercial farming interests.

Local stakeholders were also asked if they agreed with hunting restrictions in the reserve; Figure 6.15 shows that there was more awareness in Ria Lagartos than in Ria Celestun with regard to such regulation.

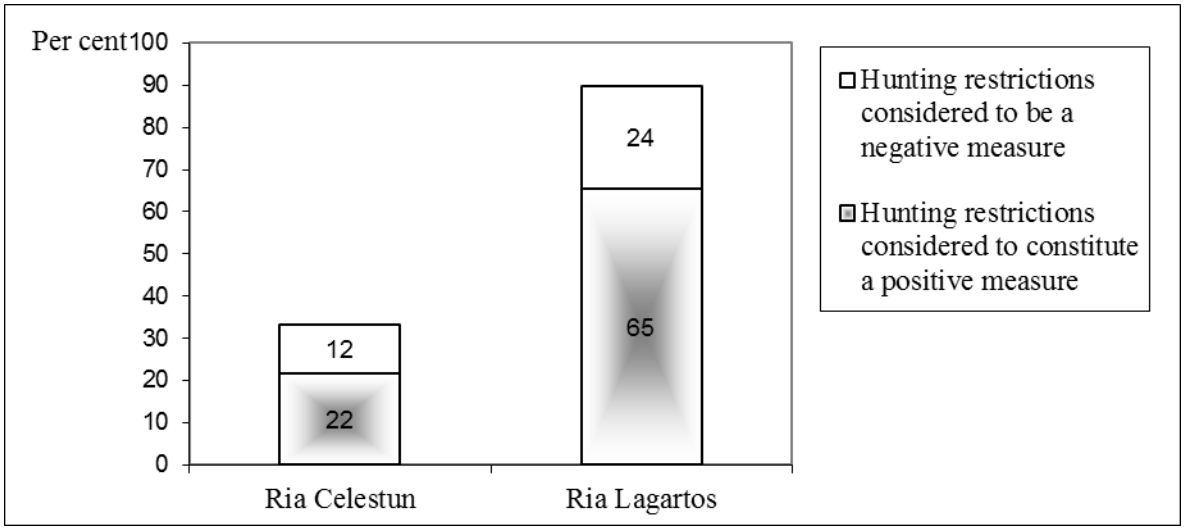



Figure 6.15 Local knowledge of and opinions on hunting restrictions in the reserve. Source: The author.

In Ria Celestun, 34 per cent of informants were aware that hunting was restricted in the area, 22 per cent being in agreement with the measure and 12 per cent in disagreement. In Ria Lagartos, 89 per cent of informants were aware of hunting restrictions, 65 per cent confirming that they were in favour and 24 per cent that they were not.

According to rangers, hunting had by no means been abandoned as a source of livelihood. On a scale 0 to 5, where '0' was equal to no support for compliance with hunting restrictions and '5' represented a high level of support for them, Ria Lagartos rangers assigned the activity a grade of 2.6 and Ria Celestun rangers a grade of 3.0.

However, an aspect of hunting that has been appreciably curbed in both reserves is of the Pink Flamingo, This species has undergone a significant recovery in numbers as a result of conservation efforts. This example does not allow a comparison between the case study areas of the present thesis because Pink Flamingos spend part of the year in Ria Celestun, which is their feeding area of choice, and part of the year are in Ria Lagartos, which contains their preferred nesting area. However, before the creation of the reserves, local hunting of adult flamingos for meat and the constant raiding of nests for eggs had resulted in a seriously diminished population. In1954, the estimated population of Pink Flamingos was approximately 6,000 (SEMARNAT & CONANP, 2006: 20). In comparison, recent estimates suggest that their number has increased to approximately 23,000 inhabiting these two areas

during the December–February season. This represents 75 per cent of the total population distributed across the entire Peninsula (CONANP, 2006b: 39).

#### 6.3.2.6 Wood collection

Wood collection for fuel and timber, for housing and for fishing infrastructure represents another important livelihood. Figure 6.16 illustrates the frequency of engagement of local stakeholders in wood collection.

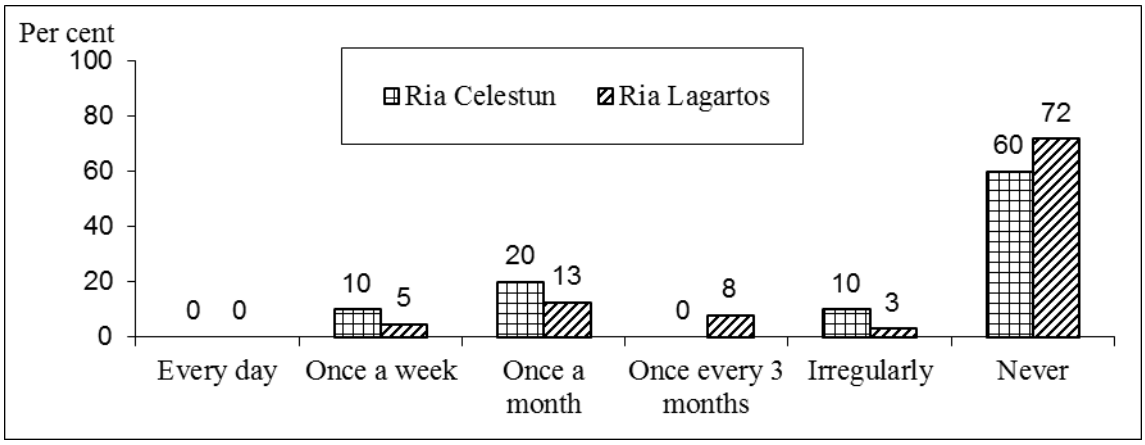



Figure 6.16 Frequency of engagement in wood collection reported by local stakeholders (values in percentages). Source: The author.

The majority of all stakeholders no longer relied on wood collection as this activity was reported to have become less prevalent in recent years. Stakeholders reported that previous generations relied on the collection of forest wood for both fuel and construction materials but as construction materials have changed, this has reduced the necessity for these resources. Stakeholders noted that residents only occasionally use palm leaves for roofs and fences. Sixty per cent of informants from Ria Celestun claimed to have never collected wood, and 72 per cent from Ria Lagartos reported no reliance on the activity. In Ria Celestun, 30 per cent of local stakeholders reported collecting wood between once a week and once a month; and the equivalent number in Ria Lagartos was 21 per cent. Similar proportions of stakeholders – 10 per cent in Ria Celestun and 11 per cent Ria Lagartos collected wood only once every 3 months or on an irregular basis.

The higher dependency on wood collection in Ria Celestun is consistent with official statistics from 1980 and 1990 on the number of houses that use wood for cooking purposes, which was then greater in Ria Lagartos than in Ria Celestun. In contrast, there were more

houses with a gas supply in Ria Celestun than in Ria Lagartos (INEGI 1980, 1990). Higher reliance on wood collection is clearly related to indicators associated with levels of poverty, which were also consistently higher in Ria Celestun than in Ria Lagartos (see Chapter 4).

It is important to note that a Ria Lagartos office project to reduce dependency on wood for cooking has funded the acquisition of 50 environmentally friendly stoves that burn less wood than conventional appliances. Consumers previously collected a bundle of wood every two days but since the adoption of the new stoves, the same bundle will last for two weeks. This initiative has been operational since the early stages of the reserve but has recently been assigned a higher profile by the reserve office.

Additionally, reserve managers ensure that local communities are aware that, although the cutting down of trees is prohibited, they may collect fallen branches from the forest floor. Informants from Ria Lagartos explained also that they had requested permission to collect wood and that the rangers had accordingly designated an area for such a purpose, thus reducing the accumulation of dry branches and leaves that were a danger if they caught fire.

Another source of deforestation is the over-exploitation of palm leaves for roofing traditional Mayan houses; and, more recently, they have been in great demand for giving an 'ethnic' look to resort hotels.

Changes on wood collection therefore are attributable to customary changes, market demands and availability of wood. As availability has reduced due to the increased rates of deforestation, conservation policies and technological improvements are playing a role in reducing and regulating wood extraction by local communities.

#### 6.3.2.7 Sustainable wildlife management

Wildlife management has been reported by area managers as a tool for implementing sustainable livelihoods. This conservation policy is implemented not only in protected areas but also under other property rights. Depletion trends caused by extracting wildlife (eg, hunting or gathering) without replenishment have been addressed by creating areas of wildlife management. In these areas, extractive activities without persecution are allowed

provided replenishment of the wildlife stock extracted is ensured. These areas are known as Units of Environmental Management (UMAs).

Several wildlife management initiatives were reported in the areas of study, including production of artemia, shrimp, fish, peccary, oco-pheasant, crocodile, crab, bees, palms, mangroves and other plants. Except for two plant nurseries operating in El Cuyo and Rio Lagartos, fish production in deep water cages by a group in Isla Arena, and a crab enclosure initiative carried out by a group of women in San Felipe, most of the projects are in an experimental phase. Some other projects such as shrimp production and other aquaculture initiatives had were reported in interviews as disestablished due to a lack of technical support. There were only 4 UMAs that had survived for two years or more, these involved breeding; crocodile, peccary, oco-pheasant and flamingo. The flamingo UMA is an initiative by external community actors with the purpose of enclosing flamingos that need care and rehabilitation before liberation. Therefore only three UMA registered initiatives exist as sustainable livelihoods.

Based on the political narrative of livelihoods and the integration of conservation and local needs espoused during interviews with officials of the reserves and the agencies of conservation, a substantive amount of UMA involvement in the community had been anticipated in the study areas. The availability of subsidies for UMA establishment, in addition to other funds available to the local communities in the protected area could strengthen the establishment of UMAs and support sustainable livelihoods.. However, UMAs projects found were modest and more examples were cited as existing outside the protected areas than within. Some insights as to why, are highlighted in the interviews with local actors implementing UMAs.

People who want to support the conservation through wildlife management find that potential revenues from the sale of meat or other parts of wildlife seem to be substantially higher than those gained from farming such areas. However, the challenges associated with establishing a UMA are often complex and often local communities, mainly trained as fishermen or traditional farmers, have neither the knowledge nor skills required for UMA implementation.

Firstly, the technical advice and investment required to set up an UMA project is expensive. Subsidies are available for some initial technical advice but there is an ongoing budget need.

Secondly, the paper work required to obtain permission to sell or extract a product was said to be expensive, difficult, and required travel to the city to complete paper work which made it a slow and time consuming process. An example given by one stakeholder illustrates the bureaucracy involved. Market opportunities are often irregular, and impossible to plan well ahead. For example, a buyer may place, an order for pheasant meat for an event, a couple of weeks in advance. However, the UMA has to obtain permission to sell from the Ministry of Environment and Natural Resources and this is often takes a month or more. The buyer won't accept the meat without permission; therefore the business cannot meet the request and loses a profitable sale. Another common challenge reported are the inspection visits to UMAs where sanctions and requests to provide paper work for every movement of the wildlife (sometimes as small as changing cages) makes it a burden to manage. The requirement for detailed records because a project is inside a protected area seems to disincentivise local stakeholders to engage on projects of sustainable wildlife management. More discussion on this is presented in next chapter.

### 6.4 Local participation

Local participation is an essential ingredient of the national policy of conservation. Local participation is rooted in policy documents based on the adoption of the Convention on Biological Biodiversity and the Agenda 21, which emphasise social participation and the creation of consultative bodies with varied stakeholders to implement conservation efforts. National officials and heads of the protected areas emphasise the importance of a participative approach with local stakeholders of the protected areas, including the fishing co-operatives, eco-tourist co-operatives, *ejido's* organisations, and other local groups. In the management plan for the protected areas of study the role of local participation is also highlighted as a sub-component of the program considered essential to achieve conservation goals.

Examples of a number of efforts to involve local participation at the time the research were noted. However study of the history of the Reserves revealed that local participation did seem to have been considered in the initial stages when the areas were designated as protected areas. The initial impetus and pressure to control the growth of the communities of study originated in the 1970s from the Convention on Wetlands of International Importance, which placed pressure on the national government to protect these areas. International conservation

organisations and national NGOs lobbied for the areas to be protected and for the legal designation of their conservation status. Managers confirmed that only after the reserves started operating, and the management plan formulated were efforts made to communicate this to the local community and the participatory conservation approach initiated. Local stakeholders confirmed that the establishment was created by the government and the local communities only informed when people were sanctioned or told that some activities were forbidden due it having become a reserve. Initially these situations created polarity between local stakeholders and managers of the area.

Local participation efforts were reported to have strengthened in the last decade, since the beginning of the 21st century, by placing posters in the area, organising activities in schools and inviting stakeholders to meetings to share information and obtain feedback from the local communities.

The first assessment of local participation is based on data inputs from local stakeholders' reports with regard to how often they received invitations to attend meetings with the reserve office, and their subsequent level of attendance. Informants claimed that their representatives always attended meetings to which they had been invited.

This indicator provides insights into their level of involvement as it assesses local commitment to participation, and also the readiness of protected area management to promote inclusion, given that stakeholders reported that they attended every meeting to which they were invited. Figure 6.17 shows the distribution of attendance levels in both reserves.

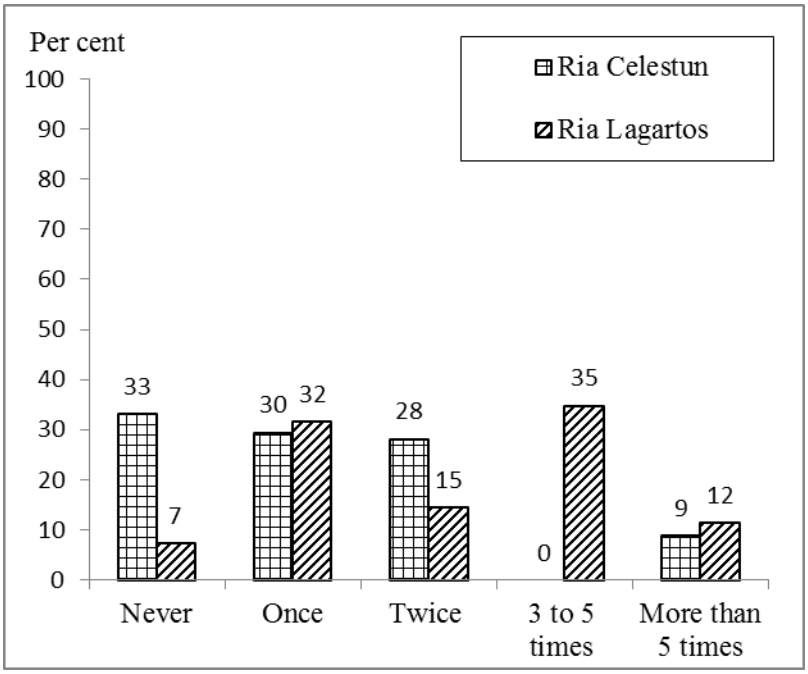



Figure 6.17 Frequency of stakeholder attendance at meetings with reserve management throughout the year (values in percentages). Source: The author.

In Ria Celestun, 33 per cent of stakeholders stated that they never participated in meetings with the reserve staff, mainly because they did not receive invitations; while in Ria Lagartos this situation was reported by only 7 per cent of stakeholders.

An average attendance level of a single meeting a year was reported by 30 per cent of stakeholders from Ria Celestun and by 32 per cent from Ria Lagartos. Twenty eight per cent of stakeholders from Ria Celestun said they attended 2 meetings a year but only 15 per cent from Ria Lagartos. An average annual attendance level of 3 to 5 meetings was recorded by 35 per cent of respondents from Ria Lagartos, but no one from Ria Celestun reported such a frequency. Attendances at more than 5 meetings were 9 and 12 per cent of respondents respectively

Participation amongst stakeholders from Ria Lagartos was significantly higher than was the case with Ria Celestun. Only 7 per cent of stakeholders from Ria Lagartos attended no meetings, whilst 33 per cent from Ria Celestun recorded zero attendance. In contrast, 47 per cent from Ria Lagartos attended 3 or more meetings whilst only 9 percent attended 3 or more from Ria Celestun.

The second variable used to assess participation was local inclusion. Assessment of this variable was based on views from local stakeholders' of how often they thought opinions they expressed at meetings were taken into account in subsequent conservation policy and programme decision-making.

A common concern expressed by the local stakeholders was their limited influence on the decision-making process despite their attendance and participation in meetings. According to local stakeholders, Ria Lagartos shows greater inclusion of the opinions of local participants into decisions and programmes of conservation than occurs in Ria Celestun. Figure 6.16 illustrates stakeholder perception of the extent to which conservation management incorporates local views and opinions into decision-making.

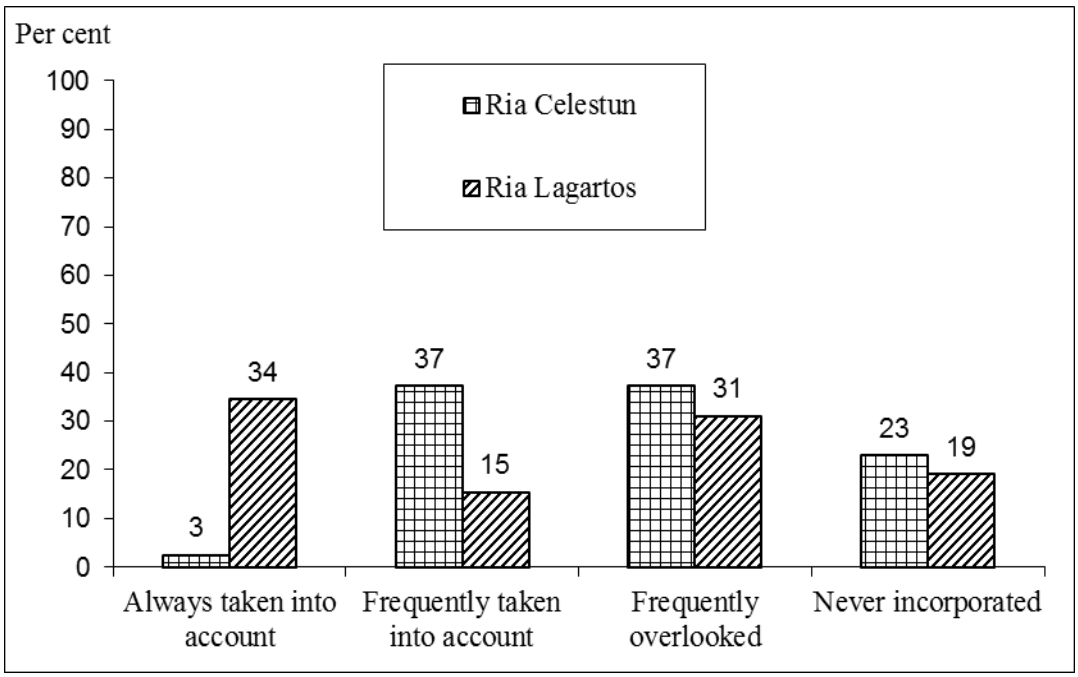



Figure 6.16 Perception of the level to which local views, opinions and needs are incorporated into the design of conservation programmes (values in percentages). Source: The author.

Forty per cent of stakeholders from Ria Lagartos considered that their opinions and concerns were taken into account either always or frequently in conservation programmes with the remaining 60 per cent believing that local needs were 'frequently overlooked or never incorporated'. In Ria Celestun, the proportion of informants who considered that local concerns were incorporated into conservation policies, and the proportion of the opinion that

their needs and concerns were frequently overlooked or never taken into account by officials was evenly balance at 50 per cent.

Such were the findings of the study in spite of efforts on the part of reserve management agencies to keep local stakeholders informed about developments to conservation programmes. Indeed, communities perceived that even in cases in which provision had been made for the expression of opinions about a given project, such concerns often seemed to carry very little weight when it came to making final policy decisions.

### 6.5 Conclusions

Based on the assessment of the three components, local cost and benefits, local livelihoods and local participation, it can be concluded that the efforts of integrating conservation and development are more effective in Ria Lagartos than in Ria Celestun.

Local benefits, including: improvement of municipal services, supportive community and cultural services, regulation of tourism services, diversification of livelihoods, infrastructure for economic development, employment linked with conservation, and income from park entrance fees invested in the community, were reported to be substantially higher in Ria Lagartos than in Ria Celestun. On the other hand, local costs including restrictions on land use, killing of livestock by predators, increases in crop-raiding animals, denial of traditional rights, sanctions, reduced access to resources, and displacement of people were reported higher in Ria Celestun.

Generation of local benefits and support for sustainable livelihoods seemed to be linked to programs created to provide local communities with access to funds to implement initiatives to promote rural sustainable development and temporary work as a way to compensate local people when rules of conservation, such as fishing closures and restriction on access to biological resources, such as hunting or wood collection affect them. Sustainable livelihoods have been promoted in the study areas through an emphasis on eco-tourism and to a lesser degree on sustainable wildlife management. Eco-tourism seems to be more widespread in Ria Celestun than in Ria Lagartos and sustainable wildlife management is still low profile but more frequent in Ria Lagartos. Only a few economic initiatives existed in the areas of study including oco-pheasant, crocodile and peccary production. Conflict between local livelihoods

linked with conservation such as hunting and wood collection seemed to be higher in Ria Celestun than in Ria Lagartos. However the reasons are not exclusively limited to higher levels of conservation awareness, but due to the existence of surrounded forest owned by *ejido* in Ria Celestun not generally being used for farming and therefore containing game and allowing exploitation of wood resources, In Ria Lagartos, where the majority of *ejido* is used for farming, and there less game exists did not share this level. Fishing in the estuary, an activity forbidden by conservation, continues to occur as part of the livelihoods, but with more dependency in Ria Celestun than in Ria Lagartos. The protection of fishing in Ria Lagartos is not primarily attributed to conservation rules imposed by governmental policies, but also to traditional institutions of fishing which seem to play an important role in fishing management and conservation in the area.

In terms of local participation, a certain level of disenchantment was evident with the process of participation, particularly in Ria Celestun. A major cause was the lack of consultation with local communities in the early stages of the establishment of the reserves. The original initiatives to give both study areas conservation status came from external national and international actors and pressure groups including foreign conservationist institutions, ignoring the views of local people. Nevertheless, a difference was discovered between the two areas studied, with the local communities of Ria Celestun displaying significantly lower levels of local participation, based on the frequency of stakeholder attendance at meetings with the reserve management throughout the year and on the perception of the level to which local views and opinions are incorporated into the design of conservation programmes.

A longer history of attempts and projects to involve local communities into the management of was found Ria Lagartos than in Ria Celestun with at least a decade of difference on social work and on participation. Despite a more promising assessment of the level of participation found in Ria Lagartos over Ria Celestun, the inclusion of local inputs into conservation policies is still considered low in both areas of study, although slightly higher in Ria Lagartos.

Extended discussion on local benefits and costs, local livelihoods and local participation is presented in the next chapter where information both from academic discussion and from this research is presented to extend discussion on the challenges of implementing the integrated conservation and development approach in protected areas.

# CHAPTER 7 “DISCUSSION”

## 7.1 Introduction

This chapter has two main purposes, first to explore the results of the study and test them against the academic debate on integrated conservation, and second, to extend the discussion based on the insights and findings that this research has to offer.

The main results of this research shows a comparative analysis for Ria Lagartos and Ria Celestun's protected areas where levels of integrating conservation and development based on an Integrated Conservation Assessment is demonstrated to be higher in Ria Lagartos than in Ria Celestun. The overall results of this assessment attributed a higher proportion of local benefits; a lower level of local costs and higher levels of local participation in Ria Lagartos than in Ria Celestun since implementing the protected area plan and higher levels of local inclusion in Ria Lagartos. The comparative analysis on local livelihoods showed more varied and greater number of examples of sustainable livelihoods initiatives in Ria Lagartos than in Ria Celestun. The comparative analysis on livelihoods become more complex and will be widely discussed in the chapter, as, even though the initiatives of sustainable livelihoods were found to be more varied in Ria Lagartos than in Ria Celestun, farming an important activity in Ria Lagartos is threatening the forest habitat while in Ria Celestun farming does not figure as a livelihood on which local communities rely substantially.

Academic debates around integrated conservation are to be discussed based on comparative scenarios found in the case studies. Initial discussions are based on the main components of integrated conservation identified in the theoretical review of this research. Further lessons based on factors that contribute to the implementation of integrated conservation are discussed and explored. The chapter concludes by discussing the validity of the approach of integrated conservation based on the findings of this research.

## 7.2 Discussions on costs and benefits

### 7.2.1 Fair distribution of incentives

Ensuring a continuous transfer of benefits to local communities is a major characteristic of integrated conservation and a critical aspect to incentivise conservation among local communities. The use of incentives has a direct effect on all aspects of integrated conservation. A major challenge in implementing this conservation approach is, how to incentivise the direct users of natural resources in the protected areas to support environmental protection policy and their willingness to buy into policy decisions while pursuing their livelihoods.

As Newmark & Hough (2000) note, creating employment opportunities; channelling revenue into community development; tolerating low levels of natural resources exploitation; building infrastructure, and incorporating local views in the management of the reserve are examples of benefit flow found in African protected areas in which efforts to integrate conservation and development have been made.

The benefit-sharing model advocated by Emerton (2001) and Norton-Griffiths (1996, 2000) considers that the distribution of benefits within the community and to other actors is an important aspect of transfer of benefits. In Ria Celestun, local stakeholders attributed 57 per cent of the local benefits from conservation efforts listed for this analysis. However this fact did not transfer to a positive view of the reserve by the local stakeholders. When asking local stakeholders about subsidy programmes, informants from Ria Celestun claimed that it was often the same groups of people who benefited from such programmes, and that corruption within local organisations with regard to access to funds generated mistrust. Thus, identification of the unequal distribution of conservation subsidies in Ria Celestun seems to have disincentivised local engagement in such initiatives. In fact, 90 per cent of local stakeholders in Ria Celestun reported low levels of attendance at meetings about the reserve matters, in a frequency of zero to twice a year. Only 10 per cent of the stakeholders reported attendance at meetings in intervals of 3 to 5 times and over 5 times a year. In Ria Lagartos local stakeholders attributed 76 per cent of the seven indicators of local benefits to the reserve actions, but even though more local benefits from conservation were attributed in Ria Lagartos' reserve, this did not incentive local support and participation proportionally. In meetings held to discuss matters relating to the reserve, 54 per cent of local stakeholders

reported a low level of attendance, in a frequency from zero to twice a year, and 46 per cent attended meetings 3 to 5 times or over 5 times a year. Overall, however, attendance proved to be higher than in Ria Celestun.

The transfer of benefits to local communities must be compared with benefits granted to other actors (Norton-Griffiths, 1996, 2000; Emmerton, 2001). In both case studies (Ria Lagartos and Ria Celestun), great disparities were found between monetary benefits granted to local communities by the government and revenue generated for other actors. Indeed, direct income benefits to local communities were low. Temporary employment subsidiary programmes offered only the minimum wage; and, potential benefits notwithstanding, programmes to support the diversification of livelihoods at the time of the study generated only modest income for local communities. It is important to note that the initial objective of the Program of Temporary Employment was to provide temporary jobs for fisherman on the inauguration of the closed fishing season policy; and to support conservation activities. However, fishermen's income traditionally generous, though irregular, had declined in recent years due to stock scarcity. Therefore, some people found it humiliating to join the employment programme in return for such low remuneration. Others simply preferred to find any other job even if unsustainable since unsustainable livelihoods and restricted activities often presented a greater income incentives than the benefits from PRSD or PTE, especially when low levels of surveillance was perceived for certain activities.

Local perception of generation of monetary benefits from conservation activities to the government seemed to the people to be high considering the total of some 6.5 million Mexican pesos (approximately US$540,000) was collected in reserve entrance fees between 2003 and 2008 (CONANP, 2009a). Figure 7.1 shows that entrance fees in respect of the two case study reserves increased significantly from the commencement of collection in 2003 to 2008.

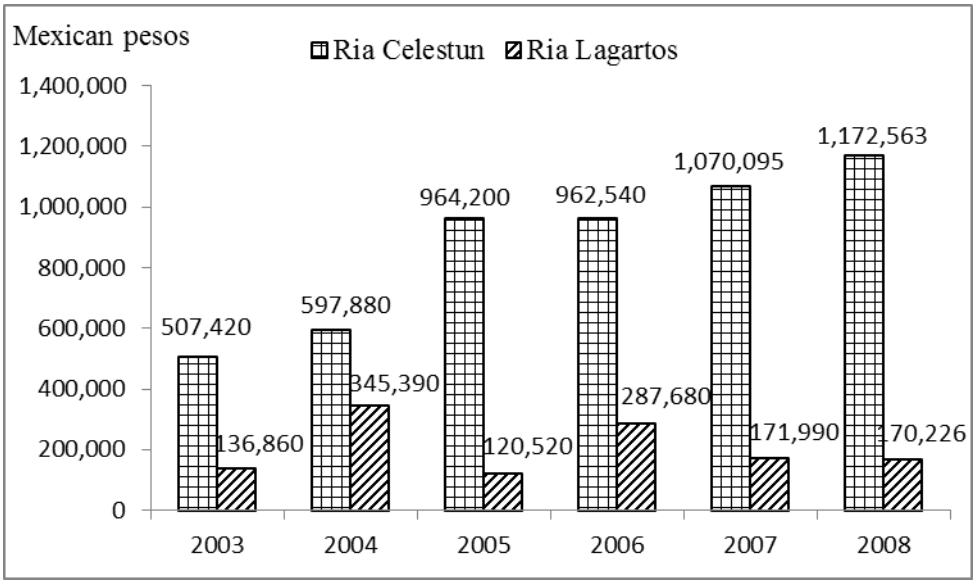



Figure 7.1 Annual increases in total entrance fees collected in Ria Celestun and Ria Lagartos. Source: CONANP, 2009a.

Ria Celestun collected 80 per cent of the total entrance fee revenue generated by the two reserves, yet only 30 per cent of its local stakeholders identified the fee as a benefit to their local communities. Ironically, a higher proportion of local stakeholders from Ria Lagartos (43 per cent) considered the entrance fee to be a positive income factor in spite of the fact that this reserve collected only 20 per cent of the combined total.

A small proportion of local stakeholders from both protected areas considered the entrance fee to reserves to be a positive benefit to their respective communities despite the fact that a proportion of the revenue generated was reported by conservation managers to be extracted for the protected area budget.

The modest comparative benefits perceived from some tour operators created conflict and opposition regarding the collection of an entrance fee into both protected areas. Operators tried to avoid them citing higher tour prices for visitors incurred threatened their livelihood. This was found in minutes of the advisory council for Ria Celestun. The establishment of a stand for launching boat tours seemed to have played an important role in resolving the problem. Entrance fees in Ria Celestun were requested in the ticket office of the touristic centre where most of the tour operators cooperatives were represented. However, this entrance fee collection was still reported as a point of disagreement at the time of the research. The expression by a local tour operator in this regard illustrates that fact:

> *"…we launch tours from the beach rather than from the luxurious touristic centre of "their reserve", then we can give better price as we don't charge the entrance fee…they say it's for social programs… social programs that give breadcrumbs only".*
>
> Member of a tour operator co-operative Ria Celestun

As Hulme and Murphree (2001) point out with regard to experiences in Africa, in order to understand the attitudes that benefits from conservation generate, distribution patterns must be taken into account. The negative benefit allocation pattern clearly shown in the experience of Ria Celestun is consistent with reports by Norton-Griffiths and Southey (1995); Bond (2001); Emerton (2001); Wells, Brandon and Hannah (1992); and Norton-Griffiths (1996, 2000), all of whom point out that disparity in comparison to the generation of benefits for other actors can actually disincentivise local community members from participation and even create social resistance to the buying in to conservation projects.

A different perception could be built, if the allocation of funds generated from reserve entrance fees followed a transparent procedure that guaranteed the return of a fair predetermined percentage to local communities.

Unequal distribution of benefits was found also in studies of Amboseli National Park (Norton-Griffiths, 1996), Kenya; Khao Yai National Park, Thailand; Volcanoes National Park, Rwanda (Wells, Brandon & Hannah, 1992); and the CAMPFIRE initiative in Zimbabwe (Bond, 2001).

Similarly, this study found that distribution of local costs creates analogous dynamics. Not all actors received the same pressure to restrict their land uses and activities for the sake of conservation. This is evidenced by comparing restrictions reported by local *ejido* versus restrictions established to support the Salt Industry in Ria Lagartos. The expansion allowed to the salt industry after the reserve had been established provided the company with a sharp growth opportunity and positioned it to become the second largest salt producer in Mexico.

Ria Lagartos Head Office reports claimed that the salt company's operation had been controlled and regulated since the publication of the management plan. Despite the fact that the salt company's growth was restricted, the legality of the enterprise should have been

called into question, particularly since the salt company openly refers to an operational area of 9,715.4 hectares (COSYSA, 2010), which represents as much as 16 per cent of the protected reserve area. The operational territory extends beyond the concession area stated in the management plan of Ria Lagartos by up to 5,000 hectares (INE & SEMARNAP, 1999). As presented in Chapter 5 (Section 5.6.2, Secondary sector) the salt industry creates a high ecological disturbance in the estuarine system to establish evaporisation lagoons for the process of salt extraction and causes deforestation of original coastal dunes for road construction, (Vega-Moro, Cepeda-González, Duran, Méndez et al., 2006) discharge of untreated wastewater, destruction of mangroves, alteration of hydrological flow in the estuary and flooding of the nesting area of the Pink Flamingo (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998).

Earth removal for road access and extensive new areas of salt extraction were observed during field work on concession land, while accompanying ranger patrols and while observing activities to restore flamingo nesting areas to reduce their flooding vulnerability. New large tracts of land were observed to have been cleared for road access to the lagoons for salt extraction operations. No documents of request or impact assessment documents were found for this construction. Threatened species of palm such as "*kuka*" were left vulnerable for illegal logging as a result of clearing vegetation for the new road (see Picture 5 in Appendix 9). No record of sanctions, nor related information was identified during a search conducted by rangers nor by an archival review.

In return for this disregard of conservation measures the salt industry was granted the status of a sponsor for conservation, particularly for the pink flamingo, despite generating only modest employment opportunities at minimum wage level to the local communities. Local *ejido* owners reported that they considered the current situation a case of double standards and inequality in the distribution of restrictions and costs for conservation.

Restrictions on farming production practices that were enforced on the *ejido,* on which over one hundred families of the local community depend, were seen as unjust when permission was given to a private salt extraction company, owned by one single family not originally from the community, to deforest and change land usage.

International experiences cited, and the results of the present study both support the contention that there is a negative correlation between the unequal distribution of benefits and costs, and the level of community participation, which in turn affects the capacity to integrate conservation and development.

### 7.2.2 Ensuring that there are more total benefits than total costs

The generation of benefits can only provide a complete assessment in terms of integrated conservation when they are analysed in relation to the cost that environmental protection policies impose on local communities. According to Emerton (2001) and Bond (2001), the successful implementation of integrated conservation implies that the total benefits generated in protected areas must be greater than the total costs imposed by conservation initiatives (Emerton, 2001; Bond, 2001). This assertion is clearly represented in Ria Celestun where, despite 57 per cent of local benefits being attributed to the protected area management, this was an insufficient incentive to get the community to support the reserve, even though 62 per cent of the indicators of social costs were attributed to the presence of the reserve. A negative balance of -5 of benefit/costs is an indication of the trade-off between local costs and local benefits.

The present study further explores this concept by incorporating the evaluation of costs and benefits by different actors. Local stakeholders provided a higher rating for both the benefits and costs associated with conservation than did the rangers. Local officials at policy level did not identify as many concrete examples of either benefits nor costs of conservation as did local community members or reserve rangers (with the exception of Ria Lagartos office personnel). This demonstrates that the level of awareness of benefits and costs is higher amongst those people who are directly affected, and lower amongst those actors external to a given reserve. Consequently, there is the risk that these costs and benefits will be underestimated.

The communities under study utilised and relied upon a wide range of biodiversity activity to sustain local development: fish and crustacean stocks to sustain fisheries; scenery and fauna as tourism attractions; estuary dynamics for salt production; soil and animals for farming; and the forest for hunting, a source of traditional medicine, wood collection and honey production. Livelihoods that did not provide a direct economic benefit such as hunting, wood

collection and subsistence agriculture seem to have been underestimated in the analysis of benefits and costs by rangers and office managers; with the exception of wood collection acknowledged by Ria Lagartos Head Office. A better understanding of social costs associated with the reserve was perceived by managers in respect of livelihoods that generated revenue such as fishing, tourism and farming.

Access to wood for construction and fuel was cited by 35 per cent of Ria Lagartos stakeholders as a restriction to accessing of natural resources, compared to 57 per cent of stakeholders from Ria Celestun. The perceived impediment to complementary livelihoods caused by the enforcement of reserve regulations seems to have been underestimated by rangers.

The restriction of access to natural resources, including wood for fuel and construction, meat, and medicinal plants, is identified by Ghimire and Pimbert (1997), and Murombedzi (2001) as a significant source of costs to local communities. Similar restrictions were found in the present case studies, including specific examples detailed within the indicators of local costs: the prohibition of access to flamingo meat and eggs; products from other wild ducks, turkeys, pheasants and other birds; sea turtle meat and eggs; venison, peccary meat and other wild mammals that used to play an important role on the local diet as a source of protein. In the case of wild mammals such as turkeys or peccary, the main reason for a current reduced consumption was reported to be the scarcity of them in the forest and to a lesser degree, conservation restrictions. However for certain wildlife species such as ducks, flamingo meat and eggs, and turtle eggs, the current reduced consumption was attributed to conservation rules that control access to them. This represents a significant cost in terms of food security for the local families.

“In times of ‘nortes’ when stormy weather stops us to go out fishing we go shooting to the estuary. Then we get arrested, punched and fined for carrying some ducks to feed our kids. Ducks that we shoot on our land… Later on the ‘gringos’ come and shoot our ducks. They are treated as kings by the same conservation guards… They don’t even need the food…the ducks are carried by their dogs… Those thief get clapped, we get treated as criminals”
Member of the local community of Ria Celestun

This quote, shared by a member of the local communities of Ria Celestun, shows deep feelings of resentment against the reserve. Elements such as land of 'ours' and land of 'them' (the managers) implies disenchantment and a perception of corruption. Wildlife managed by official hunting quotes and conservationist organisations such as Ducks Unlimited regulating the game in Ria Celestun by issuing hunting licences, is viewed with suspicion. The locally held perception expressed above represents a complex situation where conservation and local development do not seem to integrate. High levels of communication channels play an important role in shaping a shared perception between officials of conservation and local stakeholders and can improve perception of local benefits. Communication as an adjunct to positive partnership will be widely analysed in the local participation section.

### 7.2.3 Compensation for local costs

According to the semi-structured interviews with national conservation officials, to reduce or eliminate local costs, biosphere reserves were targeted in regions that consisted mainly of national and federal state-owned territory. However, despite this policy, with regard to both protected areas under study, there was still a significant disparity in the area of community land included in each reserve: 4,664.70 hectares, 6 per cent of the area of Ria Celestun was owned by the *ejido*, while in Ria Lagartos, 37 per cent belonged to the *ejido*, which covered an area, a total of 22,315 hectares (INE & SEMARNAP, 1999; SEMARNAT, 2000b). Figures 7.3 and 7.4 show the distribution of property in Ria Lagartos and Ria Celestun respectively, according to figures established in the management plan of each (INE & SEMARNAP, 1999; SEMARNAT, 2000b).

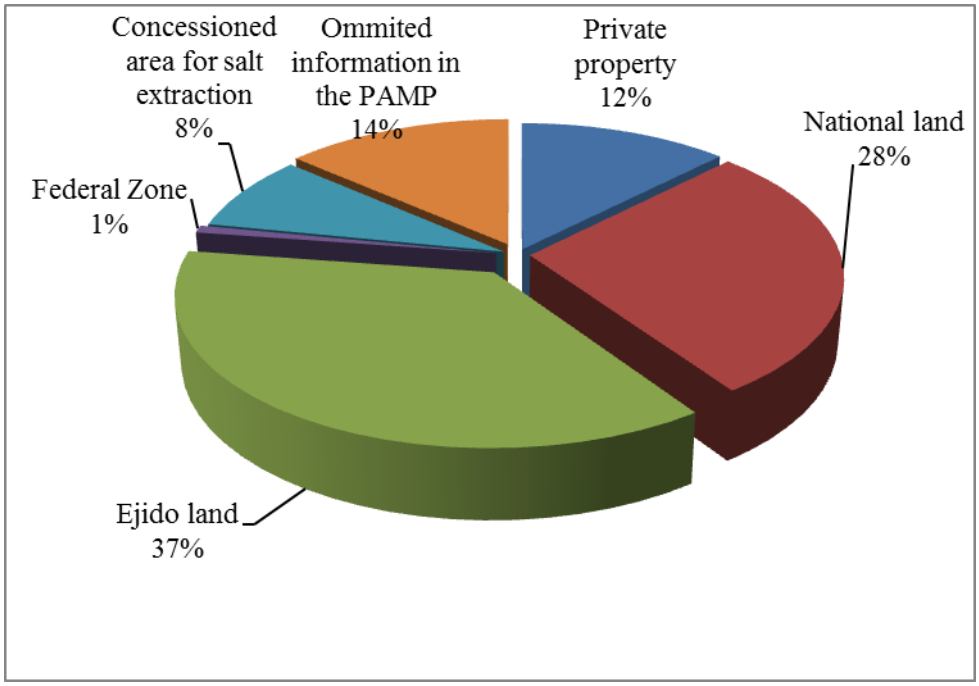



Figure 7.3 Land distribution in Ria Lagartos. Source: Adapted from INE and SEMARNAP, 1999.

A comparison between Figures 7.3 and 7.4 reveals that the majority of land in Ria Lagartos was under *ejido* ownership, which had a direct relationship to the local communities preferred use of land for livestock production. In Ria Celestun, *ejido* land comprised only 6 per cent of the biosphere reserve, with comparatively limited community interest in productive projects on this land. There was considerably less privately owned land, which amounted to 12 per cent of land in the Ria Lagartos region and 1 per cent in Ria Celestun (INE & SEMARNAT, 1999; SEMARNAT, 2000b).

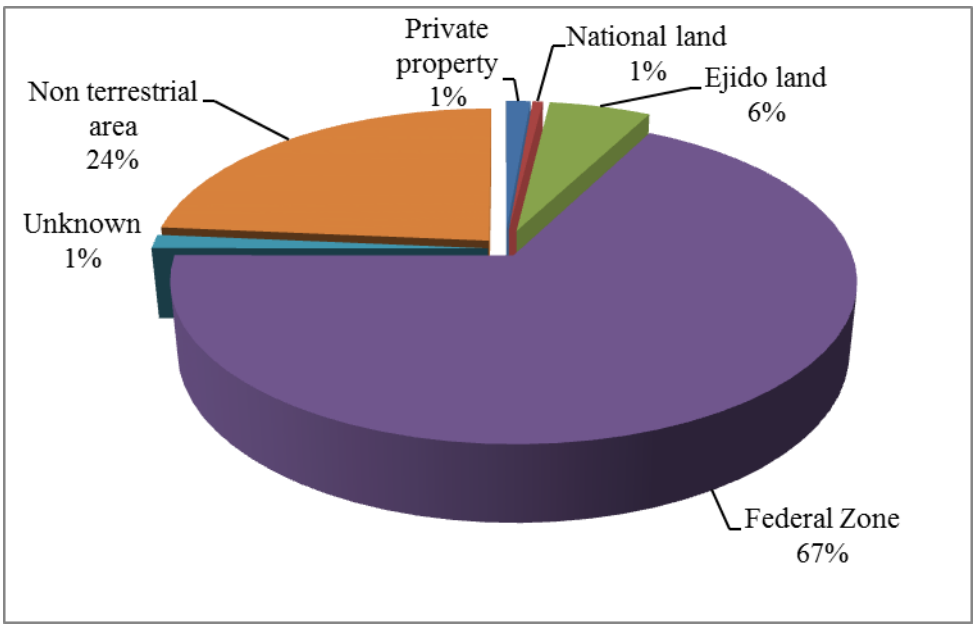



Figure 7.4 Land distribution in Ria Celestun. Source: SEMARNAT, 2000b.

Even when the *ejido* was located in a buffer zone, it was still deemed to be inside the protected area despite the land being devoted primarily to extensive livestock farming. This affected at least 115 families in Ria Lagartos who were members of the *ejido* (data from the communities of San Felipe and Rio). This research found that at the time conservation policies were moving toward establishing the biosphere reserve, cattle ranching was expanding in the area surrounding and including of Ria Lagartos, with contradictory government subsidies offered to promote livestock production (Ramirez-Cancino and Rivera-Lorca 2010; Andrade-Hernandez 2010; Eastmond and Garcia de Fuentes 2010). Local members of the ejido had limited involvement in the negotiations involved in the establishment the biosphere reserve (as this was advocated by external conservation organisations). These *ejido* members had anticipated benefiting from the subsidies for cattle farming and most of the *ejido* land was devoted primarily to extensive livestock farming.

With the establishment of Ria Lagartos biosphere reserve, restricted land use for cattle farming, constitutes an opportunity cost associated with a lack of access to livestock subsidies. In Ria Lagartos, there had been no economic assessments of the opportunity cost of such a constraint. However, loss of revenue to local households should not be underestimated. For instance, the opportunity cost associated with lost revenue from potential farming activities in Kenya's protected areas is estimated to be approximately US$200 million (Norton-Griffiths and Southey, 1995). Unsurprisingly, the recurrent indicator of cost assessed by many stakeholders in Ria Lagartos was based on restrictions on the use of land associated with farming. Indeed, 86 per cent of stakeholders, referring directly to cattle rearing limitations, considered this to be a burden.

Efforts to intensify farming in Ria Lagartos were closely monitored by landowners who had already invested in livestock production before the area had received protected status. Farming restrictions created conflict between the *ejido* and Ria Lagartos Head Office when the conservation agenda diverged from that of other government agencies that had a stake in and supported livestock breeding in the surrounding region. For example, subsidies from other sectors of government for the erection of non-electric fences in the reserve caused a conflict of interest between development interests and conservation. Similar inconsistencies were found in respect of the CAMPFIRE initiative in Zimbabwe by Murombedzi (1999), in which the same district experienced both government-assisted investment to support

agricultural expansion, and conservation agency efforts to protect biodiversity and limit deforestation.

Other documented direct local costs incurred by *ejido* members are livestock attacks and crop damage. This kind of social cost resulting from conservation is widely documented as sources of substantial cost to local communities in African and Asian contexts (Saberwal & Rangarajan, 2003; Ghimire & Pimbert, 1997; Murombedzi, 2001; Emerton, 2001). However, such phenomena appear to have been of much less severity in respect of the present study as no fatal human attacks are documented. This is not surprising given that the size of wild mammals inhabiting the savannas and forests of southern Mexico tends to be significantly smaller than those found in regions of Africa and Asia. The jaguar, the largest predator inhabiting the research areas, grows to only 1.12–1.85 m in length (Alcérrega & Robles, 2005). However, crop raiding, mainly in self-consumption *milpas*, while not considered a significant cost by managers of the protected areas of study, was reported by local stakeholders to have a significant effect on conservation by 88% of local stakeholders of Ria Celestun and by 59 per cent local stakeholders of Ria Lagartos.

Animal attacks were considered to be a local cost by only 30 per cent of stakeholders from Ria Celestun, on account of the fact that livestock breeding was not a widespread activity in the region. However, in Ria Lagartos where livestock breeding was an important source of revenue, 74 per cent of informants considered animal attacks to constitute as a cost. Examples provided, include attack to farmed ducks, chickens, wildlife production of oco-pheasants; and attacks on calves. Some stakeholders believed that the attacks were by jaguars, others believed by coyotes, which, although not common in the area, were considered the culprits, because they claimed that groups had been seen prowling around the stock. Presence of the coyote is being confirmed by Pronatura's photographic monitor of mammals in Ria Lagartos (PPY 2010). Mention of feral dogs was also reported by managers and rangers of the protected areas. Attacks from feral dogs if confirmed, cannot be directly associate with conservation cost as other factors such as poverty (abandonment of pups that become feral) and a limited animal control policy are in play.

Jaguar attacks on flamingo nesting sites are documented in the early years of reserves management by *Ninos y crias* (the conservation organisation in charge of monitoring this species) as stopping reproduction of the population at that time. Flamingos nest in specific

locations of nesting areas and the birds were either killed, or abandoned the nest as a response to the attack. Jaguar footprints confirmed these cases. A total of 126 jaguar attacks were recorded between 1998 and 2004 in Ria Lagartos, (Chavez y Zarza, 2009). In order to redress this conflict a project to produce and liberate wild pig (collar peccary) has been discussed and minuted by the advisory council in 2005 as part of the dialogue between the reserve managers and the *ejido* members. However, the human-jaguar conflict, that would inevitably end with the extermination of the jaguar due to farmers taking action against livestock attacks, is more complex than just food availability for the predator. Jaguar conservation has been an important focus of the NGO *Biocenosis* in Yucatan (Alcerrega-Aguirre et al 2010). They have uncovered a pattern between poor farming techniques and jaguar attacks. The coefficient of land for producing a head of bovine of Yucatan is between 5.01 and 10.62 hectares of land due to the poor soil quality. In dry season farmers rely on night grazing and on the capacity of the cattle to find the food and water the paddocks do not have. Poor fencing allows cattle to seek better grazing conditions, such as flooded rain forests closer to the mangroves and often in 'nuclear' zones of the protected areas where the jaguar hunts in dry seasons.

*Biocenosis* has worked with farmers to control and restore farmed ecosystems (Biocenosis 2002) by providing capacity building and some financial support to promote practices that can reduce the possibilities of encounters between stock and the jaguar. Reforestation of forage crops in paddocks, intensification of farming, investment on irrigation systems, modification of stock routines so as to avoid night grazing, the separation of bulls to manage juvenile stock, as most jaguar attacks are recorded to have impacted on juvenile stock, intensification of grass cutting through provision of harvesting equipment, provision of electric fences and economic compensation for stock lost from a jaguar attack and finally diversification in the wildlife management units (Alcerrega-Aguirre et al 2010).

Crop raiding by wild animals was also reported by 59 per cent of Ria Lagartos informants in the parts of where crops (particularly *milpa*) were grown. Crop raiding was also a significant problem in Ria Celestun, where on 88 per cent of the land, subsistence *milpa* farming complemented livelihoods. Raiding animals reported were, deer, racoons, wildpigs and tepezcuintles, important prey species of jaguars and other superior mammals.

In sum, the analysis of local costs, despite the efforts to eliminate them, still affect local stakeholders. Reducing local cost is not a sufficient strategy to integrate conservation and development, as at best they can only be minimised rather than eliminated.

This concept leads to the consideration of equity, discussed from the point of view of two aspects. Other areas use land with exploitative and productive purposes, creating incomes for other actors. The areas of study were not designated under the initiative and decision of the local communities (as it will be presented in the section on local participation). External initiatives to protect and maintain the areas that contained relatively well conserved habitats and generate environmental benefits came from external actors, such as international wetland and migratory birds; and Mesoamerican corridor projects. However, the environmental benefits that these areas potentially provide go beyond national frontiers. In this sense, if local communities, characterised by episodes of poverty and struggling to meet family needs have to disproportionally carry the costs of conservation for the benefit of external actors, then, despite the efforts to initiate local participation, conservation is perceived to be an externally imposed decision. As presented by UNDP (2002) and Chambers (1995 & 2005) people fighting poverty are more vulnerable to environmental changes as they have higher dependency on diverse natural sources to complement their livelihoods. Secondly, as argued by Agrawal & Gibson (1999), when comparing depletion of ecosystems with commercial activities and local communities, low capital to access resources creates a lower impact on natural habitats than the large scale of an industrial company, such as the salt industry as was discussed in the section on livelihoods. Such disproportional distribution of cost and benefits of conservation among local and external communities lead us to consider elements of social justice in the conservation agenda (Redclift, 2000). Comprehensive compensatory policies could represent an interesting tool to redress the local costs of conservation that cannot be eliminated. In this respect, Environmental Services Payment schemes are a potential tool for redressing local costs incurred from conservation strategies in protected areas. Partnerships between different departments governing natural resources are relevant as the Environmental Service Payment Program is managed under the National Commission of Forestry (Macip-Rios and Macip, 2013). During field work, no examples of these were found in the areas of study. However, an update of archival information requested from Ria Lagartos head office in 2013 during the last stage of this research confirmed that 3,063.10 hectares had been established under a Payment of Environmental Services Program including 4 *ejidos*. Telephone conversations with Ria Celestun officers stated that no projects on Payment of

Environmental Services existed in Ria Celestun despite interest in this program. The explanation being that proposals submitted to the National Commission on Forestry for these projects were not successful due to the local *ejidos* not meeting with the project requirements.

Efforts to 'compensate' local communities through the Program of Temporary Employment (initiated to support fisherman during fishing closures seasons) had provided some positive outcomes, but reports from local stakeholders inform, that due to the payment being set at only minimum wage level, the programme was not attractive enough for local fisherman to comply with regulations, as they could make five to ten times the amount in a restricted activity. Another criticism was, that because of the limit to a number of beneficiaries allowed on the listing and the same people being retained every year, many deserving people were left out programme because there was no sharing or rotation of beneficiaries. This was perceived as corruption as 'friends' of personnel seemed to always get listed.

## 7.3 Discussions on local livelihoods

### 7.3.1 Generation of sustainable livelihoods

The head offices of both Ria Celestun and Ria Lagartos cited the establishment of sustainable livelihoods as an important aspect of an integrated policy of conservation. Two main activities were supported to promote long term sustainable local livelihoods: ecotourism and sustainable wildlife management.

If comparing the importance of these livelihoods with the predominant activity in the area, fishing in the sea, might seem modest, given that its frequency of engagement on the higher interval practiced in a range of every day to once a week is 57 per cent of the local stakeholders of Ria Lagartos and 40 per cent from Ria Celestun. As presented in the results, fishing activity is regulated at the moment with minimal sizes and closures during the reproductive seasons for commercial species to conserve the stocks and additionally, most of the marine area where fishing takes place is outside the polygon of the reserves.

It was found that the efforts to promote and grow ecotourism based on fishing are reaching comparable levels of engagement to those in farming. Wildlife management does not figure yet as an important livelihood.

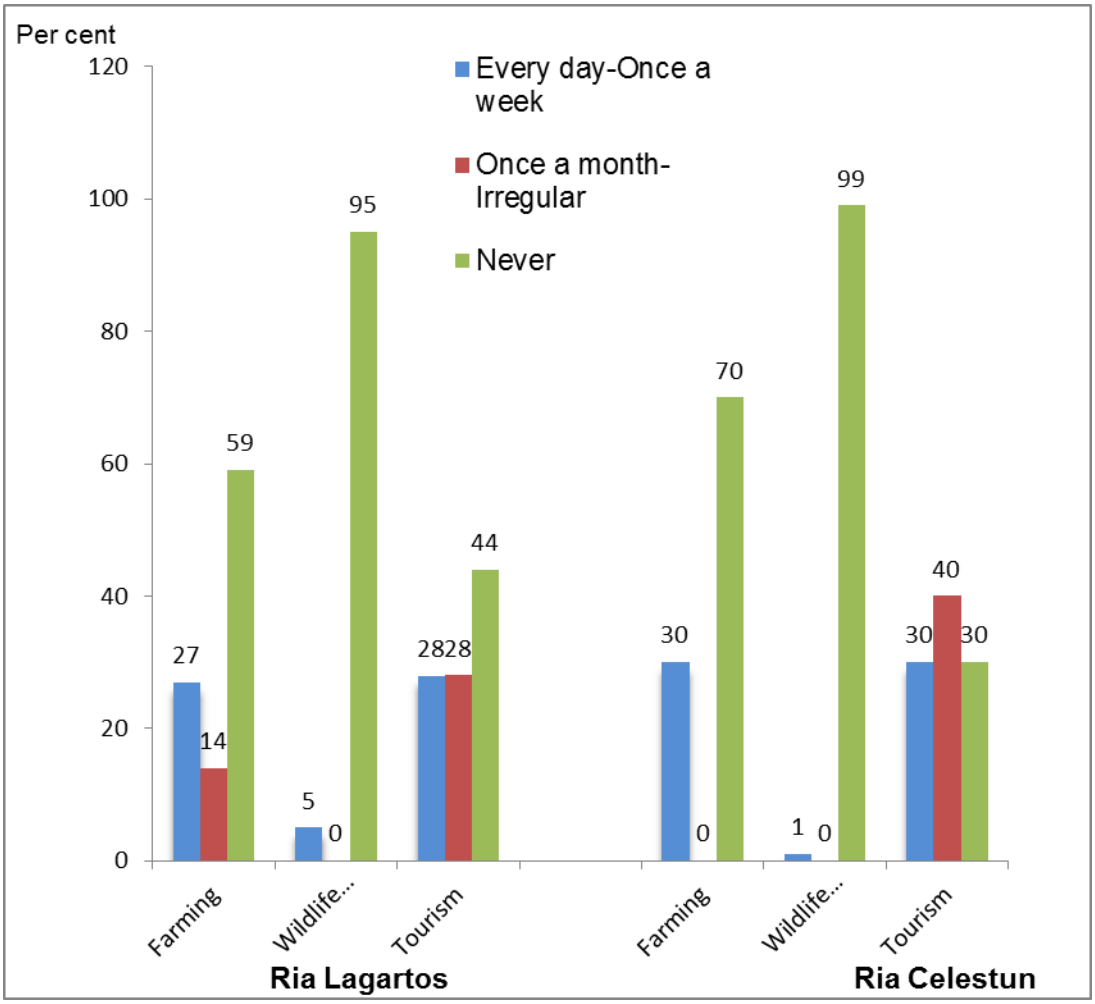



Figure 7.5 Comparison of percentage of local stakeholders engaged in farming, wildlife management and tourism activities. Source: The author.

Figure 7.5 shows that 28 per cent of local stakeholders of Ria Lagartos reported to currently engage in eco-tourism at least once a week, an engagement comparable to farming given that 27 per cent of local stakeholders of Ria Lagartos engage in farming activities on the same interval of frequency. This dynamic is similar in Ria Celestun where 30 per cent of local stakeholders are reported to engage in eco-tourism activities and another 30 per cent on farming.

Accredited eco-tourism operators, trained to perform to reserve standards, and with valid licences to operate reported an engagement in tourism between every day to once a week. This research discovered stakeholders who reported a more sporadic and irregular frequency to engage in tourism activities, often using fishing boats without safety procedures, taking random routes and not providing informative material. Actors who did not comply with reserve standards implemented by ecotourism accreditation or trained operated tours. These

people, identified as opportunistic actors engaged in complementary livelihood took advantage of the high seasonal demand for ecotourism trips. Ecotourism as a substitute for overreliance on fishing has become the most important source of alternative livelihood in the two biosphere reserves. Affluence of tourists creates opportunities not only for sustainable livelihoods for eco-tourism cooperatives but also for restaurants, hotels, handicraft cooperatives and merchants in the town. Nevertheless, despite ecotourism being a growing viable source of income, other opportunities unlinked with tourism need to be explored due to the limited number of visitors, and the seasonal characteristic of the activity. The fluctuations between high numbers of tourists during holiday seasons, reasonable numbers over the spring and summer, and few or none at all for several other months of the year during the times of '*nortes*', which are characterised by windy and stormy weather was found to place a strain on families. This phenomenon should therefore be addressed and other complementary livelihoods in which to engage during the low seasons explored, as eco-tourism shares a similar low season to sea fishing although the timing for the season's closure for fishing differs slightly with the high tourist season.

While eco-tourism is reported to play a role as an alternative to fishing, sustainable wildlife management, plays a role as an alternative to cattle farming. Ecotourism has become a major activity for fisherman who could not continue living from fishing once the number of fishermen increased and the fishing quota regulated. The frequency of engagement by locals on ecotourism previously presented proves the effectiveness of promoting alternative activity.

Seasonality of a livelihood is an important aspect to consider when creating alternative activities to reduce direct access to forest biodiversity. For instance, this research has found a relationship existing between sea related livelihoods and inland related livelihoods. During low seasons for fishing and eco-tourism (the season of '*nortes*'), more pressure is placed on inland activities such as farming, hunting, wildlife capture and other inland extractive activities to meet local needs. According to local reports ecotourism is not detracting from the access to the inland ecosystems during the low seasons. It is then that extraction peaks.

The direction of economic expansion of livestock production in the area within Ria Lagartos (Ramirez-Cancino and Rivera-Lorca 2010; Andrade-Hernandez 2010; Eastmond and Garcia de Fuentes 2010) coincide with stages of stagnation of the fisheries (Fraga, 2004; Sánchez-Salazar & Fraga, 1999). Deforestation rates between 1988 to 2008, mainly attributed to the

expansion of farming, resulted in a 20 per cent loss of forest cover of Ria Lagartos (PPY, 2008) confirm the coincidental timing of cattle ranching expansion which occurred after the decline in fisheries. This demonstrates that reduced fishing opportunities in the case study areas have played a role in the expansion of farming activities.

This observation feeds to the discussion that if sea-based productive sources of food and income decay, an increase of inland livelihoods is expected to contribute to the fulfilling of local livelihoods. Therefore, understanding the dynamics between sea and inland livelihoods, and assessing the environmental impact of those relations, represent an important element to be incorporated in strategies for sustainable livelihoods in coastal protected areas. A sustainable livelihood, promoted by conservation policies that contribute to reducing pressure of inland ecosystems, is wildlife management. However, engagement in wildlife management and sustainable production was found to be low. Only 1 per cent of stakeholders in Ria Celestun engaged in this activity and 5 per cent in Ria Lagartos (as presented in figure 7.3) Units for Sustainable Wildlife Management are clearly described in the General Law of Wildlife as a strategy for the promotion of sustainable livelihoods (DOF, 2006a). The creation of units of wildlife management (see Chapter 3, Section 3.3) aimed at creating a legal mechanism for accessing biodiversity with an approved management plan (DOF, 2000).

Such regulations found in DOF, (2006a) responded to a wider vision of conservation; legislation that was designed to return legal biodiversity rights to landowners while promoting the sustainable breeding and management of wildlife. Indeed, the government created this mechanism as a conservation tool, since past policies imposing full restrictions and prohibition had not provided the expected results.

Units of wildlife management in an area covering 39.47 hectares, identified at the time of the field work were, peccary-wait tail deer, palm *Chi it* and oco-pheasant in Ria Lagartos,. And, in Ria Celestun one unit of crocodile was identified within a small extension of 400m$^2$. Initiatives such as breeding of songbirds, other species of mammals hunted for bush meat and palms such as the '*kuka'* at present illegally extracted to sell as ornament plants, would be potential strategies to avoid the extensive environmental impact of cattle farming while arresting the decline of their populations due to illegal extraction. However, the latest updated archival information obtained has shown an increase of UWM in Ria Lagartos. New units of

*Kuka* palm, queil, crocodile and tepezcuintle have been established with a total extension of of 6050 hectares of productive units, 32.38 of them being under *ejido* management.

Establishing units of sustainable wildlife production is not straightforward. It requires intervention to help individuals and co-operatives identify a diverse range of initiatives which the programme might then develop and fund; its aims being to establish the sustainable farming of wildlife species that have commercial value but whose extraction from the wild is prohibited. The programme guidelines allow for the commercial exploitation of the majority of animals, but also take into account their relocation, repopulation and reintroduction based on a comprehensive management plan and set of operational regulations (DOF, 2006a).

Local stakeholders experienced in the management of units of wildlife production pointed out that, even though assistance and some funding was available for community support with regard to a range of programmes, the potential for revenue generation, seemed to be constricted by the general regulation governing the implementation of wildlife units. Such disincentives included bureaucratic conditions that had to be met in order to operate units; the amount of time required for the management of units (considerably more than that necessitated by extensive cattle farming); and a lack of knowledge about the rearing of unfamiliar species, and other administrative requirements that were beyond the capacity of *ejido* members. Training programmes featuring the knowledge and skills required to successfully engage in this alternative livelihood was required.

The nature of this kind of undertaking meant that a period of time and investment was required before it began to generate revenue. Thus, stakeholders often engaged in such initiatives whilst continuing to maintain other occupations on which they could rely for an income.

Project developers could argue that according to economic projections of land usage, sustainable wildlife management initiatives would generate higher revenue than that potentially earned from extensive farming. However, implementation experiences highlight that delays by the authorities to grant permission for harvest, represents a major problem. For the crocodile unit in Ria Celestun such delays meant high costs of prolonged feeding and in Ria Lagartos, for the oco-pheasant unit, a loss of a sales. In both cases, delay on administrative requisites represented cost that affected the viability of the projects.

Nevertheless, based on reports from local stakeholders of both livestock farming and wildlife management, this study argues that the promise of higher revenue from alternative wildlife production notwithstanding, local landowners would still prefer cattle farming, this being based upon four reasons identified by the study:

1) Extensive livestock production as it was practiced in Ria Lagartos, required very low investment and management outlay; 2) as the market is local, cattle farming did not require permission for harvesting, nor paperwork, external review of the production process, or other bureaucratic interactions with the wildlife management office at the MENR – which was located in the distant capital of Yucatan; 3) extensive farming was a familiar low-risk activity in terms of revenue generation; and 4) the wildlife management programme required a degree of entrepreneurialism, a human quality that could only be nurtured through training and on-going support.

The second argument concerns the fact that extensive cattle farming is practiced by a high proportion of the population of Ria Lagartos where the widespread *ejido* lands means greater involvement in farming, Accordingly, assistance and support for *ejido* members must be implemented strategically, particularly when the percentage of land being used for this purpose is considerable.

Based on this experience, two arguments can be considered. The first derives from Bond's (2001) analysis of African protected areas, in which he concludes that an alternative livelihood must exceed the proceeds of primary agricultural income. Similarly, the present case studies show that in order to incentivise alternative livelihoods in Ria Lagartos, it is necessary that the incentives exceed the revenue generated by cattle farming. The second is from Emerton (2001). Based on studies in East and Southern Africa where restrictive agricultural and livestock production represent an opportunity cost of wildlife conservation and represent significant earnings forgone for local communities. This resembles Ria Lagartos farmers who are faced with restrictions in obtaining subsidies for livestock production to change land use as they are located within the reserve.

The projects on sustainable wildlife management in the area of study have not reached a capacity return on which to rely as a principal activity. The analysis found that livelihoods

that made a high environmental impact (characterised by extensive systems such as cattle ranching) often brought higher returns than the possible benefits promised by units of wildlife management or temporary employments supported by the agency of conservation programmes.

For instance, hunting is preferred to breeding game through a unit of wildlife management. Reliance on hunting was 4.4 times higher in Ria Celestun, where 40 per cent of informants hunt on an irregular basis; while only 9 per cent of the population of Ria Lagartos, hunted.

Fishing in the estuary is another livelihood that, despite being restricted by conservation policies, still continues to exist. This activity is particularly stock depleting when practiced on a regular basis of at least once week frequency reported by 30 per cent of local stakeholders of Ria Celestun and by 13 per cent in Ria Lagartos. Figure 7.4 shows its comparison with farming.

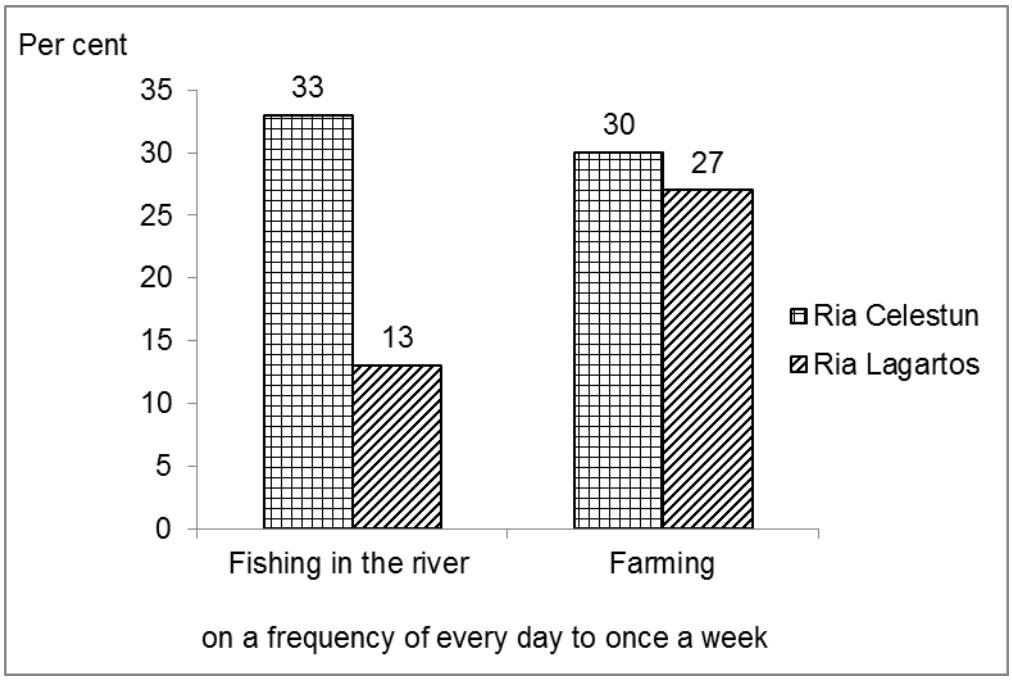



Figure 7.6 Percentage of local stakeholders engaging in the mainly restricted local livelihoods due to conservation policies. Source: The author.

The protected estuary is accessed for fishing on an irregular basis. In Ria Lagartos stakeholders report that the estuary is traditionally considered a place to collect food when long periods of storm (*'nortes'*) stop them going out fishing. Irregular use of the estuary was found higher in Ria Celestun as detailed in results chapter.

The comparative analysis of livelihoods of high and low environmental impact shows that despite the efforts to promote sustainable livelihoods in the communities of study, this is an on-going challenge.

Examples of the generation of revenues from alternative livelihoods in protected areas show that the levels achieved have still been modest. Studies from, McIvor (1997) in CAMPFIRE Zimbabwe shows that the revenues from tourism is still limited for local communities as the major proportion goes to private tourist companies (not even the Department of National Park and Wildlife Management) ). Emerton (2001) shows that despite high revenues obtain from tourism by visiting Maasai Mara in Kenya less than 1 per cent of the expenditure accrued to local Maasai communities. Turner (2004) argues, that revenues reaching household level are is still minimal as the majority of revenues still at management level for programmes to support livelihoods.

### 7.3.2 Institutional co-ordination with external actors

As discussed in Chapter 2, Section 2.3.2, in the Usambara Mountains in Tanzania, the generation of sustainable livelihoods alternative to agricultural development were unsuccessful: in spite of participatory processes that introduced a variety of local enterprise proposals. Needlework, chicken rearing schemes, and fishpond production projects could not be sustained as was expected, as capacity, in terms of both human resources and funding was limited (Stocking & Perkin, 1992). Such experiences emphasise how integration with other institutions takes on substantial relevance and importance. It is not expected that conservation agencies be able to provide all the technical capacity to support new enterprises. Their importance lies in the ability of such actors to establish formal partnerships with other institutions that do have the technical wherewithal to support the wide variety of projects that integrated conservation demands, so long as the former are able to embrace a partnership approach to their initiatives. The bringing on board of new institutions and alliances is a necessary prerequisite to the long-term sustainability of conservation projects that benefit local communities.

In both reserves under study, the implementation of protected area management plans has required collaboration between diverse organisations. In order to assess community

awareness of this inter-institutional network and the perceived level of co-ordination, local stakeholders were asked to give an approximation of the number of institutions operational in each reserve. With regard to Ria Celestun, the average number of institutions local stakeholders believed to be working towards conservation goals in the reserve was 5; and in respect of Ria Lagartos, 13 institutions were cited.

The main institutions local stakeholders identified as having established alliances with Ria Celestun Head Office, were the National Forestry Commission; the National Fisheries Commission, MALF; FAEP, the Ministry of Social Development; the NGO *Pronatura Peninsula de Yucatán*; and the local health centre. Local stakeholders from Ria Lagartos named all of the above, with the addition of the Autonomous University of Yucatan; the Department of Ecology of the Yucatan government; the Centre for Scientific Research and Advanced Studies; the NGOs *Dumac*, *Niños y Crías* (Kids and Critters) and *Biocenosis*; and the Environmental Youth Alliance of Yucatan. In addition, Ria Lagartos Head Office reported that the reserve was conducting temporary research projects in collaboration with a number of universities. These reports are an indication of higher levels of institutional co-ordination with external actors in Ria Lagartos than in Ria Celestun. This correlates with corresponding higher scores of integrated conservation.

Local and national institutions design policies that affect local populations, and therefore represent potential partners for communities and park management agencies (Brown, 2002). These policies are not only implemented by the head offices of the reserves or the NCPA; other government departments such as the MALF include in their mission statements the aim of ensuring the sustainability of local livelihoods. Nevertheless, the ‘greening’ of livelihoods in the reserves was reported to be a major challenge to conservation agencies. Inconsistent rural growth strategies on the part of different government sectors – e.g. fisheries, forestry and agriculture – often run counter productive to conservation efforts, creating barriers to the achievement of protected area objectives (Pimbert & Pretty, 1997).

In the 1980s, the Bank of Rural Credit promoted cattle farming in Ria Lagartos (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998). At the time of the study, local stakeholders reported that this activity was still being subsidised. This is an activity that is opposed to conservation goals and represents a conflict of interests for local development. Another example of a lack of inter-institutional co-ordination affecting conservation projects

was the construction of power lines in Ria Lagartos by the Federal Electric Commission, the erection of which impacted heavily on the wildlife, particularly birds (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998). The importance of a coherent approach among institutions demonstrates that conservation must also be understood as a political process (Schwartzman, Moreira & Nepstad, 2000).

International organisations and NGOs are also important actors in these conservation partnership networks (Stolton & Dudley, 1999; IUCN, 2005; Western, 2001). Significant contributions have been documented concerning NGO collaboration with reserve management in both Ria Lagartos and Ria Celestun, principally through the involvement of *Pronatura Península de Yucatán* (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998) And the NGO *Niños y Crías* (Kids and Critters) (Tabasco Contreras, 2005). In spite of administrative changes in the environmental sector from the early 1990's, that resulted in consolidation of the institutional capacity to manage protected areas (as presented in Chapter 3 Section 3.3.1, Evolution of natural protected areas in Mexico), internal reorganisation continues to represent an obstacle to direct implementation, as demonstrated by delay in the release of international funding for Ria Lagartos (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998).

The establishment of a successful partnership between agencies associated with conservation and local communities requires the implementation of institutional processes and legislation to promote networking between disparate organisations (Rodgers, Hartley & Bashir, 2003). Inter-institutional co-operation in respect of coastal zones was studied by Sorensen, McCreary & Brandani (1992), who found that the involvement of a variety of government sectors in a natural area often caused the fragmentation of responsibilities, or duplication of initiatives. Therefore, they proposed a system of horizontal integration to facilitate mediation between different levels of government on the one hand, and vertical integration to co-ordinate NGO relations on the other (Sorensen, McCreary & Brandani, 1992).

Partnerships with academic institutions are also critical in terms of protected area administration, particularly with regard to the establishment and monitoring of new research projects. Fisheries management provides a good example of collaboration between central government, academia and the local community. Documented cases in the Philippines, Denmark and Japan that have incorporated the inclusion of local knowledge and the

[2] *Horizontal integration may also involve networks of communities involved in conservation initiatives (Berkes, 2004).*

participation of communities in the scientific modelling and planning of fisheries have proved to be highly successful in the management of fish stocks (Evans and Birchenough, 2001). Significant contributions from the partnership between the Research and Advanced Studies Centre of the National Polytechnic Institute of Mexico (known as *CINVESTAV)* and the head offices of the reserves are also documented, including the monitoring of water quality, mangrove conservation, and submerged grass conservation in both estuaries (Herrera-Silveira & Comin, 2000; Herrera-Silveira, Zaldívar-Jiménez, Teutli Hernandez, Chi Chan et al., 2005; Herrera-Silveira, Zaldívar-Jiménez, Osorio Moreno, Trejo et al., 2005; Herrera-Silveira, Zaldívar-Jiménez, Osorio Moreno & Alonzo Parra, 2005) .

Even though this study emphasises the essential role of the community in environmental protection – and vice versa – an approach that is reliant on a community-centric focus alone would prove to be inadequate, since local populations have limited potential to mitigate the effects of the powerful external threats to which protected areas are subject (Wells, Brandon & Hannah, 1992). Therefore, any examination of the role of the community in conservation needs to take the interaction of the former with other institutions into account (Borrini-Feyerabend, 1996).

The exploitation of linkages between local actors, government conservation agencies, and other institutions working towards common objectives is essential to the realisation of integrated conservation. An increasing number of conservation agencies operating in protected areas are making efforts to involve local communities as strategic partners rather than burden them with the full responsibility of ecosystem protection. Berkes (2004) argues that a ‘cross-scale’ approach is the most effective method of addressing conservation challenges; similarly, the present study considers that a variety of institutions must operate in harmony if conservation is to be effectively integrated.

Similar to Berkes (2004), who supports the concept of cross-sectoral conservation, the present study found that integrated conservation and development requires multiple capacities, many of which are beyond the resources of the conservation agency. Accordingly, integration and co-ordination with other actors and institutions becomes essential. However, in so doing, it is important to promote cordial relations, particularly with the municipal authorities; since, as reported by Ria Lagartos Head Office, in its enthusiasm to collaborate in

integrated conservation, the reserve runs the risk of undermining local government sovereignty, which could elicit an unfavourable reaction.

## 7.4 Discussions on Local Participation

### 7.4.1 Promotion of local participation

The head offices of both Ria Celestun and Ria Lagartos stated that the initial lobbying and political mobilisation to promote the establishment of these localities as protected areas did not originate from their communities but was instigated by NGOs and academic centres. This is an important feature, for it emphasises that the political will to conserve these areas via statutory legislation came from outside the communities residing there. Ria Lagartos office managers acknowledged that early mobilisation in 1979 to promote the protection of the area did not include local participation; but since the reserve's status changed to that of a biosphere reserve, substantial effort had been made to secure local involvement in policy development by including community participation processes in an integrated approach. National and regional office managers pointed out, that modification to the Ecological Equilibrium and Environmental Protection Law in 1996 created important opportunities for local community participation. The main changes included a mandate for social consultation with local inhabitants before the designation of a protected area.

The protected areas under study are managed according to annual operational plans co-ordinated with national policies that provide a framework for implementation. The ultimate document that links national policy with operational strategy is the protected area management plan (PAMP). This text lists general operational strategies, norms, and the geographic limitations of 'nuclear' and 'buffer' zones.

Local participation is included as a sub component of the social development component in both Ria Lagartos's PAMP; published in 1999 and Ria Celestun's in 2000. Involving local communities in the conservation and sustainable access of natural resources and promoting local organisation and self-appraisal to support local participation is the objective of this sub-component in both reserves. Diversification of livelihoods is an important strategy included in components of the PAMP.

Local stakeholders were asked if they were aware of the PAMP and, as Figure 6.29 shows, when compared with results from Ria Celestun a higher percentage of Ria Lagartos stakeholders knew about its existence.

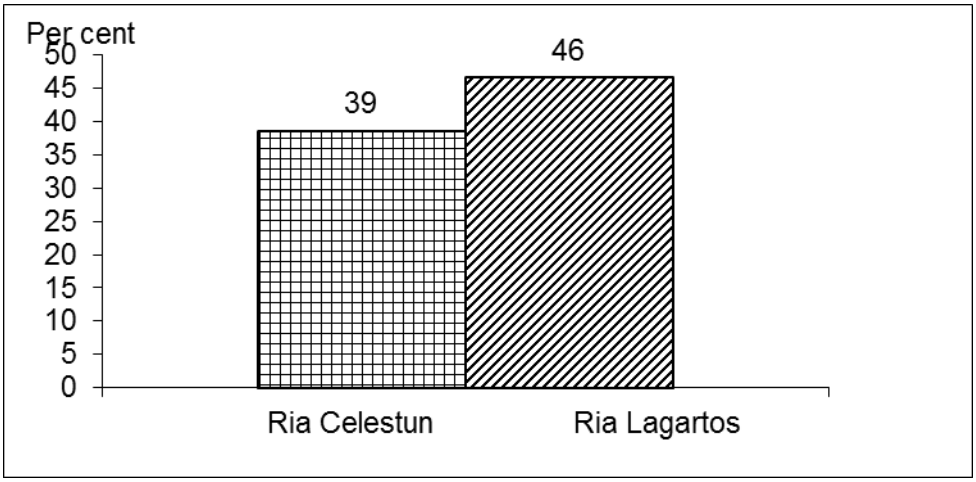



Figure 7.7 Percentage of local stakeholders aware of the PAMP (2007). Source: The author.

Thirty-nine per cent of Ria Celestun informants were aware of the management plan, while forty-six per cent of those from Ria Lagartos were familiar with this text. Stakeholder's awareness and understanding is essential before they can buy into programmes. Knowledge brings understanding. Understanding facilitates a 'buying in' to conservation efforts. Only then may constancy in implementation of the policies designed be achieved.

A factor providing insight into the reason for local stakeholders from Ria Lagartos being more informed, than those in Ria Celestun about the reserve and their PAMP is the Ria Lagartos office initiative to design a user-friendly version of the PAMP and circulate it in the communities. This version includes illustrations and questions and answers by cartoon people informing and addressing common concerns. This was not documented to have occurred in Ria Celestun.

Another important strategy of local participation which Ria Lagartos has promulgated, is the creation of advisory bodies for the protected area on which local stakeholders could participate, obtain information and voice their opinions. The advisory council of Ria Lagartos was formed in 1993 –six years before the reserve was decreed a biosphere reserve and before the PAMP was created. In Ria Celestun, after its inception by the first government protective decree in 1979, local consultation was limited. Its advisory council was formed in 2003, three

years after its elevation from protected area status to biosphere reserve, and the publication of the PAMP.

The technical advisory councils on which representatives of local stakeholders and external institutions sit, provide a forum for all interested parties to discuss opinions on conservation policies and programmes (DOF 2004), represents the implementation of an essential strategy to heighten local participation. The establishment of technical advisory councils was also influenced by international agreements and funding guidelines. Informants from national and regional conservation offices pointed out that the council was now prefaced with the epithet, ‘advisory,’ a measure intended to emphasise local participation, which had previously been marginalised when so-called technical expert opinion dominated the meetings.

The establishment of advisory councils has brought different experiences – some successful and others in the process of consolidation. Based on diverse experiences in protected areas throughout Mexico, national-level managers pointed out that during the 12 years of local participation promotion, important cumulative lessons had been learnt about consultation and consensus building. Managers recognised that there was still a long way to go and much to learn, but considered significant progress had been made in fostering participation in the implementation of the country’s protected areas.

Ria Lagartos Head Office managers were able to provide concrete examples demonstrating that local opinions expressed in the advisory council were incorporated into decisions making with regard to reserve administration, For example, they reported the stimulation of active discussion and efforts to incorporate local knowledge on the determination of the geographic boundaries and the establishment of ‘nuclear' and ‘buffer’ zones in the reserve. The agreement between these designations with local stakeholders was significant, as the 'nuclear' zone was restricted to research activities only but the buffer zone was an area in which local communities had limited access to natural resources as determined by conservation regulations.

In addition to the advisory council, to social research and to environmental education efforts, including a strategy to circulate the PAMP, the Ria Lagartos office organises public events such as presentations and activities in schools during the flamingo festival and the celebration of the World Environmental Day. Meetings with local stakeholders have been organised to

provide follow up on activities and initiatives that received funding. Officials and rangers stated that local participation had been positive in Ria Lagartos. Evidence of this is that local stakeholders clearly knew who the reserve personnel were and no antagonism between them was perceived.

In the early developmental stages of reserves in Ria Celestun local participation was limited to public talks, community notice boards and, more recently, Environmental Day celebrations, but there was no strategy that included social research, continual environmental education or follow up mechanisms after consultation. Therefore, once the local stakeholders were brought to the advisory council, their level of involvement was reported to be limited.

Consequently, participation in reserve management, based upon stakeholder participation in meetings with reserve authorities and actors, was assessed higher in Ria Lagartos than in Ria Celestun. The higher percentage rating of attendance by local stakeholders from Ria Lagartos (35 per cent) represented the second highest frequency of attendance at meetings with the reserve officials – between three and five times a year. In contrast, the most common attendance frequency cited by stakeholders from Ria Celestun was no attendance throughout the whole year (33 per cent).

As detailed in Chapter 6, local inclusion assessment was higher in Ria Lagartos than in Ria Celestun. Therefore, in order to understand the continuity of participatory efforts in the reserves, local participation was investigated beyond the simple attendance at meetings.

To gain deeper understanding of the dynamics of participation, other mechanisms designed to facilitate community inclusiveness were assessed. Local stakeholders from Ria Lagartos expressed positive relationships with the reserve personnel, but they believed that although villagers' were given the opportunity to voice opinions, this was the limit of their participation. They spoke of being unable to make any real impact on the reserve decision-making process as they did not have the right to vote.

An example of inclusion in Ria Lagartos, was the debate on the restriction of certain economic activities, the aim being, to establish their environmental impact and depending on the findings, suggest viable alternatives. The advisory council also debated local opposition to the inclusion of the sea within the boundaries of the reserve. Local contributions were

taken into account during the formulation of the Ria Lagartos management plan and the sea was not included in the polygon of the reserve. This issue addressed by the advisory council demonstrated how, through inclusion, local communities could influence decisions that directly affect them.

Local knowledge also being incorporated into the decision-making process was seen when the salt industry requested the closure of a channel in the estuarine system in the interests of production efficiency. Fishing co-operatives advised against this initiative, citing the potential negative effects of this project on estuary dynamics. As expressed by managers of the protected area and in the minutes of the advisory council, these opinions were instrumental in determining the resolution to reject the request made by the salt industry.

Another topic debated by the advisory council in respect of Ria Lagartos was the establishment of a visitor entrance fee. Tour operators' opposition to the entrance fee was associated with the addition costs incurred. Raising the price of tour excursions was believed to leave the operators with less negotiation capacity to set an advantageous price for the tourist. At the time of the study, an external ticket office had been established in order to circumvent the perceived problem by separating the entrance fee to the reserve from the tour operator's fees. Despite this, the entrance fee was still not perceived in a positive light on the part of reserve communities, and disputes between tour operators both in Ria Lagartos' and Rio Celestun communities remained a problem. A further example of contention over the issue of reserve entrance fees is that 70 per cent of stakeholders from Ria Celestun and 57 per cent of those from Ria Lagartos denied that such a charge represented a viable mechanism for transferring benefits to local communities (as discussed in detail in Section 6.2.1.1, 'local benefits').

Local stakeholders' perceptions of the efforts of protected area offices to promote local participation tended to be positive in respect of Ria Lagartos but were less so in the case of Ria Celestun. Conversely, in Ria Celestun, there was no evidence of local involvement in the design of the management plan. As Wells, Brandon and Hannah (1992) point out, in order to be effective, participation must be continuous rather than occasional. Moreover, the continuous effort to involve local communities in the management of Ria Lagartos exemplifies 'active participation', as classified by Mannigel (2007); while Ria Celestun provides an instance of 'passive participation' in terms of Mannigel's (2007) model.

Ria Celestun officials initially experienced resistance to efforts to promote community participation in decision making. This was due to reluctance on the part of local stakeholders to negotiate with reserve office authorities despite communication being established between the reserve and tourist operators in order to collaborate on conservation initiatives. However, since 2003, Ria Celestun officials have increased their efforts substantially to promote local participation by means of identifying local requirements, community conflicts and interests, and by reinforcing the progress made through capacity building support.

Based on their attendance levels and perceptions of local inclusion, local stakeholders from Ria Celestun reported a low level of community participation This perception does not do justice to efforts, at the time of the study, on the part of Ria Celestun Head Office, to increase participation. It does, however, accurately portray the prevailing state of limited participation during the reserves's early stages of development. Contrary to the perceptions held by stakeholders, rangers reported that local stakeholders were frequently invited to meetings with reserve officials. Nevertheless, more invitations to community members to participate in meetings notwithstanding, rangers reported that involvement was often limited to listening to presentations from conservation office personnel. Moreover, none of the Ria Celestun managers could recall instances in which local community opinion had been incorporated into conservation policy design. Accordingly, the perceived inclusion of local opinion was reported to be low by local stakeholders.

The opinion of a hotel operator of Ria Celestun illustrates this situation. When asked about the extent of inclusion of local views expressed in the meetings of the advisory council:

> *"those meetings exist only to satisfy their established requisites of the reserve. But really, there is no follow up…"*
> Member of the local community of Ria Celestun

The fact that the advisory council was established in both reserves as a precondition of GEF funding (Andrews, Migoya Von Bertrab, Rojas, Sastré Méndez et al., 1998) brings to question the authenticity for local inclusion in the areas of study. However, this policy needs to be perceived as an opportunity and does not necessarily undermine the concrete examples of local community involvement that were found to have been employed by reserve management, (such as the positive examples found in Ria Lagartos) Nevertheless, despite

follow ups being found on local concerns expressed in discussion sessions, further investigations revealed no systematic follow up mechanisms were in place for issues raised by local stakeholders, particularly in Ria Ceslestun. Indeed, as Brosius, Tsing and Zerner (1998) point out, the integrated conservation approach is put in jeopardy if implementation practices only focus on legitimising decentralised conservation programmes.

Local participation is a major element of integrated conservation (Borrini-Feyerabend, 1996; Agrawal & Gibson, 1999; Brown, 2002; Saberwal & Rangarajan, 2003). As noted by Kemf (1993), an essential precondition for local participation in conservation is fluent communication between local stakeholders and the reserve management office. Such dialogue proved to be more effective in Ria Lagartos than in Ria Celestun, a finding based on the incidence of local stakeholders' invitations to, and attendance levels at meetings.

### 7.4.2 Understanding the concept of community

A commonly cited reason for the failure to implement an integrated approach to conservation is the simplification of the concept of community, and the misunderstanding or neglect of basic assumptions about communities, such as social participation, power dynamics, and local perceptions of environmental protection (Leach & Scoones, 1997; Agrawal & Gibson, 1999; Brown, 2002). As noted by Pimbert and Pretty (1997), participatory approaches represent a fundamental methodological tool for the understanding of local skills and knowledge associated with the sustainable use and conservation of biodiversity.

This study found that participatory approaches were applied in Ria Lagartos in the processes of establishing the biosphere and during the formulation of a management plan. On the other hand, in Ria Celestun, there was no record of such approaches being implemented in the community for the purpose of incorporating its views into conservation programmes.

Based on information obtained from semi-structured interviews, it was found that Ria Lagartos Head Office organised a series of workshops as part of the process of designing its management plan. However, during the same planning stage at Ria Celestun, the only actors who collaborated with head office were academic centres and regional NGOs. Local stakeholders were not included in the formal participatory process.

In Ria Lagartos, the judiciousness of carrying out social assessment was demonstrated through archival information recording a series of workshops with stakeholders aimed at documenting local practices and customs linked to the natural ecosystem, and giving local communities the opportunity to voice their concerns about the intended establishment of a reserve on their land. Additional objectives of this evaluation were; to understand the nature of the communities' resident in the reserve; to identify their leading social actors; and to study their co-operative mechanisms in order to promote local participation in conservation and the sustainable use of nature (Sosa-Escalante, 2000).

The social study was carried out by the Autonomous University of Yucatan, utilising participatory assessment methods proposed by Schutter (1986 in Sosa-Escalante, 2000), which incorporated the ethno-ecological principles of proponents such as Nigh and Rodríguez (1995 in Sosa-Escalante, 2000), and Bonfil (1987 in Sosa-Escalante, 2000). Data collection methods included surveys; semi-structured interviews; workshops with local communities; and analysis of the participative mechanisms advocated by Ria Lagartos Head Office (Sosa-Escalante, 2000). The assessment covered power relations; local perceptions of conservation; an identification of the conditions necessary for the enhancement of local participation; and an analysis of the strengths, opportunities, weaknesses and threats that local communities thought should be taken into account when establishing local community participation.

The relevance of incorporating such information into the local conservation process is highlighted by Leach and Scoones (1997), Berkes (2004), and Agrawal and Gibson (1999), all of whom demonstrate how a misconception of the community and its intrinsic dynamics represents a major cause for the failure of the integrated conservation approach. The utmost importance of community understanding of the meaning of conservation is summarised by Anderson and Grove (1987a), who point out the different meanings conservation can have for different people. Accordingly, the results of the Ria Lagartos social assessment list more than 15 local participant definitions of the concept of conservation (Sosa-Escalante, 2000).

Other findings pointed out by local participants contained in the social assessment archival data of Ria Lagartos, include the risks of allowing certain stakeholders in positions of power to employ their contacts to divert funding from reserve projects and utilise them for their own interests, and for conservation programmes that represent a source of conflict with and/or

within the local community. (Sosa-Escalante, 2000). This is a relevant consideration that is evidenced by Brosius, Tsing, and Zerner (1998) in respect of other experiences in which interventions aimed at local involvement in the participatory process lack a proper understanding of whether the community can actually reconcile conflicting interests and suppress disruptive elements.

The identification of these issues is accompanied by a series of recommendations on how to address them. In terms of participation, 84 per cent of the 762 people surveyed stated that there were insufficient communication channels between the reserve head office and the local communities. Fifty-three per cent of informants reported not having participated in conservation programmes initiated by head office, whilst 47 per cent considered that they had been involved (Sosa-Escalante, 2000). The social assessment summary also included a critical analysis of the reserve's advisory council and recommendations as to engage with the communities to improve local participation (Sosa-Escalante, 2000).

The use of participatory approaches in Ria Lagartos not only contributed to a greater understanding of the complex nature of the communities in the reserve, but demonstrated also that by placing attention on social research, local communities self-esteem increases (which is reflected in empowerment –discussed in following section). Community is perceived as an important player whose opinions are being sought and visions taken into account. Participatory assessment helped head office to understand the communities' social dynamics better, thus enabling the design of more appropriate and effective strategies for the implementation of integrated conservation than was the case in Ria Celestun. No such exercise had been conducted in Ria Celestun. Recent simplistic attempts to involve local stakeholders in its advisory council risked being perceived as merely an attempt to legitimise theoretical discourse of participation in conservation programmes as argued by Brosius, Tsing, and Zerner (1998).

As the quote below demonstrates, some Ria Celestun stakeholders believed that the manager held them in low esteem:

> *"The reserve takes us for troublemakers… but people is not listened to (sic). There is no room for negotiation with the reserve"*
>
> Member of the community of Celestun.

As the results of the ICA on these case studies confirm, participatory approaches can make a difference in the design of effective local conservation programmes in protected areas, and have also been associated with high levels of local empowerment (Rodgers, Hartley & Bashir, 2003; Saberwal & Rangarajan, 2003). This is the discussion focus in the next section.

### 7.4.3 Local empowerment

Local empowerment is defined as a "process by which people, especially poor people, are enabled to take more control over their own lives and secure a better livelihood" (Chambers, 1993: 11).

Empowerment, not only gives people a voice in the decision-making process, but also the organisational capacity to implement decisions and carry out projects of their interest (Brown, 2002). Indeed, local organisational capacity, having been described as, "the ability of people to work together, organise themselves, and mobilise resources to solve problems of common interest" (Alam & Begum, 2005: 18) is identified as a key element of local empowerment. The variety of established social groups found in Ria Lagartos, including religious groups, sports teams, women's organisations, music groups and environmental organisations, demonstrate the extent to which the capacity for teamwork, and the development of formal mechanisms for expressing community agreement or disagreement with reserve policy, exist in the community of Ria Lagartos. It is in this regard that local organisations play a vital role in developing a community's social capital. Social capital is characterised by the informal rules and relationships that allow for coordinated action and engagement in community ventures (WB 1997 in Desai and Potter 2002).

This can be illustrated by taking a close look at some local organisations working in the community of San Felipe in Ria Lagartos; where levels of empowerment were remarkable, as demonstrated by exemplary and effective efforts to rebuild the community after the destructive forces of hurricanes (Local Government, 2007).

A body, the local NGO *Actam Chuleb* dedicated solely to conservation, was found in Ria Lagartos. This grassroots association facilitated the preservation of approximately 21 $km^2$ of a shallow reef habitat abundant in fish stocks located 5.5 km of the coast off San Felipe. *Actam Chuleb* had begun its operation in 1997 – before the establishment of the biosphere

reserve – as a local initiative of San Felipe's fishing co-operative (Fraga, Gavaldón & Echeverría, 2004). Among their activities, the NGO reported the facilitation of open forums to discuss the operational regulations of the protected marine area; carrying out photographic recording and monitoring of reef stocks; and initiating voluntary patrols of the locality.

Another local voluntary organisation found in San Felipe was the environmental youth group *Isla Cerritos*. This recently organised band of young people in their mid 20s to mid 30s promoted ornithology and environmental awareness while exploring possibilities for alternative livelihoods. Two of the services they offered were the restoration work of mangroves and environmental awareness talks at local primary schools. At the time of the study, they had raised sufficient funds to purchase equipment such as binoculars, books, kayaks, bikes and a boat. to support of ecotourism ventures. This group worked in partnership with other regional youth organisations in Yucatan to implement wetlands restoration projects, clean up campaigns and voluntary environmental patrolling in the reserve.

Another documented example of local groups capacity for teamwork was the local environmental contingency group. This organisation had been established to implement disaster mitigation planning, as the coast of Yucatan is exposed to, and has been severely damaged by hurricanes. Some of the work carried out by the group was in capacity building for families with the purpose of ensuring that homes were better equipped and prepared for natural disaster contingencies in order to reduce the damage. They also provided regular weather reports and warnings as to when hurricanes were heading for the region.

Local organisations provide the capacity needed to access available funds for community programmes, to implement local conservation initiatives; sustainable livelihoods projects; and the promotion of responsible practice in the preservation of natural resources.

Another important aspect of local participation and local empowerment noted by Wells, Brandon and Hannah (1992) is their contribution to monitor and reduce illegal practices in protected areas. This is illustrated by San Felipe's fishing co-operatives that had created *Actam Chuleb*, to protect fishing stocks. This research found that San Felipe's fishing cooperatives were empowered and were empowering their members by assisting in obtaining financial support for the acquisition of equipment (including boats and motors) and by playing an important negotiation role in setting a fair price for the fishing catches. Strong

fishing co-operatives were found to be a supporting channel for the implementation of fishing regulations, given that circulation and discussion of fishing regulations took place within internal meetings and local agreements. Support for those regulations facilitated by external actors potentially reduced the illegal catch and the continual entry of fisherman associated with free access fishing presented by Seijo, Defeo and Salas (1998) in Chapter 5.

A program of community patrolling is documented in Ria Lagartos between the local council and two local organisations, - '*Isla Cerritos'* for open fishing patrols, and the 'women organisations of fishers of the sea' who carry out a project on sustainable use of two species of crab '*Maxquil*' (*Libinia dubia*) and '*Mech'* (*Limulus polyphemus*), that are used as bait by the octopus fisheries (SEMARNAT 2012) which are the second most important fisheries in Yucatan (Sánchez-Salazar & Fraga, 1999).

In contrast to Rio Largartos, the capacity of community organisations in Ria Celestun was found to be very poor. Although fishing is the most important economic activity in the area not a single fishing co-operative was identified. This lack of industry cohesion was recurrently reported by local informants as being related to the high extent of internal conflict in the community. Fishermen could be loosely classified into focus groups depending on whom they sold their catch to. Two main fish buyers with the infrastructure to freeze stock regulate fish prices, which they maintain significantly below the market value. The absence of a co-operatives in the community curb any chance the fishermen might have to obtain a better price for their catches.

The absence of fishing co-operatives, rather than favouring the implementation of fishing regulations, tends to favour 'free rider' behaviour and over-exploitation characterised by open access fisheries (Seijo, Defeo & Salas, 1998). This was confirmed by several reported complaints regarding sanctions and fines imposed on fisherman for not adhering to quotas, minimum sizes and seasons.

For the local actors, the absence of fishing co-operatives in Ria Celestun also meant a lack of access to initial support for the acquisition of fishing tackle, as well as boats and motors. This situation was taken advantage of by a local businessman running a fish freezing company. The company provided financial support to fishermen to purchase a boat and equipment, but – according to fishermen's reports – this came with a non-negotiable obligation to sell their

catches at the price the company set. This created a position of power for this family but disempowered the fishermen. Local people, particularly immigrants, were dependent on the company's offers as no banks existed in the community. This situation, could have been addressed had fishing co-operatives been established. In their absence, such disempowerment contributed to the limited capacity observed for local people to work together, organise themselves, watch over the natural resources and mobilise resources to solve problems of common interest. Subsequently the implementation of conservation policies was impeded.

Whereas Ria Lagartos hotel cooperatives cited examples of organising funding to offer the initial touristic infrastructure incentives such as palm parasols on the beach and tourist information stands to encourage people to stay in the communities, Ria Celestun hotel operators neither participated as a group nor targeted funding to community interest.

The eco-tour operators working in Ria Celestrun seem to have been better organised in recent years. According to evidence gained from focus groups and semi-structured interviews, the performance and cohesion of tour operators co-operatives, with the support from reserves and regional conservation NGOs, such as *Pronatura Peninsula de Yucatan*, has improved. As was revealed in the interviews, since the mid 1990's, the formation of social co-operatives has been obligatory if an enterprise is to qualify for the receipt of a subsidy. According to Ria Celestun officials, obtaining a subsidy became the sole purpose for the establishment of some co-operatives in Celestun. Many did not last long and broke up in the early 2000s .

Since 2003 support to tour operators was widely reported by Ria Celestun managers. Support provided includes capacity building initiatives implemented by reserve personnel, conflict resolution; organisational assistance with new schemes; support for resource management; and the delegation of power. At the time of the study, tourism co-operatives seemed to enjoy a reasonable degree of stability and had grouped themselves into a federation to promote communication and collaboration. Improved relationship with the reserve agency illustrates how the reserve can empower by providing support to local organisations.

The present case studies demonstrate that empowerment is not achieved as a consequence of existing opportunities and the right conditions for social participation only; they are other factors that favour it. The intrinsic characteristics of local communities were found to be

associated with their level of empowerment, for example, the degree of social cohesion and education levels rating slightly higher in Ria Lagartos as presented in Chapter 5.

Organisational capacity and social cohesion where found to be stronger in Ria Lagartos than in Ria Celestun. As Figure 7.9 shows, the perception of social cohesion varied between the areas of study.

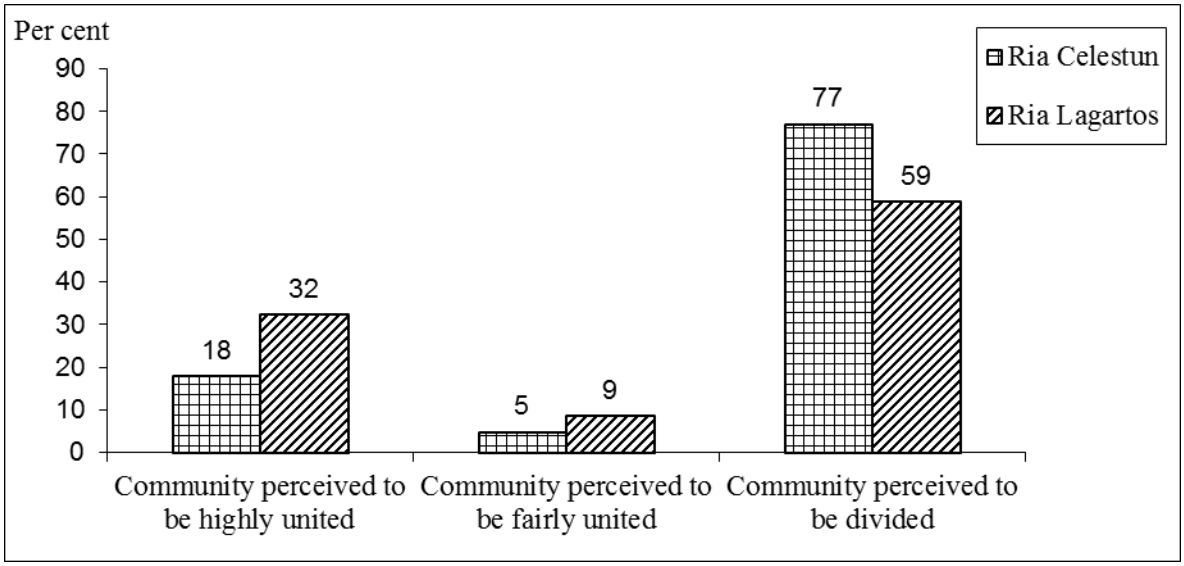



Figure 7.9 Social cohesion levels assessed by protected area communities under study (values in percentages). Source: The author.

According to data collected from local stakeholders, social cohesion levels were higher in Ria Lagartos than in Ria Celestun. Ria Lagartos communities were perceived to enjoy greater unity, 32 per cent of participants from the latter considering that the community was 'highly united' while only 18 per cent from Ria Celestun were of a similar opinion. However, the majority of informants from both reserves considered that the community was divided – 77 per cent of Ria Celestun respondents and 59 per cent of Ria Lagartos respondents. This notion was further investigated through focus groups and was found to most often be associated with standard differences along political and religious preferences rather than overt conflict.

Rangers were also asked to assess levels of cohesion within local communities on a scale of one to five. The average ranger assessment for Ria Lagartos communities was 4.1 and that for those in Ria Celestun was 3.5. This shows that rangers too perceived that there was a higher level of social cohesion in Ria Lagartos than in Ria Celestun.

Opinions of the local community of Ria Celestun are as follows:

> *"In Celestun there is no leadership of any kind. That's why no hotel organisations exist, no salt extraction or fishing cooperatives. .That's why there is no real representation in front of the reserve"*
>
> Local representative of a hotel of Ria Celestun

These findings suggest that due to the empowerment level in Ria Lagartos being higher than in Ria Celestun, particularly in their attention to environmental concerns, a more positive attitude towards conservation was achieved from the reserve's efforts to involve local communities in the conservation of the reserve. Figure 7.8 illustrates this by portraying higher willingness to engage in voluntary work related with the reserve in Ria Lagartos than in Ria Celestun.

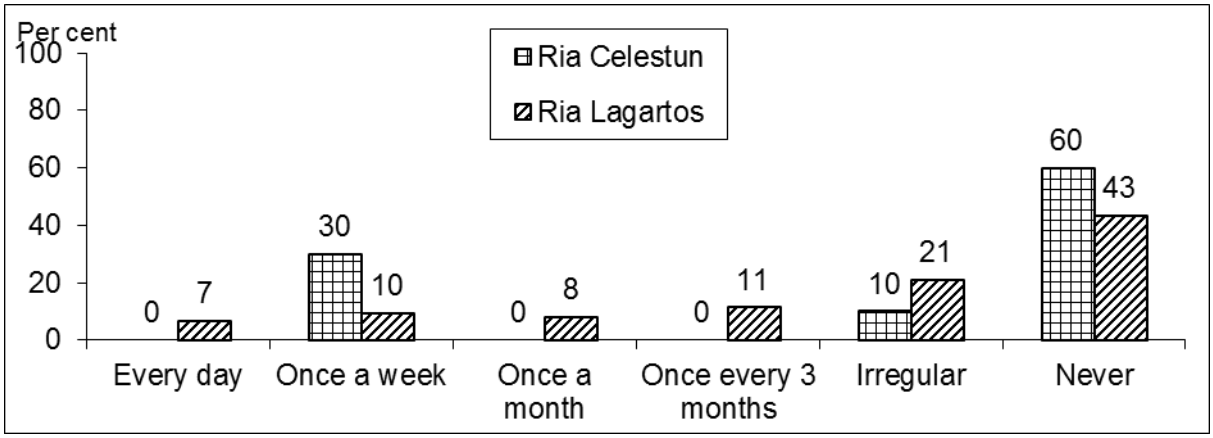



Figure 7.8 Comparative willingness to engage in voluntary work for conservation in the areas of study
Source: The Author

Willingness to engage in voluntary work for conservation was cited by 57 per cent of stakeholders in Ria Lagartos on any frequency while in Ria Celestun it was cited by 40 per cent of stakeholder. In Celestun, 60% of stakeholders stated that they refused to co-operate with voluntary work initiatives. The following expression shared by a local informant reflects the feelings containing different issues that this research has addressed and assessed.

> *"Voluntary work? Why would I help if the reserve has paid people to clean up…, but watch them… doing nothing all day but annoy us or denigrate our work. [He threw an empty bag of rubbish to the sand], there it goes, they can clean it up [the reserve personel], give them something to do"*
>
> Member of a tour operator co-operative Ria Celestun

In this regard, Adams (2004) points out that imposed rules of conservation such as in cases under many colonial authorities, not only proved to have no real positive effect (as local communities continued their patterns of natural resource usage), could create resistance, resentment, and in some cases increase exploitation in the form of a perceived urgency for the use of restricted resources. Phrases ellicited from members of the local communities regarding the criminalisation of duck hunting brought forth notions of resentment and resistance towards the reserve.

Beyond the observation that more local organisations existed in Ria Lagartos than in Ria Celestun, analysis of some of the bodies operational in Ria Largartos illustrated the contribution that a healthy mix of actors can make to the successful implementation of an integrated conservation approach.

In sum, the extent of social capital that exists in a community; the manner in which locals organise their community, the political performance of their local institutions, the extent of the community's engagement in voluntary work and social cohesion are all important elements that reinforce empowerment. All of these empowering elements were found to be significantly higher in Ria Lagartos than in Ria Celestun.

External reasons also have an effect on the extent that local empowerment and social capital is observable in a community. Factors such as immigration pressures and education levels were found to contribute to lower levels of empowerment in Ria Celestun where immigration levels are higher and education levels lower than that in Ria Lagartos. This is presented in chapter 5.

Local participation mechanisms in Ria Largatos contributed towards the strengthening of local empowerment as evidenced by the inclusion of local knowledge in conservation decision-making. Local empowerment has also enabled the effective implementation of the conservation measures. Conversely, reserve management in Ria Celestun appears to have placed less emphasis on the significance of local empowerment. This has resulted in local exclusion from, and opposition to, conservation policies.

### 7.4.4 Local awareness

In the case studies, the level of communication between the head office and local stakeholders was also evaluated by the stakeholders awareness of the state of the wildlife. Awareness of the state of biodiversity in Ria Lagartos, where information sharing and conservation education activities promoted by head office had a positive effect on environmental awareness, exceeded the level of environmental awareness found in Ria Celestun

If the community is aware of the need to conserve biodiversity, it is more likely to engage in and aspire to participation in efforts to preserve the ecosystem than if it were unaware of the prevailing levels of biodiversity exploitation. Therefore, local stakeholders were asked if they believed that wildlife populations had declined over the previous 30 years. As indicated by Figure 7.10, the belief by the majority of stakeholders that wildlife populations in both Ria Celestun and Ria Lagartos had declined over this period was affirmed  An enhanced awareness of such a deterioration by Ria Lagartos stakeholder was observable in data collected and evaluated.

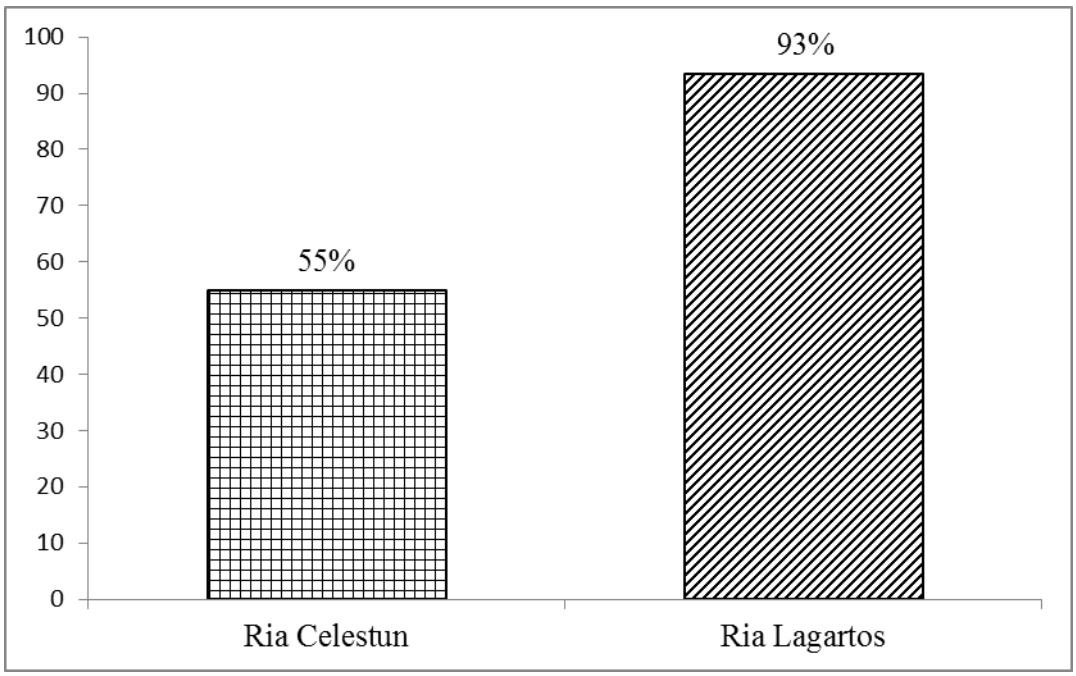



Figure 7.10 Percentage of local stakeholders of the opinion that wildlife populations have declined in the previous 30 years. Source: The author.

The considerable proportion of actors from Ria Celestun (45 per cent) who were unaware of this situation might be attributed to the influx of immigrants into the reserve 10 or 15 years

previously, who could not be expected to have a fully developed comparative view or historical perspective of wildlife numbers. On the other hand, 93 per cent of local stakeholders from Ria Lagartos demonstrated awareness of the threats facing wildlife; a perception that it is hoped will have a positive effect on consensus building strategies for the protection of the environment.

Engagement in environmental conservation is also closely linked with awareness of the opportunity to participate. A major reason why people fail to get involved in programmes aimed at providing local benefits is simply that they are unaware of the existence of such initiatives. As discussed earlier, PRSD and PTE are the main interventions designed to compensate local communities for the costs of conservation and to support livelihoods. As indicated by Figure 7.11, awareness of and participation in these two social programmes was higher in Ria Lagartos than in Ria Celestun.

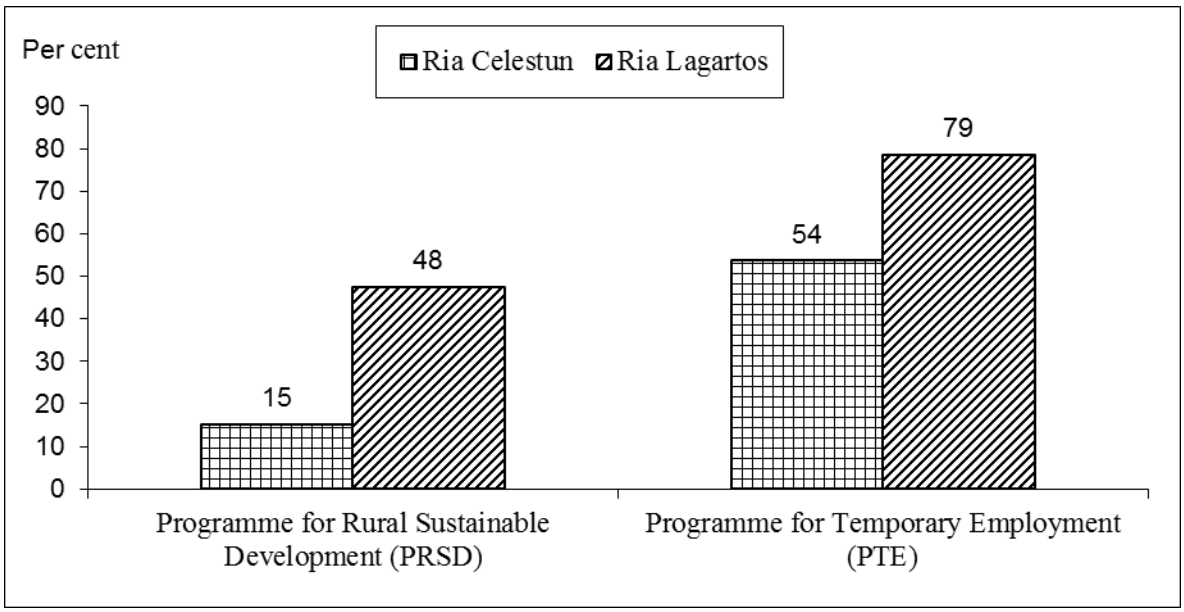



Figure 7.11 Knowledge of programmes aiming at supporting local sustainable development reported by stakeholders in Ria Celestun and Ria Lagartos. Source: The author.

In Ria Celestun, only 15 per cent of local stakeholders knew of the existence of PRSD, while 48 per cent of those from Ria Lagartos were aware of this opportunity. In Ria Celestun, 54 per cent of informants knew about the PTE, while in Ria Lagartos, 79 per cent were aware of the initiative. Knowledge of these programmes clearly increases the chances of people participating in them, and also establishes a platform for conservation awareness. Therefore,

efforts to circulate information about these interventions need to be redoubled, particularly in the case of Ria Celestun.

However, lack of knowledge about such initiatives is not the only reason for non-participate. Informants from both reserves reported that the PTE rates of pay were only equivalent to the national minimum wage, which was why many people had not joined the programme.

### 7.4.5 Improvement of implementation and enforcement

Although often considered a major challenge to those responsible for managing the reserves implementation and enforcement of regulations are essential aspects of protected area administration. However, in the areas studied, neither the dissemination of political narratives nor the publications of comprehensive conservation regulations were sufficient to ensure that local economic activities necessary for the pursuance of livelihoods were conducted in a sustainable fashion. The drafting of regulations is an important step to enforcement. Regulations are meaningful and implemented only when widely known and accepted. This study found that in the case of regulations associated with main economic activities -such as fishing closure calendars and fire calendars for farming-, it was necessary that users were sensitised to them if there were to be a reasonable chance of their being observed. Most importantly, users needed to understand and adopt them if they were to produce the desired effect. Yet, local communities often had no knowledge of existing livelihood regulations; and sometimes, centres and offices in which regulations were published were not sufficiently accessible to the public to allow for effective dissemination to the end users.

Accordingly, the frequency at which rangers patrolled the protected area was perceived to be higher in Ria Lagartos than in Ria Celestun. Seventy four per cent of Ria Lagartos stakeholders, believed that rangers patrolled in a frequency between every day to once a week while only 30 per cent stakeholders from Ria Celestun held that opinion. Substantial variation between informants from the two reserves was also found in the level of awareness and perceived effectiveness of the FAEP in enforcing conservation policies (see Chapter 6, Section 6.3.3.1, Participation in the enforcement of conservation policies).

To increase the effectiveness of patrols Ria Lagartos organised trainee sessions for their rangers with FAEP officials in order to gain understanding of legal procedures for

environmental infractions. In the Ria Lagartos archival registers for 2004 some 349 rangers patrols were documented with observation targets cited as, feral dogs, inspection of tourist operators and sighting of key species. In 2005, there is evidence of an increase in the capture of songbirds and increased extraction of '*kuka*' palm noted by patrols. Additional effort by these patrols resulted in the detention of a truck filled with resident and migratory song birds, illegally captured for the black market and their liberation in the reserve. The detention of a truck with 50 '*kuka'* palms and sites of illegal mangrove and palm extractions for construction were also documented by Ria Lagartos rangers patrols during that year.

However, the enforcement capacity of the authorities is not the only factor that determines whether regulations are adhered to. Following an awareness of regulations, the chances of being observed are also influenced by local opinion. Local stakeholders reported that they often considered regulations to have a negative effect on the very aspect of conservation that they were designed to enforce. It can be inferred that most people who thought that regulations had a detrimental effect were less inclined to observe them than was the case with those who considered them in a positive light.

Further questions were asked of stakeholders in an attempt to identify in greater detail the reasons why local people did not follow conservation practices when they were aware of them. The study found that even in situations in which people considered regulations to be positive, this still did not guarantee implementation. Other factors that frequently prevented local stakeholders from adopting regulations included traditional practices with regard to the use of natural resources; poverty (users not being able to afford to observe them); insufficient incentive to implement them; and a weak level of enforcement (either internal or external), meaning that the consequent risk of penalisation for violating regulations was low.

There was a stronger negative perception of regulations in Ria Celestun than in Ria Lagartos, with regard, in particular, to the designation of 'nuclear' zones. In this case, the lack of inclusion of local stakeholders in Ria Celestun's decision-making processes to determine 'nuclear 'and buffer zones resulted in opposition by local communities to these designations. On the other hand, in Ria Lagartos, the taking of local knowledge and opinion into consideration generated more acceptance and a more positive effect on conservation policy and local willingness to respect it.

Substantial progress seems to have been made in circulating fishing regulations within the protected areas. Results show full awareness, with a higher percentage of stakeholders in agreement with them both Ria Lagartos and Ria Celestun although at a lower rating of acceptance in Ria Celestun. Nevertheless, cases in which users failed to observe fishing regulations were reported to have persisted, with instances being more widespread in Ria Celestun than in Ria Lagartos. For example, 800 vessels were reportedly unlicensed in Yucatan, with inspectors experiencing particular difficulty in fulfilling their duties in Celestun port (Tzec Valle, 2008). Such relatively low respect for fishing regulations and poor level of enforcement is fairly typical of small-scale fisheries in most Latin-American countries (Salas, Chuenpagdee, Seijo & Charles, 2007).

Local communities were also asked to grade on a scale ‘one’ to ‘five', one being low and five high, the level of regulation enforcement by external actors such as institutions that had a presence in the reserve (e.g. the protected area agency, local government, and other government agencies). Local stakeholders from Ria Celestun graded the level of enforcement by various government agencies with a ‘one’, the lowest possible score; while those from Ria Lagartos awarded it the relatively high grade of ‘four’, indicating a high awareness of government efforts to protect the area.

## 7.5 General discussion on integrated conservation as a model for implementation

### 7.5.1 Attribution of ecological performance

This study lastly aimed to assess whether the level of integrated conservation has had an effect on improving the effectiveness of conservation - which was the primary reason for the establishment of a protected area in the first place.

The majority of biodiversity monitoring indicators registered in archival information from reserve offices including numbers of crocodile, birds and jaguars (CONANP 2005) and by research centres on mangrove productivity, water quality, seagrass (Herrera-Silveira *et al* 2005a, Herrera-Silveira *et al* 2005b, Herrera-Silveira *et al* 2005c) were not found to be in a systematic format that could provide a directly comparative view between the reserves. As reported by managers, efforts to monitor wildlife in the protected areas under study were limited by budget constraints, an absence of monitoring in Ria Celestun and non-comparative sampling methods employed in the early stages of the reserves. Few studies were found that allowed comparisons about wild life monitoring to be made between the reserves.

A taxonomic study of fish larvae and juveniles carried out in four estuarine systems of the Yucatan, including Ria Lagartos and Ria Celestun between 1994 and 1997 is used to reference the state of biodiversity. The results of this study located Ria Lagartos with higher level of fish abundance (number of organisms) and fish diversity (number of species) than Ria Celestun (García-Hernández et al 2009).

Data from the 2005 census of the pink flamingo (*Phoenicopterus ruber*) (Contreras 2005) showed the higher concentration of flamingos in Ria Lagartos to be in May with 24,040 organisms while in Ria Celestun, the highest concentration of pink flamingos was in January with a count of 16,000. In the coastal zone of the Yucatan flamingos move from west to the east through the year, spending the early months of the year in Ria Celestun which is their most important feeding ground due to the abundant flow of spring water that supplies high levels of nutrients (Herrera-Silveira and Morales Ojeda 2010). By the month of May they move on to Ria Lagartos where the population peak and the highest reproduction success is recorded (Contreras 2005).

An indicator of the abundance of sea turtles was found in a study of Carey turtle (*Eretmochelys imbricata*) that recorded the number of nests in the Yucatan main nesting beaches. It allocated higher numbers to Ria Lagartos than to Ria Celestun. This data collected from registers between 1990 to 2007, showed an average of 84.56-225.56 nests in Celestun beach and an average of 52.27-84.56 in Isla Arena beach (both from Ria Celestun); while in Ria Lagartos nest numbers were recorded as 225.26-396.00 in Rio Lagartos (Las Coloradas beach) and El Cuyo beach (Cuevas et al 2007).

Monitoring of crocodiles in Ria Lagartos of the species *Crocodylus acutus* and *Crododylus moreletii* population found in archival registers for 2004 and 2005 showed a steady recovery of the population that was reduced to 10% by the 60s. In Ria Celestun, according to managers of the reserve, no monitoring of crocodiles has been carried out.

A study of jaguar (*Panthera onca*) designating priority habitats for jaguar conservation in Yucatan include Ria Lagartos but not Ria Celestun (Ceballos & Chávez, 2005; Chavez and Zarza 2009).

The monitoring of specific birds species linked to low spine forest, coastal dune vegetation, rainforest, mangroves and beach vegetation in Ria Lagartos showed a healthy trend of growth in their populations. Results of such bird monitoring have increased the number of species recorded in Ria Lagartos from 333 (as published in the Management Plan) to 378 according to the 2005 archival records. Monitoring of birds in Ria Celestun has not been carried out.

A study of the mangrove coverage in Yucatan estuarine systems based on remote sensing carried out in 2000, shows a higher rate of deforestation in Ria Celestun with 1.49% being the rate of deforestation during a calendar year while Ria Lagartos did not show any reduction in the coverage of mangrove forests (Rodríguez-Zúñiga, 2000).

Monitoring of water in the Yucatan area has been carried out (Herrera-Silveira 2006; Herrera-Silveira and Comin 2000; Herrera-Silveira *et al* 2005a, Herrera-Silveira *et al* 2005b, Herrera-Silveira *et al* 2005c) but because the studies and parameters where Ria Lagartos and Ria Celestun were included were not conducted at the same time, direct comparison cannot be elicited. However, the analysis of studies on the estuaries rivers of Yucatan all concluded that Ria Lagartos and Ria Celestun present, overall, a good quality estuarine water. However it was noted that Ria Lagartos's estuary presented early signs of eutrophication associated with the cattle farming and agricultural activities (Herrera-Silveira and Morales-Ojeda, 2010).

In order to complement the assessment of ecological performance in the reserves, local stakeholders and rangers were asked to assess and comment on the state of wildlife based on local knowledge and observations carried out during patrols.

Local stakeholders were asked if they attributed a discernable process of recovery of wildlife populations to the efforts of the reserve, or whether they did not believe that wildlife species were recovering. Figure 7.11 indicates their perceptions in this regard.

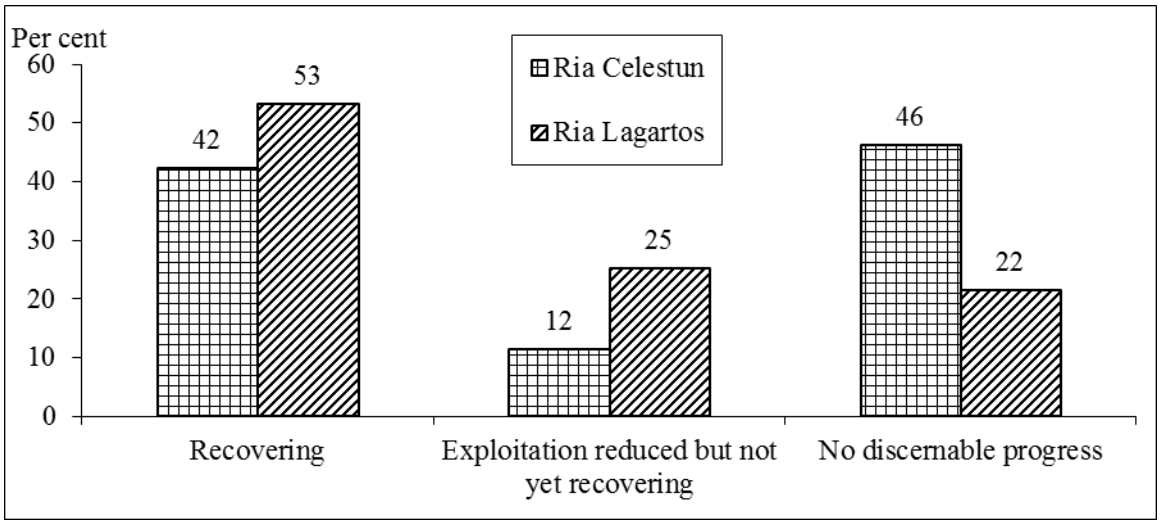



Figure 7.11 Local perceptions of the state of wildlife populations (values in percentages). Source: The author.

Local stakeholders' perceived better ecological performance in Ria Lagartos than in Ria Celestun, 53 per cent and 42 per cent respectively being of the opinion that wildlife populations were recovering. The percentage of informants who believed that wildlife exploitation had been reduced but that populations were not yet recovering was 25 in Ria Lagartos and 12 per cent in Ria Celestun, where 46 per cent did not believe that conservation policies were reducing levels of exploitation whilst only 22 per cent of informants from Ria Lagartos perceived that wildlife exploitation had not been arrested as a result of conservation efforts. Reports covering interviews with elder local people of Ria Lagartos mention positive outcomes of the reserve in terms of the sighting of deer, wild turkey and wild doves that were previously noticeable by their absence. Such perceptions inform about the significance of the reserve actions.

These findings are consistent with rangers observations. One of the two rangers in Ria Celestun believed that wildlife exploitation had slightly reduced because of conservation efforts but stated that as yet there was little evidence of species recovery. The other Ria Celestun ranger was of the opinion that wildlife populations were continuing to decline at a constant rate due to low levels of local enforcement and a lack of significant changes to local patterns of chronic exploitation.

A different scenario was reported by rangers of Ria Lagartos. Two of the three rangers of this reserve considered that wildlife populations were recovering. One of them argued that exploitation had definitely decreased under the influence of reserve policy enforcement, but

that populations were not yet recovering. None of the Ria Lagartos rangers believed that populations were continuing to decline. In support of this assertion, they cited reports of greater frequency of sighting of wild mammals in the reserve, including peccary and agouti. Since mammals in both reserves are particularly vulnerable to habitat loss and fragmentation as their access to prey and drinking water is reduced and interrupted, such reports represent a valuable indicator of the level of biodiversity conservation.

Uncontrolled fires are a major cause of loss of forests and are often associated with agriculture and farming because fire is used to clear the land for agriculture (SEMARNAT, 2012). Rangers were asked if they considered that the efforts of the reserve had resulted in a reduction of fires in the protected forest. All the rangers in Ria Lagartos and one of the two in Ria Celestun reported that incidences of fire had decreased. However, whilst one of the rangers from Ria Celestun considered fires to have been tightly controlled, the other believed that they had increased in number. In Ria Lagartos, two of the three rangers believed that incidences of fire had decreased significantly, but the other believed that they had only decreased slightly. The more positive assessment of fire danger in Rio Lagartos may be attributed to the fact that the office often requested fire bans during the flamingo-breeding season because in the past, this had had a detrimental effect on the species population and resulted in birds abandoning their nests. Other actions to reduce fire in Ria Lagartos additional to the calendar of fires is the creation and maintenance of a 74 km firebreak protecting the reserve territory and ongoing discussions with members of *ejidos* about fire management (SEMARNAT, 2012). These actions in Ria Lagartos have resulted in fewer fires annually and less area destroyed. In 2007 5 fires were recorded, destroying an area of 1,200 hectares. Comparatively in 2012, only 1 fire was recorded with a total damage of less than 200 hectares (SEMARNAT 2012).

Rangers were also asked for their views on efforts to control deforestation. Contrary to the trends in respect of other indicators of environmental performance, deforestation had not decreased more markedly in Ria Lagartos than in Ria Celestun but deforestation is still recognised as a threat. As mentioned previously, illegally converting land to pasture for ranching had resulted in a 20 per cent loss of forest cover since Ria Lagartos had been designated as a protected area (PPY, 2008: 12). In Ria Celestun one of the two rangers believed that deforestation had decreased substantially but the other believed that it had increased.

Inconsistencies in the perceptions of rangers patrolling the same area can be explained by their relative technical capacity. Two rangers were interviewed in Ria Celestun, one of whom was an elder member of the local community with a very basic level of elementary education. This individual demonstrated fierce loyalty to the reserve and was extremely conscious of not speaking out of place. He therefore portrayed the reserve in glowing terms with regard to achievements and levels of capacity. However, the other ranger was a trained biologist with a Master's degree in environmental management, who presented a more critical image of the reserve's limitations and the extent of its challenges.

In Ria Lagartos, two of the three rangers considered that deforestation rates had remained constant and the other believed that they had decreased slightly. Nevertheless, the study found that, despite a certain lack of success in this regard in Ria Lagartos the reserve had succeeded in arresting the swift rate of deforestation that prevailed in the neighbouring cattle-ranching area.

Based on these perceptions, a higher level of wildlife recovery and a reduced level of environmental degradation was reported in Ria Lagartos than in Ria Celestun as a result of conservation efforts. This suggests that higher levels of integrated conservation influenced the observed difference in the overall levels of conservation of biodiversity within the two reserves. The results support the argument that integrated conservation can effectively address the preservation of biodiversity, as expounded by authors such as Adams and Hulme (2001) and Schwartzman, Moreira and Nepstad (2000). Nevertheless, more studies in this area need to be carried out utilising species indicators to confirm this relation. The monitoring of wildlife was outside the parameters of this research.

### 7.5.2 Attribution of social performance

Proponents such as Gómez-Pompa and Kaus (1992), and Saberwal and Rangaranjan (2003) argue that a significant number of studies of the natural environment and human interaction show a positive relation between cultural conservation and biodiversity conservation; a correlation that is highlighted in the ethnoecological approach to environmental protection identified in recent Mexican conservation proposals (as outlined in Chapter 3). The essence of this approach is captured by Toledo, Alarcon-Chaires, Moguel, Olivio et al., (2001: 7) in

their assertion that, “The world’s biodiversity will be effectively preserved only by protecting the diversity of human cultures, and vice versa.”

In this regard, social indicators presented in the results including social cohesion, social empowement and organisational capacity were found to be higher in respect of Ria Lagartos (the protected area assessed with to have the higher implementation of an integrated approach), than was the case with Ria Celestun. Running parallel to social concerns, this study found that cultural indicators also differed markedly between the two protected areas. Figure 7.12 shows local perceptions on the conservation of culture and traditional practices in the communities of study.

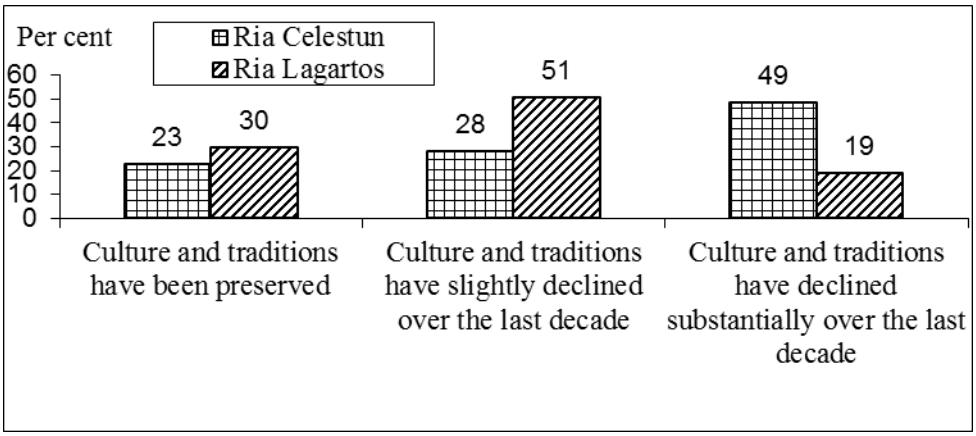


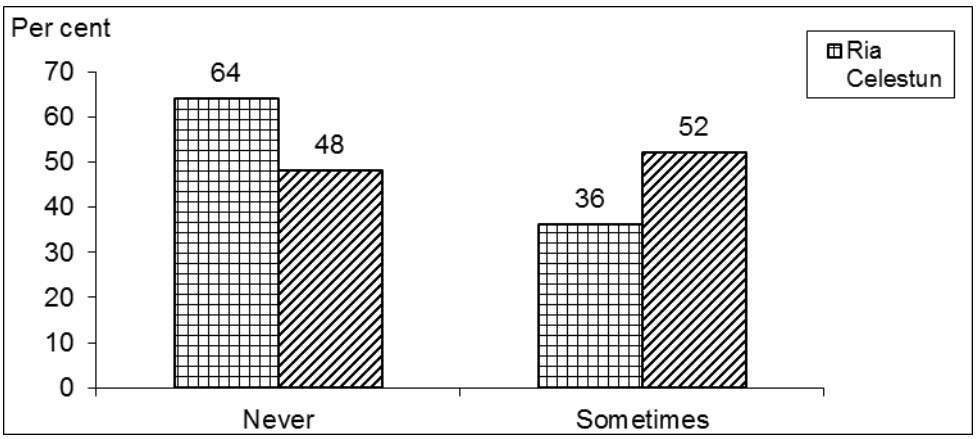

Figure 7.12 Percentage of local stakeholder’s opinions on conservation of culture and traditional practices in Ria Celestun and Ria Lagartos. Source: The author

The perception that culture and traditions have been preserved does not show a marked difference between the 23 per cent of Ria Celestun and that of 30 per cent of local stakeholders from Ria Lagartos. However, there is a marked difference in the perception that culture and traditions have substantially declined over the last decade, with 49 per cent of Ria Celestun stakeholders perceiving this to be the case, compared to only 19 per cent of Ria Lagartos stakeholders.

For example, stakeholders cited cultural indicators handed down from generation to generation, such as the Mayan ritual to call for rain and the Mayan celebration of the day of the Death, practices that have been forgotten. Local engagement centred around the celebration of the Saint of the town were found to be more pronounced in Ria Lagartos than in Ria Celestun. Enthusiasm and pride in Ria Lagartos was expressed by local stakeholders

for the Saint celebration. The local council supports its people to prepare traditional folklore all year round. Traditional activities were reported to be promoted and continued and the attendance at celebration high. In Ria Celestun complaints were voiced regarding the Saint celebration because not many people attend and the local council attached little importance to this celebration.

An example linked with biodiversity can be observed about use of herbal traditional medicine in the communities of study. Figure 7.13 shows informs about it.




7.13 Use of traditional herbal medicine in Ria Lagartos and Ria Celestun. Source: The author

A higher reliance on traditional herbal medicine was reported in Ria Lagartos than in Ria Celestun, with 52 per cent of stakeholders in Ria Lagartos reporting they sometimes use it compared to 36 per cent in Ria Celesunt. Currently herbal medicine does not represent, for any of the local communities, the major source of health treatment, Both reserves rely on medical centres within the communities and hospitals located in cities nearby.

Since cultural indicators related with conservation were greater in Ria Lagartos, so too was social performance. Loss of traditional practices was reported to be higher in Ria Celestun. This may support the idea that there is a direct link between cultural and biological diversity, but further research on this relationship would be needed to fully prove or disprove this argument, because other factors, such as religious influence, parental influence, and, social stigma linking Mayan traditions with poverty were also mentioned by local stakeholders. Forces brought to bare on community by conservation were thought to have contributed to the decline of traditional and cultural practices.

## 7.6 Conclusions

The results presented in this Chapter show that the higher levels of integrated conservation found in Ria Lagartos compared to Ria Celestun can be explained by contrasts in the measures of local costs and benefits, local livelihoods and local participation investigated in this study.

Discussions on local cost and benefits conclude that in order to incentivise local participation, it is necessary to have a fair distribution of local costs and benefits. Unequal sharing of benefits and variations in the levels of levels of tolerance between different actors amongst those who apply restrictions not only disincentive people to engage in reserve goals, but can cause social resentments and opposition to the reserve. The analysis of local costs and benefits concluded also, that the generation of benefits is insufficient as an incentive for local participation and support for conservation policies when the sum of local cost from conservation are higher than the sum of total benefits. Therefore this research argues that compensation policies need to be explored when local costs cannot be further minimised. Payments for Environmental Services represent an interesting scheme that could potentially play a role in addressing compensation of local costs.

Discussions on local livelihoods identified eco-tourism and sustainable wildlife management as the main strategies for the support of sustainable livelihoods. While eco-tourism is reaching important levels of engagement among local stakeholders, levels which are comparable to farming activities; poor levels of engagement on sustainable wildlife management keep this land use alternative limited to members of the *ejido*.

In order to promote livelihoods that are preferable to extensive cattle farming, which in Ria Lagartos is considered the major conservation threat, it is essential to address three main conditions: 1) the rate of return from other sustainable livelihoods such as wildlife management must be comparable to, or greater than the rate of return from extensive livestock breeding; 2) extension schemes should be initiated to support implementation; and 3) it is necessary to provide technical support for wildlife management during the early stages of any projects until it is well established.

At the time of the research project, all of these conditions were frequently not met in respect of the units of wildlife management as were proposed in the contexts of the case studies. Therefore, conditions outlined above, 1-3, should be incorporated into strategies to promote sustainable livelihoods in order to transform practices, not only into sustainable livelihoods, but also into 'preferred' livelihoods. Addressing and supporting local livelihoods is beyond the capacity of one agency. It needs to be addressed in partnership with other organisations with additional capacities and expertise. The implementation of sustainable livelihoods in the case studies has, in the best instances, increased the level of reliance on those activities without impeding local access to biodiversity. The analysis of livelihoods found that greening local livelihoods is a great challenge requiring multiple strategies to meet the local needs of communities facing poverty.

Important relations between sea based and inland based livelihoods were found as a result of seasonal analysis of livelihoods. Fishing and eco-tourism were found to share low periods when 'nortes' weather conditions stop them to go out to the sea. Shared seasonality reduces the income of local stakeholders with a high reliance on sea based activities which increases pressures inland as people seek alternative ways to meet their needs. Thus, irregular dependency on farming, hunting and other forest extracting activities was reported to peak during 'nortes' season. This relation is a fundamental aspect to consider when addressing sustainable livelihoods in the protected areas studied.

Local participation supporting conservation was higher in Ria Lagartos than in Ria Celestun. Local participation is a major aspect of integrated conservation and assessment of its effectiveness needs to include comprehensive indicators that not only enumerate attendance at meetings, but also the process of inclusion of local stakeholders into decision making and into helping shape conservation programmes. Such an element had contributed to the building of trust and promoted the willingness of local communities of Ria Lagartos to interact and support conservation initiatives.

Discussion around this topic shows important elements required to foster local participation. These include the involvement of local communities in the early stages of establishing a protected area, particularly if, as is generally the case, the initiative for development of the reserve is not driven from within the area. The establishment of clear channels of communication and consultation, gaining an understanding of the community through social

research and ensuring consistency in the implementation and enforcement of rules, regulations and access to funds are other essential requirements. The capacity for local organisation of the community, the political performance of local institutions, their willingness to engage in voluntary work and the degree of social cohesion are all important elements that reinforce empowerment and represent the social capital of a community. All of these were found to be higher in Ria Lagartos than in Ria Celestun. Even though social capital includes internal attributes of the communities, agencies of conservation can support social capital in order to positively affect local participation and engagement in conservation by understanding these elements and placing attention on social research. Limited inclusion of these elements in implementing a social strategy can create resistance to the reserve initiatives from local communities and increase challenges to the implementation of conservation regulations. Direct quotes from local stakeholders in Ria Celestun collected during field work confirm the complexity of these views.

Finally, integrated conservation was discussed as a model for implementation based on its capacity to affect ecological and social performance in the protected areas under this approach.

Through the comparative evaluation of the results of the case studies, the research shows that an integrated conservation approach can make a valuable contribution to the enhancement of social and environment well-being in protected areas. Indicators based on wildlife recovery, cultural conservation and reliance on herbal medicine were better accessed in Ria Lagartos than in Ria Celestun. A relationship between environmental and social performance indicators that comprises aspects of social capital, show similar behaviour to those of integrated conservation. A positive relationship between biodiversity and culture was observed to have enhanced biodiversity conservation approaches and confirmed the significance of integrated conservation as an approach for implementation in protected areas.

# CHAPTER 8: "CONCLUSION"

The designation of natural protected areas is considered one of the most important strategies for the conservation of biodiversity. The need to set aside natural protected areas is associated with the consequences of a model of development pursued since the 18th century that has aimed at increasing production and consumption to generate economic growth. As a result, the global rates of depletion of natural ecosystems have directed attention towards protecting a proportion of national territory where the conservation of nature ensures the provision of ecological services and the evolutionary processes of biodiversity.

Information from the World Database on Protected Areas shows that the number of protected areas around the world has been increasing significantly since the 1970s. This period of expansion runs in parallel with the emergence of sustainable development as a concept and as an alternative ideology for development.

The influence of the principles of sustainable development can be traced through political and economic ideologies and into the policies of conservation in protected areas around the world.

The increase and exacerbation of poverty has been the focus of critiques on the global capitalist model of development often imposed on developing countries. These countries have experienced an unequal distribution of the benefits generated by this model. Sustainable development addresses the finite capacity of some natural resources as well as incorporating the aim of meeting the needs of present and future generations which implies a focus upon poverty eradication as well as the environment. By addressing the relationship between conservation and poverty, sustainable development places an important role on the community for potential contributions to local development and conservation. This relationship had been previously overlooked by the discourses of the dominant development theories which are characterised by an imposition of strategies for development.

Sustainable development recognises bottom-up approaches to development, acknowledging the significant contributions that local communities and indigenous knowledge may have for conserving and nurturing biodiversity. This premise has increased attention on protected area

management. The recognition of traditional ecological knowledge challenges the idea that Western scientific knowledge is superior and indigenous communities backward which was perpetuated during the colonial era and in modern ideologies of development.

Top-down, exclusionary conservation approaches which aim at limiting human interaction with the protected ecosystems have been identified as carrying enormous social costs for the local and indigenous communities that inhabit the territory. Many examples are cited in the research where local communities have suffered evictions from their traditional lands or have been restricted from local livelihoods in the name of conservation. Exclusionary approaches of conservation have therefore created, as a result, increased incidences of poverty and threatened local communities' food security.

The patterns of inequality found in dominant development ideologies have been part of the discussions on sustainable development. International discussions in terms of allocation of responsibilities for conservation are characteristics of the sustainable debate. These discussions have also reached the protected area agenda. As evidenced in the process from Stockholm to Johannesburg, the global conservation agenda is shaped with the participation of developed and developing countries, but international power relations matter. A close look at the distribution of protected areas in the world, reveals that the sizes of protected areas are larger in developing countries and that developing countries contain more of restrictive protected areas categories than developed countries. At a national level, the unequal distribution of protected areas is also reflected in that protected areas are often established in marginal lands where impoverished local communities settle and despite those communities having a comparatively limited ecological footprint, they are forced to carry a disproportionately large conservation burden.

Sustainable development is understood as an integrative concept. The integration of scientific disciplines in the development agenda can be observed in the definition of poverty which has moved from simply a lack of income to include different dimensions of deprivation. This integrative nature of sustainable development narratives has also had a strong effect on conservation approaches and natural protected area management; from a concept based upon the separation of human and nature towards an inclusive approach where participation of local communities are acknowledged as an important premise for conservation in protected areas. A shift in ecosystem theories from balance to a non-equilibrium ecosystem theory has

changed the way human disturbances are analysed and addressed in conservation. This new approach to ecological sciences has provided opportunity to reconsider the relationship between nature and culture and has contributed to assumptions that recognise that cultural and biological diversity can coexist and reinforce each other.

International groups and conservation organisations external to the local communities advocated for the designation of Ria Lagartos and Ria Celestun as protected areas. Similar in ecological description, historical backgrounds, profiles of their inhabitants, and lobbying periods to conserve the areas, there are however particular differences between the two reserves which provide comparative analysis insights into integrated conservation. Ria Lagartos and Ria Celestun were declared biosphere reserves to allow for the conservation of biodiversity while supporting the sustainable development of their local communities, buffer areas were designated where local sustainable development was supported. However despite efforts to include local communities and enhance social participation in Ria Lagartos and Ria Celestun, conservation has created social costs by the imposition of restrictions on local livelihoods. Concepts of frugality and self-sufficiency found in the definition of sustainable communities are imposed by restricting the already modest living conditions of the communities within the areas of study.

Ria Lagartos and Ria Celestun provide excellent examples that illustrate the history of Mexican conservation. Despite the devolution of land to *ejidos*; policies restricted local community access and favoured the change of land use towards livestock production, particularly from the 1980s.

An account of the history of conservation constructed for the areas of study identified how development policies affected the process of appropriation of natural resources, particularly regarding fishing policies as this is the main economic activity of the communities of study. The history of conservation in Ria Lagartos and Ria Celestun illustrates how strategies of development based only on economic gains are insufficient to lead sustainable development. This is evidenced by strategies for fisheries development where investments to increase fishing productivity did not show a proportional increase in the wellbeing of the local community. Ria Celestun; obtaining higher levels of fishing production than Ria Lagartos and the second fishing port of importance in Yucatan, did not showed higher levels of education, health and housing conditions than Ria Lagartos. The analysis of local

development identified in Ria Celestun an unequal distribution of benefits from fisheries; lower levels of local organisation characterised by an absence of fishing co-operatives, higher levels of immigration, higher levels of poverty, and lower levels of education compared with Ria Lagartos. Regional social policies of development such as 'the walk to the sea' created as a solution to the collapse of the sisal plantations, promoted the emigration of local peasants to the coastal communities. Due to its geographic location and proximity to an important ex-sisal production area, this policy resulted in higher immigration rates in Ria Celestun than in Ria Lagartos. In Ria Celestun the economic policy of fisheries expansion with poor regulation lead to a decline in fisheries, typical of over-exploitation.

The findings from the case studies offer interesting lessons to challenges to integrated conservation that need to be overcome at a practical level. The overall outcome of the study indicates that the 'back to the barriers' is not a necessary requirement for successfully attaining biodiversity conservation. The case studies found that when participatory mechanisms are adopted, when benefits are shared with the participating communities and if sustainable livelihoods are supported, then local development is capable of being reconciled with conservation concerns and assisting in achieving conservation goals in protected areas.

Based on the results of this research, one of the areas of study, Ria Lagartos, was found to have higher development indicators in; living conditions, more success in implementing conservation policies and achieving better results from conservation than Ria Celestun. The differences levels of successful implementation of similar narratives of conservation are identified in the Integrated Conservation Assessment carried out in this research. Ria Lagartos has a higher standard than Ria Celestun based on the evaluation of three main components: local cost and benefits, local livelihoods and local participation. Higher levels of local benefits were found in Ria Lagartos over Ria Celestun. Higher local costs were attributed to conservation from protected areas in Ria Celestun than in Ria Lagartos. The balance between local benefits and local costs was positive in Ria Lagartos while in Ria Celestun, the balance between local benefits and local costs was negative, in other words, more local costs than local benefits were attributed to conservation policies. This analysis of the transfer of benefits and cost to local communities is reflected in the assessment of local participation that was found to be higher in Ria Lagartos over Ria Celestun. Attendance levels at meeting with the reserve were found to be higher in Ria Lagartos than Ria Celestun. The capacity of the local community to participate in the decision-making process regarding

the reserve's conservation programmes was higher in Ria Lagartos than in Ria Celestun. The analysis of local livelihoods identified more variety of initiatives for sustainable livelihoods in Ria Lagartos than in Ria Celestun.

The local benefits included in the analysis were: improvement of municipal services, supportive to cultural services, regulation of tourism, diversification of livelihoods, infrastructure for economic development, employment linked with conservation, and benefits from the park entrance fees invested in the community. Local costs included in the analysis were; restrictions on land use, killing of livestock by predators, increase in crop-raiding animals, denial of traditional rights, conservation sanctions, reduced access to resources, and displacement of people.

The analysis of local costs and benefits concluded that the generation of local benefits is insufficient to promote local participation when the sum of local costs from conservation is higher than the sum of total benefits. A fair distribution of local costs and benefits was found necessary to incentivise local participation; unequal levels of enforcement showing a tolerance for powerful actors (such as the salt industry or external actors to the community) did not only dis-incentivise people from engaging in conservation goals, but also caused resentment in local stakeholders, resulting in counterproductive activities that affect conservation programmes. This research concludes that despite the capacity to transfer benefits from conservation, this did not eliminate transfer of local costs. Strategies to minimise local costs are required to take high priority and compensation policies are required when local costs cannot be further reduced.

The way that Ria Lagartos implemented their policy to promote local participation shows important examples of how to achieve higher levels of integrated conservation than Ria Celestun. Ria Lagartos management involved local stakeholders during the early stages of reserve development, incorporated local knowledge into the management plan and annual operative programmes with open channels of communication. Evidence of this is found in the performance of the advisory council of the reserve which includes local stakeholders. The advisory council was created in Ria Lagartos in 1993, three years before the reserve was officially designated. Local stakeholders were engaged to participate in conservation. In Ria Celestun, the advisory body was formed in 2003, three years after the official creation of the reserve and was considered a mechanism of little interest for local stakeholders.

Investment in social research was only found in Ria Lagartos. Outcomes of this research included insights about local conservation efforts, identification of local perceptions of the reserve management and the identification of social priorities for the community. The understanding of the communities and the local assumptions of conservation stimulated a follow-up project to design and circulate a social version of the management plan of Ria Lagartos among the local communities. Not surprisingly, knowledge of the management plan was found to be higher in Ria Lagartos than in Ria Celestun.

The research found sustainable livelihoods to be the most challenging component of integrated conservation. Local stakeholders reported restrictions on livelihoods attributed to conservation programmes established by the reserves. In Ria Lagartos, the most important activity that suffered constrictions due to conservation policies is livestock production. Land use change for grazing and cattle invasion of conservation areas were identified as continuing in Ria Lagartos. This activity continues to pose threats to biodiversity in terms of deforestation by the expansion of grazing areas, the incidence of fires associated with practices to prepare the soil for grass production, pollution from agro-chemicals disseminated in soils and the coastal lagoon and conflict with jaguar which results in this species being persecuted in response to attacks on cattle.

With an approach of integrated conservation the deforestation trends are reducing, management practices to intensify farming and reforestation in grazing areas with forage plants are the result of work with local farmers. Management strategies and a community based patrolling committee have meant the incidence of fires has reduced in Ria Lagartos. The conflict between jaguar and farming has been addressed with changes in farming practices aimed at eliminating night grazing and extensive practices. Conservation funding has supported these practices with infrastructure such as irrigation systems, training and electric fences. However funding remains a challenge and pollution from the use of agrochemical inputs still a threat for aquatic ecosystems in Ria Lagartos.

As government-funded farming programmes in the area around Ria Lagartos offer subsidies for the activity, local farmers incur an opportunity cost by restrictions over livestock production in the area. Therefore farming represents a significant challenge facing integrated conservation in Ria Lagartos. In contrast, in Ria Celestun it is not an important activity of the *ejido*.

The analysis on livelihoods found that in order to promote alternative economic activities in Ria Lagartos, the rate of return from alternative sustainable livelihoods must be comparable to, or greater than the rate of return from extensive livestock breeding. Additionally technical support is required during the early stages of any project until it is well established. This is an important conclusion as the current inexistence of those two conditions explains the low number of and success from, sustainable wildlife production in the areas of study. Other important obstacles to establishing these initiatives were associated with excessively complicated bureaucracy and high risk aversion associated with unfamiliar activities.

Sustainable wildlife management, with its role as an alternative to cattle farming has only reached modest levels of interest; this creates important implication for Ria Lagartos as the *ejido* is significantly larger than that of Ria Celestun. In this respect, it is essential to address the issue of locally-owned land inside the protected area and establish partnerships with landowners to provide support for, and follow-up to initiatives. Examples of PES schemes recently established in Ria Lagartos offer an interesting mechanism to compensate landholders.

Promotion of sustainable livelihoods in the areas of study has experienced good examples in non-extractive uses provided by ecotourism activities. The support for eco-tourism results in important levels of engagement among local stakeholders, levels which are comparable to farming activities. Eco-tourism has therefore represented an important economic alternative to fishing.

The analysis of local livelihoods found inter-relationships between sea-based and land-based livelihoods as a result of seasonality. Weather restrictions on predominant sea-based livelihoods activities such as fishing and eco-tourism have an effect on an increased reliance on inland livelihoods during that period. This is due to local people seeking alternative ways to meet their needs. The relationship found between ecosystems and livelihoods can support strategic planning in promoting sustainable livelihoods.

Finally, restriction on livelihoods such as wood collection, wildlife collection and subsistence agriculture were found to be underestimated by managers. Even when those activities do not generate incomes, they have important contributions to meet the needs of local communities.

The findings of the present study shows a stronger trend towards improved biodiversity in Ria Lagartos than in Ria Celestun, with the former performing better across a range of data in terms of biodiversity conservation than the latter. Cultural indicators presented in the results for reliance on herbal medicine, social cohesion and organisational capacity were also higher in respect of Ria Lagartos than was the case with Ria Celestun. The positive trends of both biodiversity and cultural indicators, assessed as higher in Ria Lagartos than in Ria Celestun seems to support the argument that cultural and biological conservation are intrinsically related. More research is required to confirm this relationship; however this research identifies interesting insights, for instance the analysis of the communities of studies found noticeably higher levels of social capital in Ria Lagartos than in Ria Celestun.

Institutional coordination was found to be higher in Ria Lagartos than in Ria Celestun, this was based on the triangulation of reports from different actors. Institutional co-ordination of the management agency with external actors was found to increase the dissemination of conservation regulations and affect levels of enforcement. Partnership-building was also a key aspect in order to promote sustainable livelihoods. The Certified Area of Conservation *El Zapotal* in Ria Lagartos is a good example of a partnership between the reserve and an external conservation organisation. A higher number of collaborative agreements with academic, conservation and other governmental departments were found to exist in the administration of Ria Lagartos than in the administration of Ria Celestun.

Mexico has had a chequered history of conservation that has been characterised by academic and political perceptions of indigenous ‘peasant’ communities; customary land rights and ownership, and the promotion of centralised agendas influenced by a dominant development model.

The influence of sustainable development at international level is reflected by national institutional changes since the creation of the MENRF in 1994. The environmental sector has moved towards a narrative of conservation in protected areas that aims at addressing local development while placing efforts on conserving biodiversity. The growth of the institutional capacity of protected area agencies and the increased attention on local participation, on-going funding programmes to address local sustainable development and attention placed on monitoring biodiversity are examples of an agenda focusing on an integrated conservation

approach. Yet, shortcomings found in the implementation of this narrative show that there is a danger that integrated conservation in Mexico will become restricted to a discourse due to government and private development interests that can overwhelm environmental protection efforts.

The outcomes of the research reveal that conservation agencies in Mexico are still maturing their integrated conservation programmes. Moreover, mechanisms such as the UWC that were expected to be widely adopted in protected areas have been found to be of limited scope in terms of their acceptance and adoption. Development policies, surrounding, in particular; fisheries, agriculture and migration have had strong influences on the uses of natural resources of the protected areas of study. Improving inter-institutional coordination would substantially increase the successful implementation of both conservation and development policies.

The thesis concludes that integrated conservation is capable of reconciling conservation concerns and assisting in the stimulation of sustainable local development within a given protected area. The findings of the case studies support this conclusion, although arguments contending that integrated conservation seems to sacrifice biodiversity priorities for human development are acknowledged. However, it is argued that this is due to a limited integrated conservation approach, which is typically characterised by policy discourse and token efforts that fail to operationally implement a comprehensive programme that takes the needs of the local community into consideration. This can be evidenced in findings associated with Ria Celestun.

Although based on two sample reserves in Mexico the results of this study are relevant in the wider context of other developing countries in which biodiversity hotspots are located, and whose populations resident within the boundaries of natural protected areas live in varying conditions of poverty. The study provides evidence that biodiversity can be protected without excluding human activity entirely. The keys to the reconciliation of conservation and sustainable development are the facilitation of the equitable transfer of benefits; the creation of meaningful and attractive sustainable livelihoods that have the potential to mitigate costs associated with conservation activities; and local participation in the design, management and enforcement of reserve regulations.

The outcome of the research contributes to our understanding of the challenges associated with the reconciliation of conservation initiatives with sustainable local development in protected areas. It offers an assessment of Mexico's conservation policies and management strategies, with the intention of supporting the effective implementation of protected area management.

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# APPENDICES

## Appendix 1: Images of housing developments on flood-prone land in Celestun

*Photographs taken during fieldwork by the author.*

**Appendix 2: Images of traditional wooden houses in San Felipe community of Ria Lagartos**

*Photographs taken during fieldwork by the author.*

Earth removal for road access to the salt industry.

*Photographs taken during field work by the author*

Extensive new areas of salt extraction were observed during field work on concession land, which was confirmed to have been carried out for the salt company's operation. *Kuka* palms (a threatened species), were left accessible and vulnerable to illegal appropriation for sale.

**Appendix 3: Translated version of the format of stakeholder user groups meetings**

Name of group: _____Date:_____ Community: _____

___ Fisherman ___ Ranchers ___ Tourism co-operative ___ Women's organisation

___ Labour groups ___ Citizenship groups ___ Youth groups

SECTION 1: LIVELIHOOD PROFILES: USES OF BIODIVERSITY

| **1. What is your main economic activity?** | **2. How often do you participate in the following activities?** | **3. Have these activities increased (+) decreased (-) or remained the same (=) in recent years. Why?** |
|---|---|---|
| ____ Fisherman<br>____ Rancher<br>____ Tourism operator<br>____ Hunter<br>___ Worker in Salt production<br>___Merchant<br>___Agriculture<br>___ Civil servant<br>____Student<br>___Retired<br>___Unemployed | 1. every day<br>2. once a week<br>3. once a month<br>4. once every three months<br>5. irregularly<br>6. never<br>____ Fishing in the estuary<br>____ Fishing in the ocean<br>____ Repairing nets, equipment<br>____ Hunting<br>____ Wildlife capture<br>____ Tourism work<br>____ Personal sightseeing in reserve<br>____ Conservation employment<br>____ Conservation volunteer activities<br>____ Farm work<br>____ Wood collection<br>____ Herb collection (medicinal or food)<br>____ Burning vegetative matter<br>____ Temporal Employment<br>____ Other offices (plumber, electric)<br>____ Wildlife management (UMA)<br>____ Management of your organization<br>____ Own business | Provide an answer for each activity |

| 4. Activity: | 4a. How did you learn it? | 4b. How many more of your family does the same activity? (siblings) Is it common that family members continue with traditional family activities?<br><br>4c. Would you like that your offspring do the same activities to earn a livelihood? |
|---|---|---|

SECTION 2: LOCAL PARTICIPATION IN CONSERVATION

| 5. In what year was the biosphere reserve created? | 6. What was the main purpose of the establishment of the reserve? | 7. Where are the geographic limits of the reserve? |
|---|---|---|
| ___ Between 1970-1975<br>___ Between 1975-1980<br>___ Between 1980-1985<br>___ Between 1985-1990<br>___ Between 1990-1995<br>___ Between 1995-2000<br>___ Between 2000-2005 | | Coastal boundary:<br><br>Land boundary: |

| 8. How did/do you get information about the reserve? | 9. Have you ever seen advertised or received an | 10. How often have you participated in reserve | 11. In what way have you participated? (select as many |
|---|---|---|---|

| | | | |
|---|---|---|---|
| (select as many existing answers)<br><br>_____ From friends<br>_____ From community meetings<br>_____ From stakeholder organisations<br>_____ From the agency of the reserve<br>_____ From other government agencies<br>_____ From other institutions<br>_____ From the media<br>____ From public presentations about the Reserve<br>Other sources _____ | **invitation to participate in a meeting about the reserve?**<br><br>_____ Yes, once a year<br>_____ Yes, twice a year<br>_____ Yes, between 2 – 5 times a year<br>_____ Yes, more than 5 times a year<br>_____ No, never | **affairs in the last year?**<br><br>_____ Once a year<br>_____ Twice a year<br>_____ Between 2 – 5 times a year<br>_____ More than 5 times a year<br>_____ Never | existing answers)<br><br>_____ Hearing from other members of the community<br>_____ Listening to a presentation<br>_____ Listening and commenting your opinion<br>_____ Voting on previously developed ideas<br>_____ Active discussion of ideas and voting<br>___ Designing a policy in cooperation with other groups/agencies |
| **12. Has the stakeholder group disagreed with any conservation activity?**<br><br>Y N<br><br>What?<br><br>Why? | **13. Do you consider that the local community agrees with:**<br><br>____ the majority of the conservation regulations<br><br>____ With about the half of the conservation regulations<br><br>____ With the minority of the conservation regulations | **14. Do you consider that the local community's opinions are taken into account in the design of conservation regulations?**<br>____ Yes, local opinions are always taken into account<br>____ Yes, local opinions are frequently taken into account<br>____ No, local opinions are frequently overlooked<br>____ No, local opinions are never incorporated. (Why?) | **15. Where is the rubbish accumulated in your locality?**<br><br>___ It is burnt or buried<br>____ Open trash locations<br>___ Separation facilities: organic / inorganic<br><br>Do most people separate the refuse at home?<br>___ Y ___N |

SECTION 3: ENFORCEMENT AND IMPLEMENTATION THROUGH INSTITUTIONS

| | | |
|---|---|---|
| **16. Which organisations do you know that** | **17. Have you heard or participated in** | **18. How often did you see a ranger** |

| | | |
|---|---|---|
| **contribute in achieving conservation objectives? What do they do?**<br><br>NCPA_____<br>MENR_____<br>MALRDFA_____<br>NFC_____<br>Port Authority_____<br>FAEP _____<br>Centre for Scientific Studies of Yucatan_____<br>CINVESTAV_____<br>Universities_____<br>Pronatura_____<br>Niños y Crías (Kids and Critters) _____<br>Biocenosis NGO _____<br>Environmental Youth Alliance_____<br>The Military _____<br>The Communications and Transport Ministry _____<br>The Health Ministry _____<br>The Education Ministry _____<br>The Navy_____<br>UNDP_____ | **any of these programmes? Do you consider them positive (+) negative (-) or indifferent (=)**<br><br>____ ____ Fishing closures<br>____ ____ Hunting closures<br>____ ____ Programme to support livestock production<br>____ ____ Certification of tour guides<br>____ ____ Reserve Management Plan<br>____ ____ Environmental Impact Assessment<br>____ ____ PRSD (Programme of Regional Sustainable Development)<br>____ ____ PTE: Programme of Temporary Employment<br>____ ____ Burning schedules<br>____ ____ Ranger programme<br>____ ____ Inspection and enforcement programme / FAEP<br><br>Comments:_____ | **in the reserve in the last month?**<br><br>_____ Every day<br>_____ Once a week<br>_____ More than once a week<br>_____ Once during the month<br>_____ More than once during the month<br>_____ Haven't seen one during the month<br>_____ Haven't ever seen a ranger<br><br>**19. Please tick the degree of enforcement that you believe exist in the reserve?**<br><br>5= Maximum enforcement<br><br>1 2 3 4 5<br>Comments:<br><br>**20. Please tick the degree of consistency that you believe exists between different management practices within the context of conservation of the reserve.**<br><br>5= Maximum consistency<br><br>1 2 3 4 5<br>Comments: |

SECTION 4: ATTRIBUTION OF BENEFITS AND COSTS

**21. Have you (or any of your family) had any of the following indirect outcomes from conservation in the reserve?**

| **Outcomes** | **Y** | **N** | **What** |
|---|---|---|---|
| Improvement of municipal services (rubbish collection, water services) | | | |
| Restrictions on land use | | | |
| Supportive community and cultural services | | | |
| The killing of livestock by predators | | | |
| The regulation of services | | | |
| Increase in crop-raiding animals | | | |
| The diversification of livelihoods | | | |
| The denial of traditional rights | | | |
| Infrastructure for economic development | | | |
| Sanctions | | | |
| The creation of employment linked with the protected nature area (park rangers, guides) | | | |
| Reduced access to resources (wood, palms for houses) | | | |
| Income from park entrance fees invested in the community | | | |
| The displacement of people | | | |
| Other outcomes | | | |

SECTION 5: SOCIAL AND CULTURAL INDICATORS

| | | |
|---|---|---|
| **22. In general do you feel as though the reserve has increased or decreased your standard of living?**<br>Increased<br>Decreased<br>No change<br>Why? | **23. Please rank the benefits that the reserve brings to the community in order of importance:**<br>Economic benefit<br>Ecological benefit<br>Social benefit<br>Educational benefits | **24. In your opinion is this local community close-knit?** (A high degree of social cohesion) |
| **25. Do you consider that the culture and traditions of the older inhabitants are still alive?**<br><br>__ The traditions and culture are conserved<br>__ They have decreased a little in the last 10 years<br>__ They have decreased substantially in the last 10 years | **26. Are these traditions decreasing or are they actively continued?**<br><br>___ The Chaac tradition to call the rain<br>___ The Tree tradition (*Arborada*)<br>___The Saint Fair<br>___ The construction of a timber stand for the bullfights during the fair | **27. What are the origins of these traditions?**<br><br>___ Mayan<br>___ Spanish<br>___ Mixed<br>___ I do not know |
| **28. How much immigration has there been in the last 10 years?**<br><br>___ The majority of the community is from here<br>___ Immigration has been high in the last ten years<br>___ Immigration has decreased | **29. How often do you go to the herbal healer?**<br><br>___ Never<br>___ Rarely<br>___ Frequently when I get sick<br>___Every time I get sick | **30. Do you know about traditional herbal remedies?**<br><br>Y N<br><br>**How did you learn about them?** |

SECTION 6: BEFORE AND AFTER COMPARISONS

**31. Have there been any changes (decrease, increase, no change) in the following items from the local diet?**

| **Food Item** | **Please tell me how often did the grandparent's generation used to eat the following food**<br>F: Frequently (important in the diet)<br>O: Occasionally (Once every 3 months. Part of the diet)<br>R: Rarely<br>U: Unknown | **Do you think the consumption levels have decreased, increased or remained the same in the present generation?**<br>S: Same.<br>I: Increased.<br>D-: Slightly decreased (in comparison with grandparents diet, but sometimes available every 1 to 3months)<br>D+: Significantly decreased (Consumed very rarely, once a year)<br>L: Lost. It is not consumed nowadays. |
|---|---|---|
| Turtle meat | | |
| Turtle eggs | | |
| Shrimp | | |
| Liza Caviar | | |
| White Conch | | |
| Black conch | | |
| Flamenco Eggs | | |
| Cormorant eggs | | |
| Chachalaca (Bird) | | |
| Ducks | | |
| Hocolitos-Guajolote Ocelado | | |
| Pavo de monte (Bird) | | |
| Palomas (Bird) | | |
| Tapir | | |
| Uech (Armadillo) | | |
| Deer | | |
| Pizot | | |
| Jabalí | | |
| Peccary | | |
| Manaty | | |
| Quail (others) | | |

| **32. Do you consider that the diversity of animals and forest fauna has decreased in the last 30 years?** | **33. Do you feel that the diversity of animals and forest fauna is stabilising as a result of the reserve?** |
|---|---|
| ___ Y<br>___ N | __ The populations are recovering<br>__ The population are not depleted as much but they are not recovering yet<br>__ The populations are still decreasing |

**34. Other traditional uses: Have these uses increased (+), decreased (-), or have they remained the same (=) in the last 5 years?**

| | **+ - = in the last 5 years** | **Which trees?** |
|---|---|---|
| Palm fronds for roofing material | | |
| Palms or other wood for fences | | |
| Mangroves for cooking firewood | | |
| Trees for construction | | |
| Other uses | | |

**<u>For ranchers only:</u>**

| **35. Have the attacks by wild animals increased, decreased or remained the same in the last 10 years?**<br>____ Increased<br>____ Decreased<br>____ Same | **35a.How many attacks occur approximately in the region per year?** | **35b.Have you noticed an increase in the coyote's presence in the last 5 years?**<br>___ Y<br>___ N |
|---|---|---|
| **35c.Who / what do you think is responsible for the attacks in last 5 years?**<br>____ The jaguar (and cats) predominantly<br>____ The coyote predominately<br>____ Same | **35d.How do the coyotes reach this region?** | **Many thanks!** |

## Appendix 4: User groups meetings

**General objective:** To gather information in order to determine the effects of conservation policies upon the local communities within the Ria Lagartos and Ria Celestun biosphere reserves.

**Specific objectives:**

1. To identify the livelihood impacts (positive and negative) of conservation policies in the local communities of the biosphere.
2. To identify in what capacity the environmental policy framework is integrating a development approach, at a grassroots level.
3. To assess the local perception of the level of consistency and complementarity of the conservation policies in the field.
4. To assess the levels of local participation by the local communities of the biosphere reserves under assessment.

**Targeted User Groups**

44 user groups meetings were formed of representatives from the main stakeholders (most of them organised into cooperatives which were represented by the cooperative board).

The user group meetings developed in Ria Lagartos covered the following municipalities: San Felipe, Río (including Las Coloradas), and El Cuyo locality.

**SAN FELIPE**

**Number of user group meetings carried out:** 11

**Dates:** 1-10 April 2007

**Fishery Cooperatives:** 1.) Fuerzas Vivas: Sociedad Cooperativa de Producción Pesquera Pescadores Unidos de San Felipe S.C. de R.L.; 2)Sociedad Cooperativa de Producción Pesquera Legítimos de San Felipe S.C. de R.L.

**Ranchers Associations:** 3) Asociación Ganadera Local de San Felipe S.C. de R.L.; 4) Comisariado Ejidal de San Felipe,5) UMA of Pheasant production

**Tourism Cooperatives:** 6) Lancheros Punta Bachul S.S.S.; 7) Sociedad Cooperativa Hubel Chac-ha S.C. de R.L., 8) Operadores de Fly Fishing de San Felipe.

**Citizen Associations:** 8) Actam Chuleb A. C. y 9) Grupo de Prevención y Atención a Contingencias.

**Women Groups:** 10) Mujeres Trabajadoras del Mar S.C. de R.L.,

**Youth Groups:** 11) Red Ambiental Isla Cerritos S.C. de R.L.

**RIO**

**Number of user group meetings carried out:** 8

**Dates:** 12-20 May 2007

**Fishery Cooperatives:** 1) Sociedad Cooperativa de Pescadores de Ría Lagartos S.C. de R.L., 2) Sociedad Cooperativa Manuel Cepeda Peraza S.C. de R.L.,

**Ranchers Associations:** 3) Asociación Ganadera de Río Lagartos

**Tourism Cooperatives:** 4) Ría Lagartos Expeditions S.C. de R.L.; 5) Sociedad Cooperativa de Servicios Turísticos y Pesqueros La Perla del Oriente S.C. de R.L; 6) Sociedad Cooperativa de Servicios Turísticos Petén Tucha S.C. de R.L.;

**Youth Groups:** 7) Promotoras Ambientales Ecologistas de las Coloradas (*Ecologist Promotion Youth Group*).

**Workers Unions:** 8) Sindicato de Trabajadores de Las Coloradas.

**EL CUYO**

**Number of user group meetings carried out:** 7

**Dates:** 5-15 June 2007

**Fishery Cooperatives:** 1) Sociedad Cooperativa Pesquera del Cuyo S.C. de R.L

**Ranchers Associations:** 2) Comisariado Ejidal de El Cuyo

**Tourism Cooperatives:** 3) Chipecte Tours S.C. de R.L.; 4) Meco Tours S.C. de R.L.

**Woman organizations:** 5) Salt producers from El Cuyo 6) Artesanas Sol y Arena (Handicraf producers group "Sun and Sand"). 7) Handicraft Woman Group

In Ria Celestun the **user group meetings** took place in the community of Celestun and the community of Isla Arena.

**CELESTUN**

**Number of user group meetings carried out:** 10

**Dates:** 2-7 July

**Fishery Cooperatives:** 1) Freelance fisherman for Renan Solís Comercialisation 2) Freelance fisherman for the main commercial enterprise of Celestún.

**Rancher Associations:** 3) Comisariado Ejidal de Ceslestún

**Tourism Cooperatives:** 4) Cooperative Society Poal S.C. de R.L.; 5) Cooperative Society La Flor de Chuncoco S.C. de R.L. 6) Federal Association of boat trip servers Santa Cruz., 7) Society of Social Solidarity for the Hidden Paradise, 8) Society of Social Solidarity Punta Ninum

**Woman organizations:** 9) Handicraft producers group "El paso del flamenco").

**Organisation of employee:** 10) Cooperative Society for salt extraction: Templaderos S.R.L.

**ISLA ARENA**

**Number of user group meetings carried out:** 8

**Date:** 11-15 July

**Fishery Cooperatives:** 1) Pescadores Unidos de Isla Areanas SSS. 2) Pescadores de Rio Ancho SSS.3) Ixoye Marinas SC de RL 4) Corvina Escondida SSS.

**Tourism Cooperatives:** 5) Los flamingos dorados de Isla Arena SC de RL. 6) Sociedad Cooperative Servicops Ecoturisticos Carey 7) Manglar de Isla Arena SC de RL

**Organisation of wildlife management**:8) Otoch Uayin (Crocodile UWM).

+

**Appendix 5: Translated version of the format of the structured interviews for rangers**

**RANGER'S FORMAT**

Name of the biosphere reserve: _____ Position; _____ Date: _____

SECTION 1: LOCAL PARTICIPATION AND ENFORCEMENT

**1. Could you please assess the enforcement level by using the following measures?**

| **Level of enforcement perceived**<br>5= Maximum enforcement | 1 2 3 4 5 |
|---|---|

**How much do you consider that the local community enforces conservation regulations in the following ecosystems: - + =**

____ ____ Fishing in the river ……..

____ ___ Fishing in the ocean……..

____ ____Tourism regulation…….

____ ____Hunting regulations…….

____ ____Capture of wildlife for pets……....

____ ____Ranching ……..

____ ____Register wildlife management / UWM……..…

**2. Where does the reserve start and finish (the boundaries of the reserve)?**

Coast: Inland:

| | |
|---|---|
| **3. In what way does the local community participate?**<br>_____ Listening to presentations in meetings<br>_____ Listening and commenting your opinion<br>_____ Voting on previously developed ideas<br>_____ Active discussion of ideas and voting<br>___ Designing a policy in conjunction with other groups/agencies<br>___ As a volunteer in conservation activities | **4. How often did the local community receive invitations to participate in biosphere reserve affairs in the last year?**<br>_____ Once a year<br>_____ Twice a year<br>_____ Between 2 – 5 times a year<br>_____ More than 5 times a year<br>_____ Never |

| | |
|---|---|
| **5. Has the stakeholder group disagreed with any conservation activity?**<br>Y N<br><br>What?<br>Why? | **6.. Do you consider that the local community agrees with:**<br><br>____ The majority of the regulations<br>____ With approximately half of the regulations<br>____ With the minority of the regulations |

SECTION 2: LIVELIHOOD DIVERSIFICATION AND INSTITUTIONAL CO-ORDINATION:

**7. How has the reserve supported the following areas of diversification? Has the reserve conducted assessments of the impacts on them?**

Tourism

Forestry

Ranching intensification

Others:

**8. With which organization do you have better coordination? Why? Scale** 1 2 3 4 5
Max 5

NCPA_____
MENR_____
MALRDFA_____
NFC_____
Port Captain Authority_____
FAEP _____
Centre for Scientific Studies of Yucatan_____
CINVESTAV_____
Universities_____
Pronatura NGO_____

Niños y Crías (Kids and Critters) _____
Biocenosis NGO _____
Environmental Youth Alliance_____
Military force _____
Communications and Transport Ministry _____
Health Ministry _____
Education Ministry _____
Navy_____
UNDP_____

**9. Please indicate an overall grade for governmental organizations and for independent organizations.**
5= Max

1 2 3 4 5

**10. How often do ranger's patroll? What area do they cover?**

_____ Every day
_____ Once a week
_____ More than once a week
_____ Once in the month
_____ Other

Territory:

**10. Perceived effectiveness of the Environmental Police**

Scale: 1 2 3 4 5

____ Reporting
____ Coordination
____ Speed of response
____ Efficiency for concluding cases

**12. What are the main sanctions?**

**13. Please indicate an overall grade for the Environmental Police performance**

5= Best
1 2 3 4 5

Comments:

SECTION 3: TRANSFER OF BENEFITS AND COSTS

**14. Do programmes exist to promote or avoid the following impacts of the reserve upon local communities?**

| | Y | N | Explanation |
|---|---|---|---|
| Improvement of municipal services (rubbish collection, water services) | | | |
| Restrictions on land use | | | |
| Supportive community and cultural services | | | |
| The killing of livestock by predators | | | |
| The regulation of services | | | |
| Increase in crop-raiding animals; | | | |
| The diversification of livelihoods | | | |
| The denial of traditional rights | | | |
| Infrastructure for economic development | | | |
| Sanctions | | | |
| The creation of employment linked with the protected nature area (park rangers, guides) | | | |
| Reduced access to resources (wood, palms for houses) | | | |
| Income from park entrance fees invested in the community. | | | |
| The displacement of people | | | |
| Other outcomes | | | |

SECTION 4: CULTURAL INDICATORS AND BEFORE AND AFTER COMPARISONS

Social cohesion scale: 1 2 3 4 5

**15. Where do you consider more social cohesion exists and why?**
In the case of Ria Lagartos:
___ San Felipe _____
___ Rio _____
___ El Cuyo _____
In the case of Ria Celestun:
__ Celestun _____
__ Isla Arena _____

| **16. Where do the hunters come from? (Hunting for bush meat)** | **17. Where do the hunters come from? (Wildlife Capture, particularly birds)** |
|---|---|
| ___ Mainly from the local communities within the reserve<br>___ Mainly from external local communities to the reserve<br>___ Half and half<br><br>Main prey: | ___ Mainly from the local communities within the reserve<br>___ Mainly from external local communities to the reserve<br>___ Half and half<br><br>Main prey: |

| **18. Do you feel that the diversity of animals and forest flora is stabilizing as a result of the reserve?** | **19. Do you consider that incidents involving accidental fires have:** | **20. Do you consider that deforestation from other causes has:** |
|---|---|---|
| ___The ecosystems are recovering<br>___The ecosystems are not depleted as much but they are not recovering yet<br>___The ecosystems are still decreasing | ___ Slightly decreased<br>___ Strongly decreased<br>___ Remained the same<br>___ Increased | ___ Slightly decreased<br>___ Strongly decreased<br>___ Remained the same<br>___ Increased |

**21. What are the effects of hurricanes on conservation efforts?**

**22. Have hurricanes increased, decreased or remained consistent in frequency and strength since the establishment of the reserve?**

___ Increased since the establishment of the reserve
___ Decreased since the establishment of the reserve
___ Remained the same

| | | |
|---|---|---|
| **23. Have attacks by wild animals increased, decreased or remained the same in the last 10 years?**<br><br>____ Increased<br>____ Decreased<br>____ Same | **23a. How many attacks approximately occur in the region per year?** | **23b.Have you noticed an increase in the coyote's presence in the last 5 years?**<br><br>___ Y<br>___ N |
| **23c. What do you think is responsible for the attacks in the last 5 years?**<br><br>____ The jaguar (and cats) predominantly<br>____ The coyote predominately<br>____ Same | **23d. How do the coyotes reach this region?** | |

**24. Does any monitoring or programme of conservation exist for the following species?**

| **Species** | |
|---|---|
| Turtle | |
| Shrimp | |
| White Conch | |
| Black conch | |
| Flamenco adult and eggs | |
| Cormorant adult and eggs | |
| Chachalaca (Bird) | |
| Ducks | |
| Hocolitos - Guajolote Ocelado (Bird) | |
| Pavo de monte (Bird) | |
| Palomas (Bird) | |
| Tapir | |
| Uech (Armadillo) | |
| Deer | |
| Pizot | |
| Jabalí | |
| Peccary | |
| Manaty | |
| Quail | |
| Others: | |

## Appendix 6: Information on the structured questionnaire

**Objective:** Collect complementary information in order to determine the effects of conservation policies upon local communities within the Ria Lagartos and Ria Celestun biosphere reserves.

**Rangers in Ria Lagartos:**

Ranger 1: Member of local community

Ranger 2: Biologist with a Master's degree. Has a part time function as a field ranger and part time in the head office.

Ranger 3: Biologist. Full time ranger. Non-member of the local community.

Dates: 12-14 April

**Rangers in Ria Celestun**

Ranger 1: Member of local community

Ranger 2: Biologist with a Master's degree. Has a part time function as a field ranger and part time in the head office.

Dates: 2 and 3rd August 2007

**Appendix 7: Translated version of the format of the semi-structured interview**

Semi-structured questionnaire designed for officials of the NCPA.

**Name:**_____

**Position:**_____

**Date:**_____

**Place:**_____

**Historical context**

1. Who originally advocated for the establishment of the protected nature area?
2. What were the initial motivations and the interests of the advocates at the time of establishment?
3. Have those motivations been modified or remain consistent since the establishment of the protected area?
4. What stakeholders participated in the initial advocacy of the protected area?
5. In what capacity did stakeholders participate?
6. Were the majority of the actors internal or external to the local communities of the protected nature areas?
7. How are local priorities incorporated in the management of the protected area?
8. Was the knowledge and experience of local communities investigated and incorporated into the management plan during the establishment period of the protected nature area?
9. Which information?
10. How was it gathered?
11. How was the information recognized, was it applied and if so, how?

**Management**

12. Does the protected area have a management plan?
13. How was the management plan designed?
14. How is the plan updated?
15. How is it administrated?
16. What kind of indicators do you use to guide and document the objectives of the management plan?

17. Please explain the decision-making process with regards to matters affecting the protected nature area?
18. In what capacity does the Technical Advisory Council operate?
19. How are the decisions in the Technical Advisory Council (TAC) taken?
20. Who is included in the TAC?
21. What is its organisational structure?
22. What kind of governmental support for development exists in the communities of the protected are?
23. What institutions are involved (federal, state and municipal level)?
24. Does NCPA interact with them? How? (Evidence: Documents, plans).
25. With which of those institutions do you consider NCPA has the best working partnership and the worst conflict? Why?
26. Do you consider that any of those support programmes contribute towards conservation goals (In terms of complementarily and consistency)?
27. Do you consider that any of those support programs have an adverse effect against conservation goals?
28. Currently does NCPA have the institutional capacity available to implement the management plan of the protected area?
29. Currently does NCPA have the financial capacity available to implement the management plan of the protected area?
30. What is the budget for the protected nature area?
31. What other funding can NCPA obtain?
32. What kind of projects does NCPA fund?
33. What projects are outside the scope of NCPA?
34. How does the PRSD work? (PRSD: Programme for Rural Sustainable Development).
35. How much of the PRSD fund is it given to local communities?

**Social costs and benefits**

36. What productive and extractive activities take place inside and around the limits of the protected nature areas?
37. Which of them are considered to have the highest environmental impact?
38. What activities of conservation have a strong effect on the local communities?
39. What kind of benefits do local communities obtain as a result of the establishment of the protected nature area?

40. Identify the examples of the following: supportive assistance and cultural services, the regulation of services, the diversification of livelihoods, the infrastructure for economic development, creation of employment related with conservation (park rangers, guides), the percentage of fees returned to communities and other stakeholders. (Statistics and documents that provide evidence of this).
41. Do systematic or planned strategies exist for generating benefits for local communities?
42. How are these activities developed?
43. How are the outcomes of these activities charted (Evidence)?
44. Does the management plan consider broader aspects such as the health and education of local communities?
45. Identify projects: How are these activities developed?
46. How are the outcomes of these activities charted (Evidence)?
47. Has there been a positive or negative effect regarding employment as a result of the establishment of the protected nature area?
48. What kind of positive employment opportunities have developed (Evidence)?
49. What has been the cause and outcome of these negative effects? Including: The displacement of people; the deprivation of access to resources; the denial of traditional rights; change of traditional livelihoods, alteration of family structure, crop raiding animals; the killing of livestock by predators; the restriction on land for house building and other sanctions (Evidence).
50. How does NCPA intervene to minimize those negative effects?
51. What obstacles does the agency face to reduce the negative effects of conservation programmes?
52. How much is obtained from the entrance fee of the protected nature area per annum?
53. How is that finance distributed and spent?
54. What proportion is circulated within the community?

**Cultural and social development**

55. Has the establishment of the protected area had an influence on the conservation or loss of traditions?
56. What indicators were used in the establishment of the protected area to evaluate the effect upon local traditions and cultural practices?

57. Was local culture and tradition taken into account when the protected area was established?
58. How were these aspects incorporated into the creation of the protected area?
59. Do traditional practices generate important environmental impacts?
60. Since the establishment of the protected area, are those activities legal, if not, are they tolerated or prosecuted?
61. Do they still exist?
62. What has NCPA done in respect to mitigating against the impact upon traditional activities?
63. Do you consider that traditions in the local communities are being conserved? Why do you think so?
64. How do cultural and traditional activities affect the implementation of the conservation programmes of the protected area?
65. Does the management plan include the conservation of the local culture as an objective?
66. In what manner is this achieved?
67. Are broader social aspects such as migration flows, fertility also included?
68. How are these monitored?

**Participation**

69. Does local community participation hinder or promote conservation (Evidence)?
70. How does the local community perceive and implement the management plan of the protected area?
71. How are synergetic relationships between conservation and local development discovered?
72. How are these synergies further developed (Examples)?
73. Has NCPA had the support of the local community in the implementation of the protected area program?
74. How was the level of support justified?
75. In what activities does the local community participate? For example: protected area establishment, constitutional development of protected area decree, creation of the management plan, decision making and specific activities (conservation, enforcement, clearing, restoration, precaution, contingencies, attracting funding for conservation).

76. Have the local communities made petitions that have been taken into account (Evidence)?
77. What is the process for submitting a petition?
78. Have the local communities made petitions that have not been taken into account or discounted as irrelevant (Evidence)?
79. How are petitions evaluated and actioned upon?
80. Have the local communities voiced formal disagreement with any of the conservation policies?
81. How was this brought to the attention of NCPA?
82. Has the disagreement been resolved?
83. Do you consider that the local communities have the capacity to engage in some responsibilities such as community based management or co-management of the protected area?
84. Have some people of the local communities been incorporated into the protected area NCPA team?
85. How has the performance of these individuals compared with other staff?

**Reference indicators**

86. What indicators associated with the conservation of biodiversity does NCPA use (Evidence)?
87. What indicators does NCPA use to evaluate the variations in quality of life within local communities?
88. What indicators were used in the establishment of the protected area to evaluate the effect upon local traditions and cultural practices?
89. Are NCPA's indicators based upon static reviews or are they continually updated to include temporal variations?
90. What is the proportion of spending on conservation and community development within and surrounding the protected area (Evidence via financial accounts)?

**Documents requested**

- National strategy of NCPA
- Performance reviews
- Original management plan

- Modifications to original management plans
- Yearly evaluations and assessments
- Annual operating plans
- Global assessments
- General assessments
- Submitted petitions
- Constitution of the Advisory Council
- Minutes of the advisory council meetings
- List of PRSD projects operating in protected areas
- Financial accounts of protected areas
- Contracts of agreements (institutions, individual stakeholders).

## Appendix 8: Information on the semi-structured interviews

**Objectives:**

- To analyse the administrative capacity of the protected areas, particularly the integration of conservation and development.
- To identify the priorities of management and their strategic relationship with other development policies.

**Interview 1**

Present manager Ria Lagartos Head Office.

Place: Merida city.

Date:17 January 2007

**Interview 2**

Present manager of the Ria Celestun Head Office.

Place: Merida city.

Date: 19 January 2007

**Interview 3**

First and former manager of Ria Celestun Head Office.

Place: Merida city.

Date: 22 January 2007

**Interview 4**

Past managers of Ria Lagartos Head Office.

Place: Merida city

Date: 31 January 2007

**Interview 5**

Head Office of the NCPA Regional Office.

Place: Cancun.

Date:19-February-2007

**Interview 6**

Head Office of the NCPA National Office.

Director of Conservation.

Place: Mexico city.

Date:01 June-2007