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Leveraging local livelihood strategies to support conservation and development in West Africa



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ABSTRACT

Over the past 30 years, the promotion of alternative occupations has been central to livelihood-centered conservation projects (LCP). However, continued pressure on protected areas and high poverty levels in surrounding communities suggest that other LCP approaches may be needed. One historically understudied approach focuses on enhancing pre-existing livelihood strategies to achieve conservation and development goals. We assessed the efficacy of the alternative occupations and pre-existing livelihood strategies approaches to LCPs using two case studies of adjacent protected areas along the Senegal River in West Africa. One community in Senegal promotes tourism as an alternative occupation; another in Mauritania builds on the local fishing-farming mixed livelihood strategy. From 2014 to 2015 we used qualitative methods (e.g. semi-structured interviews and participant observations) to examine each LCP's capacity to deliver positive conservation and development outcomes, focusing on perceived outcomes on local livelihoods and conservation goals. Overall, LCP which focused on the pre-existing fishing-farming livelihood strategy received more positive perceptions in terms of enhancing local livelihoods, fostering positive conservation behaviors, and improving park-community relations. We conclude that these observed outcomes stem from acknowledgment of and adherence to local needs and priorities within the context of local vulnerability and a park management approach that fostered a sense of resource ownership. In places where alternative occupations like tourism have not succeeded in delivering positive conservation and development goals, this paper presents an alternative strategy that is rooted in the social and environmental realities of local communities.

1. Introduction

In the late 1980s, the conservation paradigm began to emphasize the integration of local livelihoods in the management of protected areas. This change resulted from broad concerns over social issues of poverty and vulnerability in communities impacted by exclusionary management practices for protected areas (Brandon and Wells, 1992; West et al., 2006) and growing recognition that development and conservation were not mutually exclusive goals (Alpert, 1996). Since then, researchers and NGO officials have been designing and implementing programmatic interventions to enhance livelihoods while conserving biodiversity in communities around protected areas (Salafsky and Wollenberg, 2000; Agrawal and Redford, 2006; Oldekop et al., 2016). Many of these programs operate with the premise that traditional livelihood practices are unsustainable and counterproductive with respect to conservation

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(McCabe, 2003; Lele et al., 2010; Roe et al., 2015). As a result, livelihood-centered conservation projects (LCPs – hereafter) have often focused on the introduction of environmentally sustainable occupations as alternative to traditional livelihood activities (Wright et al., 2016).

However, interventions centered on these alternative livelihoods tend to fall short of expectations (c.f. Kiss, 2004; Agrawal and Redford, 2006; Hill et al., 2012; Bauch et al., 2014; Roe et al., 2015; Oldekop et al., 2016). Continued pressure on protected areas combined with rising poverty levels have therefore led conservation professionals and researchers to examine and advance new LCP approaches that could potentially yield better results (Wells and McShane, 2004; Wright et al., 2016). For example, Wright et al.'s (2016, p7) suggest:

“Rather than using livelihood-focused interventions as a direct behavior-change tool, it may be more appropriate to focus on either enhancing the existing livelihood strategies of those most vulnerable to conservation-imposed resource access restrictions or on use of livelihood-focused interventions that establish a clear link to conservation as a means of building good community relations.”

They further advance the value of the sustainable livelihood framework to understand the role and function of resource dependent activities within broader livelihood strategies to enhance the success of conservation projects.

The purpose of our paper is to empirically examine the assertion made by Wright and his colleagues. While ample empirical research on the impacts of LCPs exists, most of it has focused on projects that promote alternative occupations. To our knowledge, no study has examined efforts to enhance existing livelihood strategies as a mechanism to reach conservation goals while improving the well-being of households around protected areas. This paper seeks to address this gap by comparing two case studies of different forms of LCPs, one that promotes an alternative occupation and another that builds on traditional livelihood strategies.

We focused on two national parks located on the banks of the Senegal River in West Africa, each with distinct LCPs that have yielded different results. In and around Senegal's Djoudj National Bird Park, ecotourism was introduced as an alternative source of livelihood for fishing villages. In Mauritania's Diawling National Park, the LCP focused on enhancing the pre-existing mixed fishing-farming livelihood practice. Following the sustainable livelihood framework, we describe the LCPs in relation to the livelihood strategies of households and the park management regime within which the projects are embedded. To determine their effectiveness, we assess locals' and park officials' perceptions of how each model contributed to enhancing livelihoods, promote conservation goals, and positive park-community relations. In the discussion, we look back at each case and extrapolate critical elements that have influenced the outcomes of these LCPs.

2. Livelihood-centered conservation projects

Livelihoods are a set of lifestyles, goals, values and practices that are carefully coordinated to meet a desired standard of living (Walker et al., 2001). Even though households pursue a diversified set of livelihood activities (Ellis and Allison, 2004; Scoones, 1998; Ashley, 2000), they have a core activity that typically defines their cultural identity such as fishermen, pastoralists and farmers (McCabe et al., 2010; Santos, 2015). The role of livelihoods within the conservation discourse has taken on different forms through the course of history. When protected areas were first established in Africa, traditional livelihoods were considered to be in conflict with conservation goals because of their dependence on natural resources. Thus, for decades, resource managers sought to suppress them from protected boundaries (Adams and McShane, 1992; McCabe, 2003; McCabe et al., 2010).

Since the 1980s, however, broad concerns about social issues such as poverty and vulnerability in communities affected by protected areas propelled policy makers to reconsider livelihoods in conjunction with conservation goals (Brandon and Wells, 1992; Wright et al., 2016). As a result, new socially inclusive approaches to conservation gained traction (Alpert, 1996; McShane and Wells, 2004; Agrawal and Redford, 2006; Lele et al., 2010; McShane et al., 2011). These approaches are branded under different terms such as integrated conservation and development projects, community-based conservation and community-based natural resource management (Wright et al., 2016). In this paper, we define livelihood-centered conservation projects (LCPs) as those that directly target livelihoods through the promotion of sustainable economic activities (either new/alternative or existing/traditional ones). Despite small differences in their strategies, they all share the same objectives of enhancing biodiversity conservation, promoting social and economic community development, and increasing local participation in conservation programs (Wells and McShane, 2004).

With this shift, the promotion of alternative occupations has dominated LCPs since the 1990s (Alpert, 1996; Agrawal and Redford, 2006; Wright et al., 2016). The types of alternative occupations that have been implemented are diverse and include the promotion of non-timber forests products, handicraft production, and beekeeping (Roe et al., 2015). Ecotourism, nonetheless, constitutes the primary form of alternative occupations that program managers have promoted, particularly in communities adjacent to protected areas (Weaver and Lawton, 2007; Stronza and Pegas, 2008; Pegas and Castley, 2014; Serenari et al., 2016). These programs operate with the basic assumption that, given the opportunity, households will allocate time and effort away from environmentally damaging activities to alternative occupations (Brugère et al., 2008). It is based on the assertions that (1) environmental degradation in rural areas is caused by poverty (Chambers and Conway, 1992; Scoones, 1998) and (2) the lack of alternative livelihood options drive most of local people's choices about resource exploitation (Davies, 2016; Brown, 2002).

Despite their prevalence, there is ambivalence and uncertainty among scholars about the capacity of alternative LCPs to simultaneously deliver positive conservation and development results. Some studies provide evidence of successful LCPs. For instance, Stronza and Pegas (2008) observed that ecotourism in two communities, one in Brazil and another in Peru, provided economic and social benefits to local communities and led to positive conservation attitudes. Other studies show that there is no clear link between LCPs and effective biodiversity conservation (c.f. Agrawal and Redford, 2006; Stronza, 2007; Hill et al., 2012; Roe et al., 2015). Many projects cited as success stories involved little change in conservation attitudes and behaviors because only modest improvements to the wellbeing of local people occurred (Kiss, 2004; Hill et al., 2012).

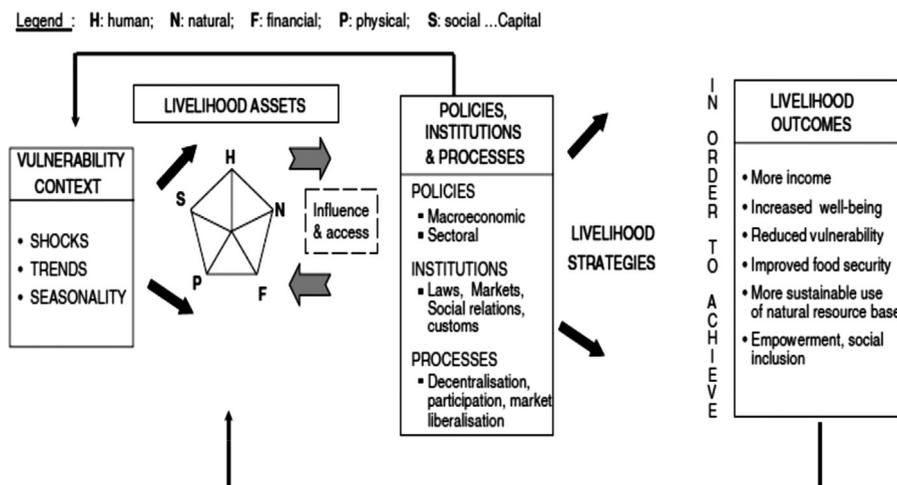


Fig. 1. The Sustainable Livelihood Framework (Source: Allison and Horemans, 2006).

Scholars have attributed poor outcomes of alternative LCPs to the simplistic ideas that inform them (Brown, 2002; Blomley, 2010). One of those, for instance, is based on the flawed notion of equivalence between economic benefits and the needs and aspirations of the local people (Berkes, 2012). Others have argued that there is a misperception among program managers of homogenous communities where people have equal power and access to livelihood resources (Waylen et al., 2013). Inevitably, intra-community variation means that LCPs rarely address all constituents completely (Agrawal and Gibson, 1999).

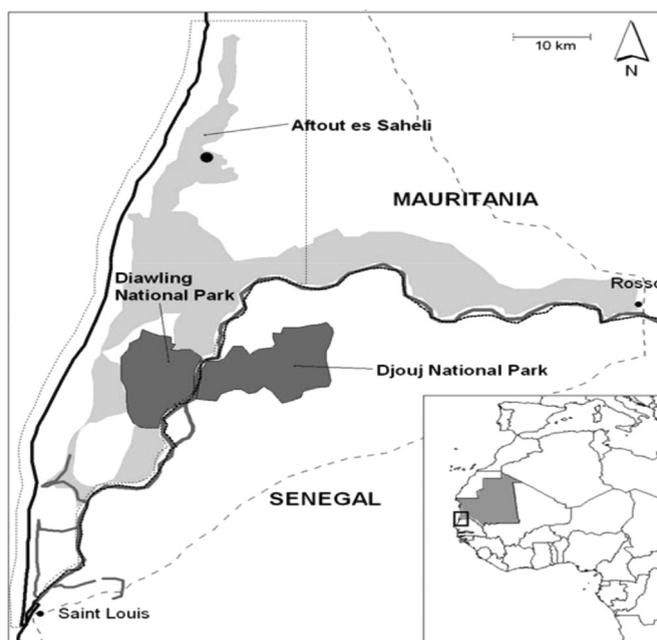
3. Sustainable livelihood framework

Building on the work of others, Wright et al. (2016) proposed the Sustainable Livelihood Framework (SLF) as a frame of reference for analyzing LCP outcomes. The SLF has been applied mostly in the development field but gained popularity in conservation research in the last decade.

The SLF, as presented in Fig. 1, considers a conservation project in relation to the social structure within which it is embedded, bringing together the capital assets, policies and institutions, livelihood strategies, social and environmental outcomes, and the vulnerability context. Households have access to *capital assets* which are grouped into five categories including physical, financial, human, social and natural. Access to capital assets are mediated by the *policies, institutions and processes*, including access and rights regimes which are at the heart of resource management (Allison and Horemans, 2006). Protected areas management regimes are considered social institutions that are comprised of a set of policies, rules and regulation and determine who manages protected area resources and if and how households can access those resources (Bennett and Dearden, 2014).

Households combine capital assets they can access within institutional structures to pursue various livelihood strategies. *Livelihood strategies* are defined as the way local people seek diverse opportunities to make a living and meet their ongoing needs for food and shelter, security and dignity, while simultaneously striving to minimize degradation to the natural resource base upon which they depend (Walker et al., 2001). These strategies lead to sustainable livelihood *outcomes* if the household can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets while not undermining the natural resources upon which it depends (Scoones, 1998). Livelihood sustainability is also affected by *vulnerability context*, which comprises the seasonal cycles, trends and shocks that are all beyond the household's control and puts pressure on their food, income and asset production systems (Davies, 2016; Allison and Horemans, 2006).

LCPs are designed to enhance the sustainability of local livelihoods. Those that build upon pre-existing livelihood strategies have the advantage of aligning with people's current coping and adaptation strategies. Such policies can include improving access to capital assets by strengthening resource use rights, providing financial services, and promoting income diversification (Allison and Ellis, 2001; Brugère et al., 2008). Other LCPs that seek to alter or replace current strategies with alternative livelihoods assume those would lead to more sustainable outcomes (Wright et al., 2016). In return, locals can choose to either adopt or reject the LCP depending on whether these projects complement or conflict with their livelihood strategies (Ashley, 2000). Overall, the SLF approach provides a holistic and integrated view by which people achieve (or fail to achieve) sustainable livelihoods. However, such an extensive analysis may not be appropriate or necessary in all cases (Scoones, 1998). This paper is primarily concerned with three aspects of the framework that have also been the focus of other research: vulnerability contexts and livelihood strategies, the management structures that shape them, and community development (i.e. enhanced livelihoods) and conservation (i.e., environmental) outcomes of the LCP.



Source: Morepo-Oto et al., 2013

Fig. 2. Map of Djoudj National Bird Park and Diawling National Park.

Source: Moreno-Opo et al. (2013)

4. Methodology

4.1. Study area and historical background

We studied communities adjacent to two national parks located in the wetlands of the Senegal River Delta in the semi-arid Sahelian region of West Africa (See Fig. 2). These wetlands are crucial to the biodiversity and livelihoods of several countries, namely Mauritania, Senegal, Mali, and Guinea. Every year, millions of African and Eurasian birds from over 120 species migrate to the region from October to May (Direction des Parc Nationaux [DPN], 2017). The resources of the river also provide important social and economic values for local communities and the national government. For instance, the livelihoods of about half the population of the region depend on freshwater fisheries (Magrin and Seck, 2009). Since the mid 1980s, the area has also been at the center of the Senegalese government plan to increase rice production through large-scale irrigation development. This prompted the construction of two dams that were completed in 1989. The dams have had devastating effects on the ecosystem of the Senegal River (Ndiaye, 2001). Environmentalists have blamed the dams for ecological changes leading to declining fish stocks and consequently decreasing bird populations (Ndiaye, 2001; Borrini-Feyerabend and Hamerlynck, 2011). The declining fish stocks combined with invasive aquatic vegetation have significantly deteriorated the livelihoods of fishing households (Magrin and Seck, 2009; Ministère de l'Environnement et du Développement Durable [MEDD], 2013).

As a result, multiple conservation areas were created in the region to protect the important population of migratory birds, maintain a steady fish stock, and restore the wetlands (IUCN, 1994). In 2005, all these areas became part of the Transboundary Biosphere Reserve of the Senegal River Delta, (see Fig. 2). The reserve covers 600,000 ha of ecosystems (terrestrial, lake, river, estuarine and marine-coastal) of great social, economic and ecological values shared between Mauritania and Senegal. The two largest protected areas of the reserve are Djoudj National Bird Park in Senegal and Diawling National Park in Mauritania. Djoudj was classified as a Ramsar site in 1977 and inscribed in the list of UNESCO World Heritage site in 1981 (DPN, 2017). Today, the reserve faces significant human-related threats, including an increase in subsistence activities such as fishing and herding (Borrini-Feyerabend and Hamerlynck, 2011; MEDD, 2013).

For this study, we selected two villages: *Diadieme*, located outside of Djoudj National Bird Park (Djoudj hereafter) in Senegal, and *Zire*, located inside of Diawling National Park (Diawling hereafter) in Mauritania. The black Moors make up the predominant ethnic group in both communities, followed by the Wolof who settled in the region more recently. These two ethnic groups control fishing and agricultural activities in the region (Fall et al., 2003; MEDD, 2013). These communities were selected because they have both been primary targets of LCPs led by international NGOs and both have the largest number of fishing households of all communities associated with the parks. Although the contexts of each village are similar in nearly all geographical and cultural aspects, the LCPs differ substantially for each of them. In Diadieme, program managers promoted tourism activities as an alternative source of revenue. In Zire, managers focused on enhancing traditional livelihood strategies, specifically, the combination of fishing and farming among households.

Table 1
Overview of data collection.

Data collection instrument	Information collected
Semi-structured interviews with fishing households: <ul style="list-style-type: none"> ● Diadieme, Senegal (n = 44; ~113 households in village) ● Zire, Mauritania (n = 40; ~90 households in village) 	<ul style="list-style-type: none"> ● Baseline socio-economic household information (e.g. sources of income, fishing and farming revenues, household assets) ● Livelihood strategies in response to vulnerability context (e.g. seasonal occupations, use of income) ● Perceived impacts of LCP on their livelihoods ● Perceptions towards park and park officials ● Challenges parks are facing ● Relations with local communities ● Perceived impacts of LCPs on the conservation ● Social interactions ● Relations between community members and park officials ● History of parks ● Integrated management plans ● Social and environmental regional context
Unstructured interviews with park officials (n = 7) <ul style="list-style-type: none"> ● Djoudj National Bird Park, Senegal: n = 4 ● Diawling National Park, Mauritania: n = 3 	
Participant observation	
Secondary data	

4.2. Data collection and analysis

To explore differences and compare conservation and development outcomes in both communities, this study used qualitative data coupled with some quantitative descriptive data collected over a period of 9 months from 2014 to 2015. The data consisted of semi-structured interviews, participant observation, and secondary data sources (e.g. technical reports and park records). [Table 1](#) provides an overview of the data collection methods, including what information was collected from each of these instruments. The semi-structured interviews were conducted with fishing households, 44 in Diadieme and, 40 in Zire, therefore representing respectively 38% and 44% of the total number of households in each village. These households were selected through a snowball sampling, whereby informants are asked to identify other potential participants. This sampling technique was the most convenient given that a source where we could select participants from was not available. Additionally, referrals from other community members helped establish trust between the first author and the participant ([Noy, 2008](#)). We targeted fishing households since the focus of this study was on fishermen and their use of resources in the park. At the start of each interview we gathered some baseline information about their livelihood activities, income sources, productive assets (e.g. livestock, farm land, fishing equipment) and farming revenues (if applicable). Collecting accurate data on income from fishing and ecotourism activities was challenging, as interviewees were only able or willing to provide ranges. This was followed by open ended questions to gather information on their livelihood strategies, the perceived outcomes of the projects on their livelihoods, and their relations with park officials.

We also conducted open ended interviews with park officials (n = 4 at Djoudj and n = 3 at Diawling) to gather information about their relations with local communities and whether and how the LCPs help conserve resources in the park. The park officials included the directors and guards who were available at the time. The secondary data included technical reports from NGOs and government agencies, and park records, which we used to gather information on the nature and impacts of the LCPs. Both interviews with officials and park records provided information on how fishermen use resources in the park as a measure of conservation outcomes. The field notes from participant observations served to evaluate the relationships between officials and villagers and corroborate local's and park officials' responses.

Most interviews were conducted by the main author in Wolof (the main local language), or in Moorish (spoken by the Moors) with the help of a local translator who was recruited from the village. The translation happened from Moorish to Wolof. The main author is fluent in French and Wolof and interviews in Wolof were transcribed to English. Those in French were transcribed in French and translated to English. During the data collection phase, the main author established residence and split her time between both communities, which allowed her to engage in participant observation. She participated in meetings between villagers and park officials, followed guards on patrols, and often visited the fishermen's sites of landing and their farming parcels. She recorded field notes to capture social interactions and daily activities, which we use in this study to understand the relationship between park officials and villagers. Our assessment relies on locals' and park officials' perceptions as evidence of outcomes of LCPs on their livelihoods, conservation goals and park-community relations. Perceptions can provide important insights into the social impacts and ecological outcomes of conservation, and eventually inform the course of action to improve programs ([Bennett, 2016](#)). Furthermore, positive perceptions of conservation programs ensure the support of local people thus enabling their long-term success ([Bennett, 2016](#); [Baffoe and Matsuda, 2018](#)). To complement our analysis, we collected secondary data from technical reports and governmental documents, which we use to describe the history of the parks, the study region and the local and broader park management regime.

The data were analyzed through a directed content-analysis approach ([Hsieh and Shannon, 2005](#)), which allowed the analysis and interpretation of data guided by the concepts under study (i.e. household strategies and priorities, conservation behaviors, local interest in projects, park-community relations). Using this approach, the concepts under study were used to guide the initial coding. However, during the data analysis, the researcher allowed underlying themes to emerge from the data for a deeper analysis of these concepts ([Hsieh and Shannon, 2005](#)). The qualitative data were analyzed using basic excel functions such as averages and percentage. The frequencies reported in percentage were obtained by counting the number of times a theme or observation was made during the interviews. We used reflexivity to ensure trustworthiness was achieved ([Guba and Lincoln, 1989](#)). Reflexivity was achieved by

contrasting the sub-themes with field notes from participant observation and informal conversations with villagers.

5. Findings

5.1. Livelihood strategies in response to vulnerability context

In the western region of the Senegal River Delta, where both parks are located, close to 25,000 households are involved in fisheries as a primary source of income (Union Economique et Monétaire Ouest Africaine [UEMOA], 2013). Fishing-based livelihoods in this region face several sources of vulnerability, including a continuing declining capture rates and seasonal resource fluctuations (UEMOA, 2013). Respondents noted the decline in fish stocks and capture rates over the past few decades – primarily due to the construction of two large dams (Ndiaye, 2001; Fall et al., 2003) - as a major issue that has led them to change their livelihood practices over the years. In the early 1990s, fishing households started to engage in agricultural activities to supplement their income from fishing activities. In Senegal, national agricultural policies favored the production of rice in that region which led *Diadieme* to engage in rain-fed rice production. However, sometime around 2005 villagers started market gardening, without any support from external organizations (personal communication). In Zire, market gardening has been practiced for over two decades, but started receiving external support through the LCPs in 2007.

In the past decade, however, market gardening has surpassed rice-production as a complementary activity for fishing households in both communities (Touyer, 2012). Apart from the increasing risks associated with the production of rice (i.e. declining precipitation rates, unfavorable agricultural policies), fishermen indicated two other major reasons for their growing interests in market gardening. First, the fact that gardening has now become a viable and lucrative venture. Second, the production and harvest seasons of major garden commodities (i.e. onions and sweet potatoes) coincide with the low fishing season, when economic return and catch rates are at their lowest level and vulnerability to food and income insecurity is high (May–August). They also come when millet and rice crops, which are typically harvested four to six months earlier, are exhausted or too expensive.

Market gardening plays a critical role in helping fishing household's cope and adapt to seasonality. Of all households interviewed, 84% in *Diadieme* and 77% in Zire reported using their gardening income to purchase a food supply that could last them for 2–3 months into the low fishing season. Whatever money they had left was used to either pay their debts, buy materials for building their homes, or purchase goats that served as a form of savings.

A fisherman's wife in Mauritania made the following remark, illustrating the embeddedness of their livelihood choices into the local social-ecological system: "You see God's work? God did that our onions and turnips are ready when there are no more fish in the lake." Therefore, market gardening is well integrated into fishing livelihoods, allowing households to balance both activities while meeting their needs for food and income throughout the year. It is a livelihood choice that represents a direct response to changes and sources of vulnerability within their social-ecological systems (i.e. Declining capture rates, seasonal fluctuations of resources, decline in rice production, and increase in market garden profitability). Case study findings also show that in Zire, fishing activities decrease during the low season, a time when fishermen tend to their gardens allowing fish stocks to recover. This recovery period reveals an inherent conservation benefit to this livelihood strategy. Therefore, an effective mix of fishing and market gardening could lead to sustainable livelihoods that are beneficial for households and fishing resources.

Program managers in Mauritania chose to enhance this pre-existing fishing-farming mixed livelihood system. However, in

Table 2

Overview of management system and LCPs.

	Nature of LCP	Management policies	Role of local institutions
Djoudj – Senegal/ Village of <i>Diadieme</i>	<p><i>Alternative Livelihood</i></p> <ul style="list-style-type: none"> ● Tourism-based occupations as alternative revenue generating activities 	<ul style="list-style-type: none"> ● Government owns and manages resources ● No community rights to access resources ● Limited participation of local communities in decision-making process 	<ul style="list-style-type: none"> ● Paramilitary park officials: <ul style="list-style-type: none"> ○ Resource management and monitoring ● Committee of village chiefs: <ul style="list-style-type: none"> ○ Conflict resolution ○ Advocacy for local communities ● Eco-guards: <ul style="list-style-type: none"> ○ Liaison between communities and park ○ Voluntarily participate in awareness campaigns for the park
Diawling – Mauritania/ Village of Zire	<p><i>Local livelihood strategies</i></p> <ul style="list-style-type: none"> ● Enhance pre-existing fishing-farming mixed livelihood system ● Provide technical and financial support for endogenous economic activities for both men and women 	<ul style="list-style-type: none"> ● Resources are co-managed between government and communities ● Communities have concession rights to resources ● Communities participate in resource monitoring 	<ul style="list-style-type: none"> ● Park officials: <ul style="list-style-type: none"> ○ Shared responsibility of resource management and monitoring ○ Provide technical support for household economic activities ● Fishermen cooperative: <ul style="list-style-type: none"> ○ Shared responsibility of resource management and monitoring ○ Improve livelihoods of households

Senegal, LCP managers implemented ecotourism as an alternative source of income for fishing households. The ensuing case studies demonstrate how the consequences of these management decisions interacted with other aspects of the SLF to produce different results. Table 2 presents an overview of the management style of each protected area to enhance our understanding of each case.

5.2. Case 1: Promoting alternative livelihoods in a restrictive management regime, Djoudj National Bird Park, Senegal

Established in 1971, Djoudj implemented its first integrated management plan in 1994. The management plan was developed and executed with the support of the International Union for Conservation of Nature (IUCN) and grounded Djoudj into the wave of participatory management approaches that were being implemented across Senegal. Djoudj's first integrated management plan included an institutional restructuring at the local level and a social and economic development program for the seven communities whose access to livelihood resources were curtailed after the park was established. It created an advisory board made up of village chiefs and a group of 35 "ecoguards" from these affected communities. The committee of local chief represents the interests of villagers in the decision-making process. The ecoguards are volunteers who serve as a liaison between park officials and villagers and undertake events to raise awareness about the importance of the park and its resources. Program managers viewed this change as creating a space for local communities to participate in the management of the park (α, 1994). However, current ownership and management authority of resources within the protected area ultimately remain in the hands of the government and the conservation policies at the local level are executed by paramilitary park officials. Moreover, communities still don't have access to fishing resources inside the park, as fishing and other extractive activities within protected boundaries are strictly prohibited.

Because fishing activities in the park have been suppressed, IUCN program managers implemented a LCP to compensate local communities by providing them alternative sources of livelihood. Ecotourism has been central to the development component of the plan since it was first implemented in 1994. The underlying assumptions were that – with evident tourism-derived social and economic benefits - local people would view the park in a more positive light and would invest less time and resources on extractive activities. The LCP efforts focused on Diadieme because it was the second largest village outside of Djoudj and the one with most fishing households (DNP, 2017). Although most households in Diadieme have historically combined fishing and farming on a seasonal basis to reduce their vulnerability to resource fluctuations, local conservationists opted to introduce tourism as an alternative source of livelihood to help reduce illicit fishing activities. IUCN built a tourist lodge in Diadieme the year the first integrated management plan was implemented. This project was designed to generate alternative sources of income and help villagers to improve their livelihoods.

5.2.1. Livelihood outcomes

The tourism project was supposed to improve local livelihoods in two ways. First, profits from the lodge would be deposited in the village bank and reinvested to improve the local school, community health center, the communal water pump and to establish a micro-credit fund for local households (IUCN, 1994; DNP, 2017). Second, villagers could receive income through formal employment in the ecotourism project. However, only 6% observed that tourism had a positive impact on their livelihoods. There were various factors that affected this low number, including minimal ecotourism revenues, and conflicts with traditional livelihoods due to seasonality and cultural identity.

From 2007 to 2012, revenues from the lodge fell from FCFA¹ 6.174 million to FCFA 1.280 in 2012, an 80% decrease. In 2013, there was a slight increase to FCFA 2.147 million, but the revenues remain relatively low. As a result, the lodge has not contributed to improving local livelihoods as it was initially envisioned. Respondents recounted that at the start of the project, households received a micro-credit loan from the village bank, which they invested into income generating activities such as petty trade and market gardening. However, beyond those first two years, they can't recall another time when any money from the lodge was deposited into the village bank again, and thus has not served to provide social services to improve locals' wellbeing Principle among the issues that the lodge revenue was supposed to improve was access to potable water. The water pump was not functioning during the entire time that the data were collected. A villager lamented the fact that this issue has still not been resolved:

"The water pump breaks down all the time. And when this happens, our women have to walk to fetch water to the next functioning pump which can be up to five km from here, or else you have to buy water from at FCFA 100 for 20L."

A fisherman's wife who used to work as a cook but had to stop to tend to the family's market garden summed up how she perceived the impacts of the LCP since it began in 1994:

"It's been twenty years since it started and all this time I have seen so many technical agents come and go and people like you asking us questions about the project and how it benefits us. But nothing! We are still here in the same misery and we are so tired!"

In terms of receiving income through formal employment in ecotourism, seasonality was a major barrier. The tourism season happened during the months of November through March, when there is a high abundance of migratory birds. During that time, economic returns from fishing are at their highest and can go up to FCFA 30,000 per day compared to FCFA 15,000 on a good day as a tour guide. Therefore, fishermen felt that it made little economic sense to give up fishing to participate in ecotourism. Even though fishing revenues are highly variable and not guaranteed every day, they could provide fish for their family meals even if it meant not earning any money on that day:

¹ At the time data of data collection 2014–2015, the West African Francs (FCFA) exchange rate was at an average of \$1 = FCFA 550.

“Sometimes you go out and you have nothing. Sometimes, you make FCFA 30,000 or if you are lucky and you catch a grouper, you can even make FCFA 50,000. But at least even if you don’t make any money, you still have fish to feed your family. You must fish almost every day. Because in this life, if you don’t fish today, you won’t eat today.”

Ecotourism conflicted with traditional livelihoods, not just because of seasonality, but also from a cultural standpoint. One referred to the project as an “empty bag”, a Wolof expression to indicate a lack of substance. By affirming their identity through expressions like “we are fishermen” or “our ancestors were fishermen”, villagers often referred to fishing as an activity that their ancestors gave them and that will always part of their life. A fisherman noted “Fishing is what I will always know best, because for a long time, that’s all our ancestors had”. Another described the great satisfaction he receives from just being on the lake in the earliest hours of the day, something he likely would not receive from another activity. Alternative activities are unlikely to override these historical and cultural forces.

We counted only 3 former fishermen employed in the tourism project at the time. The ones mainly benefitting from these jobs are the local elites. For example, five of the seven tour guides in Diadieme were relatives of the village chief, including his son. The three men who managed the lodge, the tour guide services, and the tourist shop were also perceived to be among the local elites. The local elites usually possessed large farming parcels, had their own small businesses such as local shops, and traded goods. Therefore, they tended to depend less on fishing activities than poorer households. Other ways fishing households received income from tourism was by selling their catch to the lodge restaurant or having one woman in the family work. In 2015, there were only 6 women employed in tourism as cook and housekeeper and earned FCFA 25,000 a month.

Finally, when probed about what would most likely improve their wellbeing and potentially reduce fishing activities, a fisherman responded:

“Ecotourism gave us nothing. I am not going to waste my time. Let me continue fishing, at least I know I can feed my family with that [...] If they really wanted to help us, they would help us with our gardens.”

When asked how they perceived the project, other villagers in Diadieme echoed similar sentiments. In 2015, the average market garden revenue per household was FCFA 768,000. However, not every household has the resources to participate every year, and only 55% were able to exploit their garden parcel that year. Thus, villagers believe that assisting them in their garden production to improve their livelihoods would be more impactful than the ecotourism project.

5.2.2. Conservation outcomes

In terms of conservation outcomes, it was expected that the ecotourism project would alleviate illicit fishing activities inside the park, by providing villagers with an alternative income source. However, the findings tell a different story, as illicit fishing activities inside the park remains a major challenge. Guards are required to record each incident but often neglect to do so. Therefore, the number of illicit fishing activities reported underestimates the scale of the issue. Nonetheless, we were able to extrapolate some data from the incident book to give us an idea of the characteristics of illegal fishing activities. Between March 2012 and March 2013, there were 28 incidents of illegal fishing activities recorded in the book, of which 78% occurred at the peak of the tourism season from November to February, illegal fishing in off-season is also frequent but there aren’t have enough guards to patrol the park during that period. Evidence of fishing activities during the off-season include fish nets left in the water with sizes smaller than the legally allowed one, and trash from camp sites which the first author witnessed every time she accompanied guards on patrol. When asked if villagers respected seasonal regulations, a park guard sternly noted: “These people don’t understand what ‘biological rest’² is. They just fish whenever they want at any place. We keep arresting them. [...] They’re spoiling the river!”. The director lamented the amount of illegal fishing activities that occur in the park despite the alternative income sources that villagers have:

“I don’t understand. They have everything they need to survive. They have tourism activities, they have farming, they can also fish in the buffer zone. If I had all that, I wouldn’t go through that trouble. But no, they continue to fish in the park. This is unbelievable.”

Another expected outcome from ecotourism, was improving the relationship between park officials and villagers. However, the relationships between local communities and park officials remain contentious. Conflicts between them are still common and often turn violent. For instance, a series of altercations that occurred between 2008 and 2010 resulted in the death of two fishermen (personal communication and confirmed in Segalini, 2012). The main author also witnessed verbal confrontation between park guards and villagers. A villager explains:

“The park people think they own these resources. These resources belong to our ancestors and we were here long before they were [...]. They tell us we can’t fish but they don’t give us anything else to hold on to [...]. They walk around the village with their military uniforms and try to intimidate us.”

In this case, the top-down and para-military approach of park management coupled with the alternative livelihood-focused development strategy failed to generate local support or create the conditions that would enhance locals’ attitude towards the park and participation in the project. It appeared that local support was limited because locals perceived that the project had very little

² Biological rest or “repos biologique” in French, refers to an ecologically sensitive period when fish species migrate to reproduce leaving behind mostly juvenile fish (Pandare and Sanogo, 1996).

impacts on their livelihoods.

5.3. Case 2: Enhancing pre-existing livelihood strategies in a co-management regime in Diawling National Park, Mauritania

Established in 1991, Diawling implemented its first integrated management plan in 1993. Importantly, communities were not expelled from the protected boundaries. In fact, around eight villages, including Zire, reside inside the park. Local communities contributed their knowledge and shared their vision of the park during the preparation phase of the plan. The initial objectives included the restoration of local resources and the development of the communities; various small-scale projects (e.g. mangrove restoration, reforestation, community tree nurseries and micro-credit schemes) were consequently implemented (MEDD, 2013).

From 2001, a national reform took place around the country requiring the decentralization of natural resource management. The government transferred partial management authority and, on certain instances, concession rights to local communities through their community-based organizations. This required policy makers and development agencies to design strategies embedded in the decentralization plan that would concurrently address these issues (Bonnet, 2011). It was against this institutional backdrop that Diawling started decentralizing its natural resources. Fisheries were central to this policy reform. With the technical support of two international NGOs, a co-management system was implemented in which Diawling and the local communities shared the management authority of its resources. The institutionalization of pre-existing village cooperatives, the expansion of their authority, and the formation of a village concession are all articulations of this new co-management system (MEDD, 2013).

Today, each village has its own fishery concession within the park. The concessions are jointly managed between the park administrators and the local fishermen cooperatives. The fisherman must be a member of the village and join the cooperative to fish in the village concession. The chief of each village heads its respective fishers' cooperative. Cooperative members lend their support to the park guards by taking turns in monitoring and reporting daily fishing activities including the number of fishermen per day and the average amount of catch. Resource managers, in turn, use this information to monitor closely the rate of exploitation in the fisheries.

The role of the cooperatives expands beyond the management of the resources in their concessions and support fishermen livelihood strategies. It is in this regard that the LCP intervened to enhance livelihoods through the cooperatives. In fact, the most recent DNP management plan, contained this clearly stated objective for a strategy they termed eco-development: *“strengthening traditional activities of local communities that are compatible with the conservation-restoration objectives and develop emerging economic activities”* (MEDD, 2013 p.40). Most of these efforts have focused on the village of Zire.

Zire is the second largest village in Diawling. It is also the village where local livelihoods are the most connected to the park resources (MEDD, 2013). Like most households in the region, the livelihood strategies in Zire also consists of fishing and farming. Market gardening activities are carried inside the park. Thus, project managers at Diawling have focused on building upon this livelihood strategy to push their conservation and development plan. In doing so, they have taken a holistic approach by focusing on both men and women in the villages and providing institutional, technical and financial support.

5.3.1. Livelihood outcomes

In Zire, the objective of their LCP was to lend their support livelihood strategies that households defined themselves to improve their wellbeing and had an inherent conservation benefit. In other words, rather than seeking to replace their livelihoods, the project sought to provide them with resources to effectively alleviate their food and income insecurity in the context of seasonal resource fluctuation. As such, the fishermen cooperative which is supported through the project is key to providing those resources. The cooperative funds itself primarily through the profits generated from a village store established by a Spanish NGO under the LCP umbrella. The store sells mostly household goods and supplies for fishing and farming. Furthermore, the cooperative supports gardening activities during the low fishing season by providing households with farming products such as seeds, fertilizers, and tools that are needed for farming operations through a credit system. Because Zire and their market garden parcels are located inside the park, households are not allowed to use pesticides, which is constantly monitored by park officials.

Around 35% reported to have benefitted from the cooperative to finance their livelihood activities. Only 3 people mentioned that they did not think the cooperative was helpful. While the rest explained that they did not want to depend on the cooperative and used their livestock and income from fishing to finance their garden activities. Thus, while the cooperative's financial services do not cover most households in the communities, they have been effective at serving households in need of support. The Spanish NGO's report in 2013 noted a 30% increase in the garden area exploited since the project started (Touyer, 2012). In 2015, the average garden revenues per household in Zire was 1,377,000 CFA, as opposed to 768,440 CFA in Diadieme.

Income generation among women plays a critical role in building household resilience to resource fluctuation, and often influences fishermen decision to fish or not fish during the low fishing season. The following two quotes provide a good illustration to this argument:

“This year I have been sick, so I couldn't farm. Thank God my wife is working and helping with things we need for the house. I have to rest and wait until the lake is good again.”

“I'm the only one working in this household. If I stop fishing nobody will eat.”

A cooperative for the women in the village was also formed with the technical support of park managers and the Spanish NGO. Members of the fishermen cooperative sell a large portion of their catch to the members of the women's cooperative, who then process and sell it to larger markets. As a result, joining the association was a way to guarantee them a steady supply of fish. Women reported gaining around 10,000 CFA per day from selling their smoked fish.

Additionally, park managers monitor economic activities that are emerging and have the potential to generate substantial amount of revenue, particularly during the low fishing season. For example, the harvest and sale of the acacia clove (touted for its health benefits) by women is rapidly becoming a lucrative business. Consequently, in the past two years, park managers are trying to partner with other NGOs to provide funding and technical support for women in Zire to develop more effective marketing strategies to capitalize on this emerging business. The gathering of the acacia clove and salt by women is permitted inside the park with the close monitoring by park officials. Each woman can collect 25–50 kg of acacia clove per month, which can generate up to FCFA 10,000 per month.

Additionally, the fact that program managers in Mauritania focused on traditional livelihoods rather than introducing alternative activities (e.g., tourism) helped legitimize these projects among villagers. In a way, such an approach made more sense in the eyes of the people of Zire because these projects were congruent with their reality and way of life. As a fisherman noted with a sense of pride:

“I am a fisherman just like my ancestors were. But I am also a great farmer. I grow all kinds of crops like turnips, okra, onions [...]. You can never take that away from me.”

5.3.2. Conservation outcomes

The LCP project was not designed to divert villagers from fishing activities to preserve park resources. Instead, the rationale was to reinforce the conservation benefit inherent to pre-existing livelihood strategies. In this case, the switch between fishing and farming on a seasonal basis not only provides a steady stream of food and income to households, but also gives an opportunity for fish stocks to recover while fishermen tend to and generate income from their gardens. Therefore, their focus was on complying with seasonal fishing regulations, which both park guards and members of the cooperatives monitored.

The park report shows that the average number of fishermen at the landing site for Zire declined by 88% from October 2014 (45 fishermen/day) to April 2015 (5 fishermen/day), signaling a compliance to seasonal regulations. There was also a common understanding among fishermen who were interviewed that, from March through July, no more than 10 villagers continued fishing for commercial reasons. Furthermore, it was understood that these fishers could only sell their catch in the village and not to fish traders. The village chief and park director noted that this was a measure to control the amount of fish extracted during an ecologically sensitive period, thereby ensuring a decent supply of fish for villagers. The consistency in responses from fishermen indicated a high level of consensus and understanding. The park director believed that the fact that most households in Zire (76%) engaged in market gardening during the low fishing season created the right economic conditions to respect rules regarding seasonality. He explains:

“Fishermen in Zire know the seasons for fishing and farming. When the fish start to diminish they turn to farming. They don’t go somewhere else to fish. The seasons are very clear for them and it makes our job easier.”

Fostering a positive relationship between park officials and local communities to collaboratively achieve conservation outcomes is also an important goal of the management plan and LCP. Through the household interviews and observations, there was evidence suggesting an enhanced co-existence between the local communities and the protected area. A fisherman made the following remark about their relationship with the park officials, which was echoed in other interviews:

“You know, we don’t have any problem with them. When we need something, we go to them. Really, it’s been good, Thank God.”

Furthermore, the meetings between park officials and villagers were cordial. The extensive greetings, laughs and sharing of tea during the meetings epitomized the amicable relationship between the park and the communities. Additionally, the interactions between fishermen and guards on patrol appeared less confrontational than in Senegal. The park manager insisted that the guards reduce coercive apprehension tactics and preferred to turn poachers over to village chiefs, helping maintain a positive relationship based on mutual trust and enforcement. All these instances highlight a commitment to cooperation between villagers and park officials.

Overall, the focus on strengthening the mixed fishing-farming livelihood strategy, rather than seeking to substitute it, aligned well with the needs and priorities of households in Zire. The project increased the community’s capacity to increase garden production by providing them with financial support through the cooperative and supporting women in their own activities. Thus, the LCP in Zire enhance the sustainability of local livelihoods. This approach was accompanied by a co-management system that together created the right socio-economic conditions for villagers to meet their household needs, trust park officials and respect the regulations regarding fishing activities (and associated conservation efforts) in the park.

6. Discussions

In recent years, alternative occupations have come under significant scrutiny as mechanism to achieve conservation and development goals (Agrawal and Redford, 2006; Roe et al., 2015; Wright et al., 2016). At the same time, traditional livelihoods are still considered to be at odds with conservation goals (McCabe, 2003; Terborgh, 2004; Lele et al., 2010). In this paper we juxtaposed an alternative occupation (i.e. ecotourism) and traditional livelihoods within conservation and development programs allowing us to draw comparison between a strategy that is popular despite elusive results, and another that is unconventional but with great potential. In places where alternative occupations like tourism have not succeeded in delivering positive conservation and development goals, this paper presents an alternative strategy that is rooted in the social and environmental realities of local communities.

Program managers in Diadieme, designed the LCP under the assumptions that tourism activities would provide an alternative source of income for fishing households, thereby allowing them to spend less time and effort on fishing. Yet, our findings show that

fishermen did not substitute fishing with tourism activities and past studies reveal similar a picture. Carter and Garaway (2014) analyzed how tourism on the Kenyan coast reduce fishing pressure. They found no evidence of systematic shift from fishing to tourism, citing several influencing factors including the fact that fishing was more lucrative, and cultural preference for being self-employed. In Diadieme, we found the same economic reason, coupled with noneconomic factors such as cultural identity as influencing fishermen's decision to not participate in ecotourism activities. For alternatives occupations other than tourism, Hill et al. (2012), found that seaweed farming in Central Philippines was not as effective as a direct substitution to fishing. Therefore, our case study in Diadieme adds to the cautionary literature on the prospects for alternative livelihoods for reducing pressure on protected resources by systematically replacing resource-dependent activities.

Ecotourism in Diadieme also didn't improve the wellbeing of local households by failing to provide basic social services (i.e. potable water, improved school facilities and health center) as originally planned. This is critical in terms of improving the perception of locals towards the project and consequently the park. Mbaiwa and Stronza (2010) provide evidence of the linkage between local wellbeing and perceptions of conservation program in Botswana, where tourism activities provided social services like water supply systems, transportation, scholarship and payment of funeral expenses. As a result, locals attitudes towards tourism and conservation became positive. Therefore, we could argue that if the ecotourism project in Diadieme had improved locals' wellbeing by providing those social services, it could have positively changed villagers' perceptions towards the LCP and helped them see the value in protecting resources in the park.

Rather than forcibly replacing them with an alternative occupation, Wright et al. (2016) suggest enhancing pre-existing livelihood strategies that have an inherent conservation benefit. Whether or not these strategies like seasonal livelihood diversification presented in this paper (i.e. mixed fishing-farming) are sustainable, research shows that they are an important attribute of rural livelihoods helping them cope and adapt to social and environmental changes (Béné et al., 2003; Davies, 2016). Therefore, understanding and addressing the factors that support or constrain its sustainability, both socially and environmentally, could be more productive for future conservation and development projects. Allison and Horemans (2006) note the importance of assisting people's existing livelihood strategies by improving access to capital assets and strengthening resource use rights. A major difference between the two projects we studied lies on how they each enhance access to capitals to build sustainable livelihoods. In Zire, unlike Diadieme, the LCP intervened by improving access to capital needed for their livelihood diversification. Specifically, in addition to policies that allowed access to resources in the park, they provided a mechanism for formal credit and enhanced social capital with membership to an active and well-organized cooperative

Investing in pre-existing livelihood strategies also aligns the LCP with household needs and priorities as dictated by local vulnerability contexts. This is a critical aspect of the project in Mauritania but was absent in Senegal. Furthermore, it is important to acknowledge the critical role that institutional structures play with respect to LCP design and implementation. Each of these influential factors is discussed in more detail below.

6.1. Adherence to needs and priorities dictated by vulnerability context

The need for food and income security of the household is greatly influenced by changes within socio-ecological systems. Berkes and Ross (2013) argue that for many centuries, indigenous communities adapted their livelihood strategies to reduce their vulnerability to these changes. Like most rural households, informants noted a priority to maintain a steady stream of food and income to get through the low fishing season, when fish stocks and economic returns decline. The adoption of market gardening as a seasonal activity in both communities is a result of a combination of changes in their social-ecological systems (i.e. fishing resource fluctuations, declining rice production, increase in gardening profitability). By focusing on the fishing-farming livelihood strategy, the project in Zire responded to a local need for food and income security that is influenced by the local socio-ecological system. As such, each livelihood activity serves an important livelihood function. For households in Zire and Diadieme, fishing isn't just a source of income, but importantly a safety net to ensure a daily stream of fish for their family, especially when other sources of protein are not accessible or too expensive. Scholars have supported the critical role of small-scale fisheries in providing a safety net to the very poor both in terms of income and food security (Kent, 1997; Béné et al., 2003; Belhabib et al., 2015).

Similarly, small fruit and vegetable gardens meant for household consumption have always played an important role for rural households in Africa (McCabe, 2003). In many cases market gardens today are an extension of those and serve both for income and household consumption (Wooten, 2003). Therefore, when determining the most appropriate alternative occupations, project managers must consider these critical livelihood functions that traditional activities serve for households. Food security remains one of the most important factor driving locals' usage of protected resources (van Vliet et al., 2012). Thus, strengthening pre-existing mechanisms to reduce food insecurity like the LCP in Mauritania can reduce dependence on protected resources.

6.2. Protected area management regime

Consideration of the different management regime present at our case study sites revealed a follow up question in the debate over the most effective LCP project: to what extent are outcomes explained by these management regimes versus the actual LCPs? Comprehensively answering this question requires more research, but there is information in the literature that provides some insight. For example, several studies suggest that LCPs should be embedded within institutional structures that increase their likelihood of success (Gezon, 1997; Sievanen et al., 2005; Brugère et al., 2008). Our case studies show that LCPs cannot be separated from the protected area management regime within which they are implemented. The coupling of these livelihoods and institutions together condition how locals may react to conservation policies (Matera, 2016). Furthermore, a co-management regime provides

empowering forms of community participation that can lead to social foundations for conservation (Stronza, 2007).

Alternative livelihood projects can be successful in places that adopt a co-management approach thereby inciting greater participation of locals in the decision-making process (Stronza and Pegas, 2008; Mbaiwa and Stronza, 2010). However, these approaches are not the norm. The wave of community-based natural resource management programs taking place in many African countries (Child, 1996; Ribot, 2004; Fabricius et al., 2013) signals a consensus among conservationists that institutional reforms are essential for effective LCPs. Berkes and Adekhar (2006) provide further evidence of the importance of co-management approaches for the success of LCPs by reviewing ten successful cases of community-based enterprises that seek to reduce poverty and conserve biodiversity. They identified some of the critical characteristics of these LCPs, including community control of land and resources and protection of culture. Our case studies demonstrate how these different institutional structures can facilitate or obstruct LCP outcomes.

7. Conclusions

The results of our case studies, viewed through the lens of the SLF (Wright et al., 2016), revealed that in places where alternative occupations have failed, LCPs focused on pre-existing livelihood strategies can be a more effective way to reduce vulnerability and foster livelihood sustainability, promote conservation-oriented resource use, and improve the relations between protected area managers and local communities. We found that LCPs are more likely to succeed when they adhere to local needs and priorities as defined by local socio-ecological systems and evolve within appropriate and inclusive institutional structures. Failure to consider both livelihoods and the context in which they emerge may be detrimental to both conservation and development goals. Perceptions were used in this paper as a starting point to open the discussion on the value of local livelihood strategies in integrative conservation approaches. To strengthen scholarship on this topic, future studies should provide more analysis on livelihood and conservation outcomes that move beyond perceptions.

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