ADAPTING SUSTAINABLE DEVELOPMENT POLICIES TO SUPPORT LIVELIHOOD STRATEGIES OF DIVERSE TRADITIONAL AMAZONIAN POPULATIONS IN BOLIVIA, BRAZIL AND ECUADOR

By

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A generous and loving friend. An inspiration in community forestry in the Amazon.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>4</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>11</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>12</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>13</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1 INTRODUCTION TO THE DISSERTATION</td>
<td>15</td>
</tr>
<tr>
<td>1.1 Theoretical Framework and Contextualization of the Problem</td>
<td>15</td>
</tr>
<tr>
<td>1.1.1 Forests and Livelihoods</td>
<td>15</td>
</tr>
<tr>
<td>1.1.2 The Economic Contribution of Forest Resources in Rural Settings</td>
<td>15</td>
</tr>
<tr>
<td>1.1.3 Forests Helping People Survive</td>
<td>16</td>
</tr>
<tr>
<td>1.1.4 The Forest-poverty Links</td>
<td>17</td>
</tr>
<tr>
<td>1.1.5 Forests, Peoples and Governments</td>
<td>17</td>
</tr>
<tr>
<td>1.1.6 Devolution of Lands to Local Communities</td>
<td>18</td>
</tr>
<tr>
<td>1.1.7 Market-based Conservation Strategies</td>
<td>19</td>
</tr>
<tr>
<td>1.1.8 “Hidden” Local Knowledge Systems, Overlooked Local Institutions</td>
<td>20</td>
</tr>
<tr>
<td>1.1.9 The Damaging Effects of Top-down Centralized Policies</td>
<td>21</td>
</tr>
<tr>
<td>1.2 Dissertation Focus and Research Questions</td>
<td>22</td>
</tr>
<tr>
<td>1.3 Four Distinct Amazonian Contexts: From Colonization Histories to the Development of Livelihood Strategies</td>
<td>25</td>
</tr>
<tr>
<td>1.3.1 Northern Bolivian Amazon</td>
<td>25</td>
</tr>
<tr>
<td>1.3.2 Northern Ecuadorian Amazon</td>
<td>28</td>
</tr>
<tr>
<td>1.3.3 Amazonian Estuary Region, Brazil</td>
<td>33</td>
</tr>
<tr>
<td>1.3.4 Western Brazilian Amazon - Acre</td>
<td>39</td>
</tr>
<tr>
<td>1.3.5 Colonization Histories, Economic Cycles and Livelihood Adaptations</td>
<td>44</td>
</tr>
<tr>
<td>1.4 Organization of the Dissertation</td>
<td>46</td>
</tr>
<tr>
<td>2 FOREST CONTRIBUTIONS TO LOCAL LIVELIHOODS ACROSS FOUR AMAZONIAN CONTEXTS</td>
<td>50</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>50</td>
</tr>
<tr>
<td>2.2 Research Questions</td>
<td>54</td>
</tr>
<tr>
<td>2.2.1 What Kinds of Economic Contributions do Forests Make to Local Livelihoods across Divergent Amazonian Socio-cultural and Geopolitical Contexts?</td>
<td>54</td>
</tr>
<tr>
<td>2.2.2 To What Extent do NTFPs Contribute Economically to Livelihoods of Local Populations across the Study Regions?</td>
<td>54</td>
</tr>
<tr>
<td>2.2.3 In What Ways Were Observed Patterns of Forest Use Shaped by their Respective Biophysical and Geopolitical Contexts?</td>
<td>54</td>
</tr>
</tbody>
</table>
2.3 Methods .........................................................................................................................54
2.3.1 PEN Database ...........................................................................................................54
2.3.2 Amazonian Sample ....................................................................................................55
2.3.3 Descriptive Analyses ...............................................................................................56
2.4 Study Sites .....................................................................................................................59
2.4.1 Pando, Bolivia ..........................................................................................................59
2.4.2 Sumaco, Ecuador ......................................................................................................60
2.4.3 Abaetetuba, Brazil ...................................................................................................62
2.4.4 Acre, Brazil ..............................................................................................................64
2.5 Results ...........................................................................................................................66
2.5.1 Kinds of Economic Contributions Forests Make to Local Livelihoods ..........66
  2.5.1.1 Forest reliance in relation to other livelihood strategies .......................66
  2.5.1.2 Cash versus subsistence forest use ...........................................................67
  2.5.1.3 Safety nets, current consumption or coping with shocks ......................68
2.5.2 Patterns of Forest Use and Insights into Sustainability Patterns of Harvests.....69
  2.5.2.1 Absolute and relative income by categories of forest use .....................69
  2.5.2.2 Relative forest income shares by category of sustainability ..............70
2.6 Discussion .....................................................................................................................70
  2.6.1 What Kinds of Economic Contributions do Forests Make to Local
      Livelihoods across Divergent Amazonian Socio-cultural and Geopolitical
      Contexts? ...........................................................................................................70
  2.6.2 To What Extent do NTFPs Contribute Economically to Local Livelihoods of
      Local Populations across the Study Regions? ...................................................73
  2.6.3 In What Ways Are Observed Patterns of Forest Use Shaped by their
      Respective Biophysical and Geopolitical Contexts? ....................................75
2.7 Concluding Remarks and Policy Implications ..............................................................78

3 LOCAL MEANINGS OF FORESTS AND THE WORKINGS OF LOCAL
INSTITUTIONS ACROSS TRANSFORMED SETTINGS ..................................................88

3.1 Introduction ...................................................................................................................88
  3.1.1 The Existence of Locally Developed Systems to Manage Natural Resources ...88
  3.1.2 Definitions of Local Institutions ..........................................................................89
  3.1.3 What is Behind the Development of Local Institutions? ......................................90
  3.1.4 Dismantled Local Institutions ..............................................................................91
3.2 Research Questions: Revisiting the Workings of Local Institutions in Transformed
Settings ..........................................................................................................................92
3.3 Methods .........................................................................................................................94
  3.3.1 Study Sites ..........................................................................................................94
  3.3.2 Fieldwork: Qualitative Interviews ........................................................................94
  3.3.3 Qualitative Analyses ............................................................................................97
3.4 Results ...........................................................................................................................98
  3.4.1 Forests in Local Perspectives: More than Just a Utility ....................................98
    3.4.1.1 Forest and other local resource uses .......................................................99
    3.4.1.2 Forest culture and identity ...................................................................104
    3.4.1.3 Forest-based wellbeing and conservation interests .........................109
  3.4.2 Local Institutional Structures and Workings .........................................................116
3.4.3 The Evolving Nature of Local Institutions across Transformed Settings
   3.4.3.3 Origins of existing local institutions ...................................................120
   3.4.3.4 Hybrid local-government institutions .................................................123
   3.4.3.5 Multi-functionality of existing local institutions ................................125
   3.4.3.6 Underlying mechanisms behind local institutions ..............................127

3.5 Concluding Remarks ......................................................................................130
   3.5.1 In What Ways do People from Different Adapted and Transformed
         Amazonian Settings Perceive Themselves to Be Allied to the
         Forests? .............................................................................................130
   3.5.2 Are Any Features of Local Resource Management Institutions (LIs)
         Present across Transformed Amazonian Settings that Have
         Suffered Numerous Unfavorable Interventions from Centralized
         Governments and Economic Frontiers? ............................................133

4 TOP-DOWN VERSUS BOTTOM-UP STRATEGIES: BARRIERS TO THE
   PROSPECTS OF SUSTAINABLE LIVELIHOODS AND LOCAL SOLUTIONS
   ACROSS GEOPOLITICAL CONTEXTS ..........................................................140

4.1 Introduction ........................................................................................................140
   4.1.1 Forest Peoples’ Loss of Rights Over Land and Resources around the World...
   4.1.2 Grassroots Claims and the Resultant Devolution Policies .......................141
   4.1.3 Post Victory Challenges ..........................................................................142
   4.1.4 Top-down National and Cross-national Policies .....................................144

4.2 Research Questions ............................................................................................145
   4.2.1 Definition of Key Concepts .....................................................................147

4.4 Methods ................................................................................................................149
   4.4.1 Study Sites .................................................................................................149
   4.4.2 Qualitative Data Analysis ........................................................................152

4.5 Results ..................................................................................................................152
   4.5.1 Barriers to the Prospects of Sustainable Livelihoods (BPSLs) across
         Geopolitical Contexts .............................................................................152
      4.5.1.1 Top-down/elitist social structures ......................................................153
      4.5.1.2 Incoherent/ineffective legislation and burdensome bureaucracy ......156
      4.5.1.3 Exploitative marketing chains .........................................................159
      4.5.1.4 Barriers to the prospects of sustainable livelihoods in relation to
              historical events ..............................................................................160
   4.5.2 Local Ongoing Solutions ..........................................................................161
   4.5.3 Government Solutions ..............................................................................164
      4.5.3.1 Left oriented social policies ...............................................................165
   4.5.4 Locally Envisioned Solutions ...................................................................167

4.6 Discussion .............................................................................................................171

5 CONCLUSION...........................................................................................................183
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Annual mean income per capita ($US PPP; standard deviations in parentheses) and relative income, by site.</td>
<td>81</td>
</tr>
<tr>
<td>2-2</td>
<td>Mean annual income per capita with and without forest share and respective proportion of households below the poverty line.</td>
<td>82</td>
</tr>
<tr>
<td>2-3</td>
<td>Correlation of forest income with other income sources by site ($US PPP).</td>
<td>84</td>
</tr>
<tr>
<td>2-4</td>
<td>Absolute ($US PPP per capita) and relative income (percentages) per forest use category, by site.</td>
<td>85</td>
</tr>
<tr>
<td>2-5</td>
<td>Comparative ranking: Composition of the top ten most important forest products in each site and their respective relative contribution to the total forest income.</td>
<td>87</td>
</tr>
<tr>
<td>3-1</td>
<td>Local institution elements by research site.</td>
<td>138</td>
</tr>
<tr>
<td>4-1</td>
<td>Absolute frequencies of retrieved coded sections, related to barriers to the prospects of sustainable livelihoods, by study site.</td>
<td>177</td>
</tr>
<tr>
<td>4-2</td>
<td>Absolute frequencies of retrieved coded sections, referred to local ongoing solutions at each study site.</td>
<td>179</td>
</tr>
<tr>
<td>4-3</td>
<td>Absolute frequencies of retrieved coded sections related to government solutions by study site.</td>
<td>180</td>
</tr>
<tr>
<td>4-4</td>
<td>Absolute frequencies of retrieved coded sections related to local envisioned solutions by study site.</td>
<td>181</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Map of Amazonian research sites, South America</td>
<td>49</td>
</tr>
<tr>
<td>2-1</td>
<td>Annual per capita forest income, stratified by subsistence and cash derived income</td>
<td>82</td>
</tr>
<tr>
<td>2-2</td>
<td>Seasonal income shares: relative quarterly per capita income by livelihood activity, by site</td>
<td>83</td>
</tr>
<tr>
<td>2-3</td>
<td>Sustainability levels: absolute and relative forest derived income shares</td>
<td>86</td>
</tr>
<tr>
<td>3-1</td>
<td>Local importance of forests. Visual presentation of the frequency of mentioned themes across interviews, by study sites and in descending order of most frequent total responses</td>
<td>137</td>
</tr>
</tbody>
</table>
Community-based forest management can potentially be a sustainable development pathway in the tropics, but considerable knowledge gaps exist regarding how environmental, economic, and social policies should be designed to optimally support traditional forest-based livelihoods. This research focuses on the Amazon region, encompassing variations in biophysical, geographical and socio-cultural contexts in a trinational approach (Brazil, Bolivia and Ecuador). Through a partnership with the Center for International Forestry Research (CIFOR), I analyzed the Amazonian set of the Poverty and Environment Network (PEN) database, which consists of a global survey of tropical forests and poverty. To complement these PEN quantitative assessments, I conducted 78 interviews among traditional population groups across the study sites, where I focused on collecting qualitative data on: (1) local values of forests, (2) locally developed systems for avoiding overuse of natural resources, (3) barriers impinging the prospects of sustainable livelihoods; and (4) local visions regarding alternative policy solutions. The results show how forest peoples’ local livelihood strategies have evolved in different contexts. Across all studied Amazonian settings, forests represented the most important
livelihood strategy. In some of the study sites NTFPs (non-timber forest products) played a central economic role, representing the principal source of income. Additionally, in all regions studied, forests were relevant in terms of identity, culture, attachment and conservation interests. Local institutions were present across study regions and displayed diversified mechanisms for the improvement of livelihoods locally. Finally, this study shows how local forest dwellers deal with different institutional, political and social barriers, and how these barriers can be removed by better informed policies, to enhance sustainable development opportunities for traditional populations in the Amazon region.
1.1 Theoretical Framework and Contextualization of the Problem

1.1.1 Forests and Livelihoods

In different parts of the world, local communities have coexisted with, lived in, depended on and managed forest ecosystems. Such interactions between peoples and forests have evolved in an extensive diversity of ways, managed by a wide variety of cultures, and have endured for millennia (Charnley and Poe 2007). Peoples have been using forests in many ways and to different degrees. The roles that forests play in people’s lives include the provision of food as well as construction materials, timber, medicine, fiber, fruits, nuts, game, and a range of on-site ecological services, to spiritual meanings, cultural identities, ecological knowledge and institutions for management. Nowadays, around 500 million people live in and around the world’s forests (Arnold 1992, Cavendish 2000, White and Martin 2002), while over 1.6 billion people rely to varying degrees on forest resources (Wasiq and Ahmad 2004).

1.1.2 The Economic Contribution of Forest Resources in Rural Settings

About 15 years ago, scientists started to pay attention to the economic contributions forest products play in rural livelihoods. “Hidden harvests” and “supermarket of the wild” were terms used to represent the undisclosed diversity of uses rural people in the tropics make of non-cultivated environmental resources, including forests, information generally ignored by national and international statistics (e.g., Campbell and Luckert 2002, Cavendish 2002). Studies aiming to quantify the value of forests to local communities ranged from per hectare values (Peters, Gentry, and Mendelsohn 1989), to understanding the contribution of forests to household income portfolios. Through a methodologically meticulous study using quarterly surveys for quantifying household income in southern Zimbabwe, Cavendish (2000) found that environmental incomes
made a large contribution to rural livelihoods: 35% of average total income came from “freely-provided environmental goods” (Cavendish 2000:1997). Fisher (2004) examined the role of forests in poverty alleviation in rural Malawi, and found high levels of forest dependence: sampled households derived, on average, 30% of their income from forests. Vedeld et al. (2007) conducted a meta-analysis of 51 case studies from 17 developing countries and found an average of 22% of total household income being derived from natural forests. More recently, a thorough global comparative research project (Poverty and Environment Network [PEN]) based on standardized data collection in 24 tropical and sub-tropical developing countries confirmed that environmental income makes significant contributions to rural livelihoods, with an average of 27.5% (32.1% in Latin America, 30.1% in Sub-Sahara Africa, and 22% in Asia) of total household income (Angelsen et al. 2014, Wunder, Angelsen, and Belcher 2014).

1.1.3 Forests Helping People Survive

Yet, forest benefits to rural settings go beyond income shares alone. Valuation is one step towards understanding the roles forests play in the complexities of rural livelihoods (Campbell and Luckert 2002). Conceptual and empirical work has also classified different possible dynamics concerning the role of forests in rural livelihoods, such as: supporting current consumption throughout the year; providing safety nets in response to shocks and cash needs; serving to fill gaps and seasonal shortfalls; allowing a pathway out of poverty; and playing an equalizing effect on local income distribution, besides other local non-material benefits (Angelsen and Wunder 2003, Cavendish 2003, Fisher 2004, Vedeld et al. 2007, Wunder, Angelsen, and Belcher 2014, Wunder et al. 2014, Angelsen et al. 2014). By these means, forests “can make the difference between good and bad nutrition, between recovered health and prolonged illness or between food security and starvation” (Angelsen and Wunder 2003:23).
1.1.4 The Forest-poverty Links

Some studies have demonstrated a geographical correlation between natural forested areas and the distribution of the rural poor across the developing world (e.g., Neumann and Hirsch 2000, Wunder 2001, Sunderlin et al. 2005, Sunderlin et al. 2008). Because of the aforementioned kinds of goods and services provided, forests have been increasingly recognized as critical for supporting the wellbeing of the rural poor. As such, a light has been shed on the links between forests and poverty. Scientists and development practitioners have been calling attention to the potential of forests to reduce poverty, and a variety of mechanisms towards that end have been debated. As Angelsen and Wunder (2003:1) have noted, “the issues of poverty reduction and of deforestation/forest degradation both rank highly on the current international agenda.” Real world examples exist about forest products helping people come out of poverty (Wunder, Angelsen, and Belcher 2014), so the question that arises is what forest-based poverty reduction strategies can function in a win-win basis with conservation? On the other hand, forest conversion and degradation can increase poverty among people who rely on forests’ goods and services for their livelihoods (Byron and Arnold 1999, Campbell and Luckert 2002). Similarly, the poor will suffer more from strict environmental conservation policies (Angelsen and Wunder 2003, Vedeld et al. 2004).

1.1.5 Forests, Peoples and Governments

Over the course of the centuries following European occupation and establishment of colonial rule, governments around the world appropriated much of the forest lands, declaring control over forest resources, displacing many forest peoples from their original lands, and often undermining longstanding customary forest tenure and management regimes (Ribot and Peluso 2003, Charnley and Poe 2007, Menzies 2007). By proclaiming public interests over forests,
governments and state resource management agencies have regulated forest access and use, in a process that has favored industrial and commercial interests to the detriment of local peoples (Menzies 2007). In other instances, in the guise of conservation of pristine landscapes and preservation of endangered species, local peoples have lost access to forest resources on which they have traditionally and historically depended (Charnley and Poe 2007). State control over forest resources and exclusion of forest peoples from their lands and rights resulted in drastic social and environmental consequences (Ross and Smith 2002).

1.1.6 Devolution of Lands to Local Communities

The conflicts generated by private sector interests over forests and state control through coercion, regulations and displacements led to protest and grassroots movements, which, in some instances, gained international resonance and converged with human rights campaigns concerned with rural poverty, equity and social justice, as well as with conservationists frustrated with the failures of top-down forest conservation models and policies (Klooster and Ambinakudige 2005, Mulder and Coppolillo 2005, Guha 2000, Almeida 2002, Martinez-Alier 2003, Allegretti and Schmink 2009). As such, an intellectual and political climate occurred between 1960s and 1990s: the idea that conservation and development could be linked through sustainable use by forest communities became mainstream, and culminated in demands for inclusion of local people in forest planning and management (Baker and Kusel 2003, Colchester et al. 2003, Mulder and Coppolillo 2005). As a result, an unprecedented devolution of lands and forest management authority took place over the past decades, and local communities today own or manage at least one quarter of the world’s forests (White and Martin 2002, Sunderlin et al. 2008). However, devolution processes have been primarily planned by distant policy makers, and delivered by bureaucracies who treat communities as recipients rather than active participants (Paudel,
Monterroso, and Cronkleton 2010). In the majority of cases, devolution policies are in place but, in reality, forest management authority remains in the hands of the state (Ribot, Agrawal, and Larson 2006, Larson et al. 2010). Governments devolve rights to forest communities, and then “take them back through regulations” (Ribot, Agrawal, and Larson 2006); the conservation thinking shaping these regulations derives from elite and scientific standardized notions of forest management, with little account for local customary practices and institutions for managing resources (Cronkleton et al. 2010, Larson et al. 2010). Most governments then impose burdensome bureaucratic procedures for forest management, making the activity a “daunting undertaking” for forest dwellers (Menzies 2007).

1.1.7 Market-based Conservation Strategies

Among the most debated strategies to address both rural poverty and maintenance of natural ecosystems, was the development of market-oriented conservation, based on the idea that conservation should be achieved through commercialization and, from the other way around, the link to markets was seen as a means of delivering development (Brown 2002). As an attempt to reconcile these goals, in the course of the 1980s and following decades, Integrated Conservation and Development Projects (ICDPs) emerged, under the notion that if forests are to be conserved, forest products, especially timber and non-timber forest resources, should be integrated into the market (Mulder and Coppolillo 2005). However, most of these project interventions failed to promote lasting improved rural wellbeing and biodiversity conservation, for a variety of reasons: first, they put too much effort on production, rather than marketing and matching demand to supply (Angelsen and Wunder 2003). Second, incoherent laws, a burdensome bureaucracy, and rent captured by those at higher levels of market chains tended to undermine communities’ potential to benefit from forest product commercialization (Sunderlin, Angelsen, and Wunder
Third, market-based solutions that induce resource-dependent people towards efficiency and short-term profit maximization could be exactly the strategy that would lead to overuse and destruction of natural resources (Ostrom 1990, Schmink 2004, Medina, Pokorny, and Weigelt 2009, Pokorny et al. 2010).

1.1.8 “Hidden” Local Knowledge Systems, Overlooked Local Institutions

Using detailed and contemporary studies, anthropologists, political economists, and human ecologists demonstrated that many forest user groups and communities have developed a wide diversity of mechanisms to avoid overuse, including rich webs of use rights, rules, norms, sanctions and so on (Agrawal 2002, Dietz et al. 2002). Because of their intimate relationship with the environment, forest peoples have more knowledge about local resource dynamics than anyone else; this knowledge has been labeled traditional ecological knowledge, local knowledge, or indigenous knowledge, and has been documented in many ways (Berkes, Colding, and Folke 2000, Pawluk, Sandor, and Tabor 1992). As people in local communities depend on forest resources for their survival, they have greater incentives to conserve it (Ostrom 1999, 1990). Additionally, since forest dwellers coexist in the same rural environmental conditions, they develop close social ties, trust, identities and a vision of a common future; these characteristics, in turn, facilitate the capacity to cooperate, take collective action, and develop community institutions to manage natural resources over long periods of time (Byron 1992, Ostrom 1999, Gibson, McKean, and Ostrom 2000).

Institutions are defined by Dietz et al. (2002:21) as “the rules that people develop to specify the ‘do’s and don’ts’ related to a particular situation.” Rules in local institutions include prescriptions that prohibit, allow, or demand some action or outcome, and can be used to define access, harvest levels of different forest products, monitoring, and who participates in key
decisions (Dietz et al. 2002, Ostrom 1990). But, unfortunately, in the majority of the world’s forests, local forest management regimes and institutions crafted and maintained by forest communities have been replaced by state bureaucracies controlling forest management, with negative consequences for forests and their inhabitants (Charnley and Poe 2007). Likewise, it has been reported that, by restricting traditional forest management practices, state control over forest use has damaged locally developed management regimes and increased poverty in forest communities (Friedman and Rangan 1993).

1.1.9 The Damaging Effects of Top-down Centralized Policies

The discourse defending state control over forests has been that “ignorant forest dwellers” are not capable of the scientific management necessary to extract forest products and ensure environmental protection, thus justifying the state intervention to protect forests against population pressures (Menzies 2007). The advocates of centralized government solutions mistakenly assume that official environmental agencies have sufficient and reliable information to arrive at both sustainable levels of resource extraction, and mechanisms to ensure local compliance of the legislation or enable cooperative behavior, and that they are interested in doing so, not corrupt (Ostrom 1999, 1990, Ostrom, Janssen, and Anderies 2007). Moreover, since forested landscapes are mistakenly believed to be fairly homogeneous, public officials and policy makers tend to develop and impose uniform regulations for an entire region (Ostrom 1999).

According to Ostrom (1990:216), the prescriptions developed by central governments to impose uniform regulations has the perverse effect of increasing centralization of political authority, in which (1) local natural resource users are assumed to be incapable of “long-term reflections about joint strategies to improve joint outcomes,” (2) institutions that users may have
carefully developed and established are ignored or rejected, and (3) the solutions imposed by the central government are based on models of “idealized markets” or “idealized states.” Consequently, these reforms have resulted in negative outcomes for both forests and its users. Government agencies issued detailed regulations concerning forest use and management, but due to budget and other administrative constraints, were unable to enforce those regulations. Additionally, by rejecting any existing locally developed institutions, central authorities undermined local actions to sustain and protect forest resources (Ostrom 1990, Dietz et al. 2002).

1.2 Dissertation Focus and Research Questions

The fundamental research questions posed in this dissertation project are: how to reconcile conservation and sound development across diverse groups of forest users? Can poverty alleviation, wellbeing and dignity be achieved through, or reconciled with sustainable use of forest resources? Are there possible mechanisms that could enable community forest management schemes to allow for livelihood improvements, conservation, social justice and cultural valorization across groups of forest dwellers?

In this project, I took advantage of the opportunity to access a large socio-economic database on forest uses, and to collaborate with a thoughtful and influential team of economists, specialized on forests and poverty issues. Throughout this interaction and in the process of analyzing secondary data and defining/refining research questions which the database would allow me answer, the ideas that kept emerging were mostly related to the varied economic dynamics forests play across different Amazonian settings. Do forests serve as safety nets, or are they the last resort for the poor? What are the roles of forests in reducing extreme poverty? Do forests provide income in times of shocks, or when income from other sources (i.e., agriculture) are not available? Although I considered these to be very interesting and important questions,
there were also other things I deeply wanted to understand. To what extent have past colonization histories and government programs shaped current scenarios of forest use and livelihood strategies? Do forests represent an important dimension of peoples’ sociocultural systems across contemporary groups of forest users? If so, how does it translate into conservation interests locally? Are there locally developed mechanisms to manage forest resources across the study sites? Are there structural barriers other than the economic dimensions of forest use that prevent people from benefiting from forests (i.e. escaping from poverty)? What solutions for sustainable and meaningful forest-based livelihoods have managed to succeed locally? Consequently, even though initially I had not planned to conduct fieldwork (since I already had large data sets to analyze), I decided to travel to the study sites and conduct complementary qualitative research.

The research focuses on the Amazon region, encompassing variations in biophysical, political and socio-cultural contexts. The trinational approach (Brazil, Bolivia and Ecuador) allowed me to compare results across different geopolitical contexts, including distinct development conditions and national policies. Relying on a combination of quantitative data and qualitative interviews conducted at each of the study sites, I used both an economic-quantitative approach and a social-anthropological approach, aiming to arrive at richer interpretations of findings over the subject matters. My dissertation project addresses three main subjects concerning peoples and forests: (1) the kinds of economic contributions forests make to livelihoods; (2) the local meanings of forests, and the existing institutions and mechanisms developed by local forest people to manage natural resources; (3) the bureaucratic, political and social barriers impeding win-win configurations between poverty alleviation and forest
conservation, as well as the envisioned, local and government solutions taking place to address these barriers and enhance the prospects for sustainable livelihoods.

Through a partnership with the Center for International Forestry Research (CIFOR), I was able to analyze large sets of secondary data from the intercontinental research project Poverty and Environment Network (PEN), which consists of the most comprehensive global analysis of tropical forests and poverty to date. PEN systematically gathered an unprecedented set of uniform socio-economic and environmental information that was collected quarterly at the household and village levels from forest communities of over 40 sites in 24 developing countries (http://www1.cifor.org/pen). The PEN study sites encompassed in the scope of my research are related to the Amazon region and include: (1) riverside and slave descendants’ communities in the Amazon estuary (Abaetetuba, Pará, Brazil); (2) rubber-tappers in central-western Amazonia (Acre, Brazil); forest-extractivists in northern Bolivia (Pando, Bolivia); (3) indigenous peoples and settlers in western Amazonia (Sumaco, Ecuador). Additionally, I conducted fieldwork in each of the study sites (Figure 1-1). The type of fieldwork method was carefully chosen to enable respondents a choice for personal expression on the topics under investigation (livelihood strategies; relevance of forests for survival, culture, identity and wellbeing; locally developed systems for avoiding overuse of natural resources; barriers to enabling sustainable livelihoods; and the visions of alternative policies). Semi-structured interviews with open-ended questions were designed to enhance the opportunity to genuinely understand the perspectives of forest dwellers and to provide richer qualitative data.
1.3 Four Distinct Amazonian Contexts: From Colonization Histories to the Development of Livelihood Strategies

1.3.1 Northern Bolivian Amazon

The northern Bolivian Amazon, which contains the departments of Pando and Beni, covers an area of about 100,000 Km² on the border with Brazil to the north and east and with Peru to the west (Cardona et al. 2014, Stoian and Henkemans 2000, Zenteno Claros 2013). The population of Pando department was counted at 110,436 inhabitants in 2012, 27% of which was composed of the permanent rural population (Zenteno Claros 2013). The northern Bolivia rural population is made up of indigenous and non-indigenous extractive communities (estimated at 90% of the total rural population) that have gained new opportunities to benefit from forests, as well as other social groups such as cattle ranchers, loggers and miners (Duchelle 2009, De Jong, Ruiz, and Becker 2006). The climate is classified as tropical and humid; annual temperatures range from 24° C to 26° C, annual precipitation from 1.834 mm to 2.774 mm, and altitudes range from 100 to 300 m above sea level (Zenteno et al. 2013). The region is covered with mostly intact lowland wet tropical forest vegetation, with tree species diversity of 90 species/ha and abundant Brazil nut trees (*Bertholletia excelsa*) and rubber (Poorter 1999). Compared to other tropical forest regions, the northern Bolivian Amazon has suffered minimal environmental transformation: in the mid-1990s, around 94% of the land surface was covered by largely intact forest, and until recently, the cumulative deforestation remained at only 5.8% of the department’s forest area (Stoian and Henkemans 2000). Such low pressure on forest resources is a result of low population density, limited accessibility, and because of the region’s forestry-dominated economy (Stoian and Henkemans 2000, Zenteno et al. 2014).

The Bolivian Amazon remained isolated during most of the colonial period; the first outsider intervention was by the Jesuits at the end of the 17th century, promoting partial changes
to the region as the missions introduced ranching, and congregated some indigenous populations (Assies 2006, Reyes-García et al. 2014). Only by the late 19th century, when a viable passage to the Atlantic Ocean through Beni and Mamoré-Madeira Rivers was discovered, were commercial interests initiated in rubber (*Hevea brasiliensis*) and quinine (*Cinchona spp.*) in the Bolivian Amazon (Fifer 1970, Stoian and Henkemans 2000). Colonization and settlement by non-indigenous extractive populations began, as ten thousand laborers migrated from Santa Cruz and valleys around Cochabamba to work at the emerging rubber estates, or *barracas* (Fifer 1970, Stoian and Henkemans 2000). As in other parts of the Amazon, rubber exploitation in northern Bolivia boomed: by 1898 rubber production contributed 49% of Bolivia’s export value (Bieber 1984, Stoian and Henkemans 2000). The rubber production system was organized around the so-called *barracas*, which were forest extraction production units composed of a forest estate and a workforce based on debt-peonage (informal loans locally called *habilito*) (Stoian and Henkemans 2000, Cardona et al. 2014).

The rubber economy came to collapse by 1912 when prices started to fall dramatically as a result of production by rubber plantations in Malaysia (Fifer 1970, Barham and Coomes 1996, Stoian and Henkemans 2000). Still, rubber continued to be produced and exported in smaller quantities throughout the following decades, with a second mini boom during World War II, but completely ceased by the 1980s (Helbingen and Alan 2001, Fifer 1970). The collapse and subsequent steady decline of the rubber economy led to a gradual diversification of rural livelihood strategies as forest dwellers started to combine subsistence agriculture with Brazil nut extraction (Fifer 1970, Barham and Coomes 1996, Stoian and Henkemans 2000). After the late 1980s, road access improved; in addition, regional entrepreneurs invested in shelling facilities and began to sell the end product in international markets (Stoian and Henkemans 2000, De
Jong, Ruiz, and Becker 2006, Helbingen and Alan 2001, Zenteno et al. 2014). Over the 1990s, the Brazil nut economy was boosted in Northern Bolivia, as the annual export value rose from a few million dollars to around US$30 million (Stoian and Henkemans 2000, De Jong, Ruiz, and Becker 2006), and the 2009 Brazil nut price was 71% higher than the 1997 price (Stoian and Henkemans 2000, Zenteno et al. 2014). Minor extractive booms of timber, gold and palm-heart occurred in the 1980s and 1990s (Stoian and Henkemans 2000, De Jong, Ruiz, and Becker 2006).

The Brazil nut production system paralleled the debt-peonage developed for the rubber economy, but the barraca system started to be converted into independent communities. A number of factors contributed to this transition. (1) Improved access through construction of road infrastructure partially decreased the role of itinerant merchants (who travelled to communities and traded commodities as advanced payments for forest products to be collected later) (Pacheco 2009). (2) The entitlement process and community rights to forest resources over the 1990s evolved to the formal recognition of rural communities in the Bolivian Amazon (Ruíz 2005). (3) In response to Bolivia’s 1994 Popular Participation Law, municipal governments provided infrastructure and services, leading families to settle in concentrated communities (Cronkleton et al. 2008, Duchelle 2009).

Indeed, throughout the 1990s, important policy reforms affected rural communities in the Bolivian Amazon: a Forestry Law democratized forest resources and ownership and recognized indigenous subsistence rights (Ruíz 2005, De Jong, Ruiz, and Becker 2006). It also allowed communities to exploit forest resources through formalized forest management plans. An Agrarian Reform Law resulted in 40% of forest areas placed in the hands of communities, and almost 75% of forest settlements in the region are now legally recognized as independent
communities (Zenteno et al. 2014). A national decree in the 2000s allocated rural communities legal rights to 500 ha of forest land per household, as part of a single collectively held communal title (Zenteno et al. 2014, Ruiz 2005, Duchelle 2009). Additionally, the 1.8 million hectare Manuripi National Wildlife reserve was created in 1973, but began to be officially managed in 1999, containing nine non-indigenous extractive communities (Duchelle 2009).

1.3.2 Northern Ecuadorian Amazon

The Sumaco region is situated in the Ecuadorian Amazon, a region known in Ecuador as “Oriente,” part of the upper Amazon basin next to the eastern slopes of the Andes mountains; the rivers born there flow through the lowlands, gradually converging in the Amazon river (Little 2001). The proximity to the Andeans mountain range, and temperature differences promoted by varied elevations, make this one of the rainiest regions of the Amazon basin: rainfall averages 4000 mm per year, with rain occurring all year round (Little 2001, Rudel, Bates, and Machiguensi 2002, Bilsborrow, Barbieri, and Pan 2004). Elevation averages from 1500 meters in the west to 300 meters in the east (Bilsborrow, Barbieri, and Pan 2004, Rudel, Bates, and Machiguensi 2002) and temperatures from 20° C to over 24° C (Southgate, Sierra, and Brown 1991). The rivers run fast, and even though they can represent obstacles until bridges are built, some waterways, such as the Aguarico river, have represented important transit areas for indigenous societies (Rudel, Bates, and Machiguensi 2002, Little 2001). In the upper Amazon basin, dramatic topography, and the variety of elevations and climate regimes, make this an area of extraordinary biodiversity, among the very highest on earth (Myers et al. 2000, Southgate, Sierra, and Brown 1991). The total population in the Ecuadorian Amazon (including the provinces of Napo, Orellana, Sucumbios, Pastaza and Morona Santiago) in 2010 was 648,438, less than 5% of the total Ecuadorian population (Bilsborrow, Barbieri, and Pan 2004).
The Sumaco Biosphere Reserve (SBR), established in 2000 by UNESCO, is located in the northern Ecuadorian Amazon, covering parts of the Napo, Orellana and Sucumbios provinces, with an area of 931,215 ha (Oldekop et al. 2012). The population living within the SBR buffer zone numbered 107,804 inhabitants in 2010, of which 70% was made up of indigenous lowland Quichua, while the remaining 30% were settlers (Oldekop et al. 2012).

Colonization began in Ecuadorian Amazon in the 1560s, when Spaniards descended from the northern Andes to the lowland jungle in search of gold. Two small towns were established in the area of the Coca and Napo rivers during a mini-gold boom that lasted no more than two decades. Subsequently, around the 1590s, Jesuits came to the upper Amazon basin and established the Mainas missions, which consisted of a strategy that relocated indigenous groups into large sedentary mission towns (reducciones) along the major rivers, so the natives would be evangelized, learn and practice agriculture, and renounce their traditional customs, including their mobility patterns of territorial occupation. The forced mixing of different indigenous societies into the mission towns provoked a breakdown of indigenous social organizations and incited the spread of fatal diseases, causing epidemiological destruction among the native populations. Allied to this, the adoption of the Quichua lingua franca, coming from the highlands and used by the missionaries, resulted in an ethnogenesis process called “Quichuaization” (the emergence and expanding of the Amazonian Quichua as an ethnic group), a process that continued to happen over the subsequent centuries (Perreault 2001, Little 2001).

Even though the Oriente was long neglected by Ecuadorian state investments, market demand for products such as gold, vanilla, agave, wild cocoa, and quinine increased over the nineteenth century, but it was the rubber boom, initiated in the 1880s that triggered profound social transformations among indigenous peoples living in the area, since Indian labor was
brutally appropriated to supply rubber to the caucheros (rubber traders) (Little 2001). The rubber economy in Ecuadorian Amazon caused different impacts compared to other Amazonian regions, since the rubber in the upper Amazon basin came from the *Castilloa elastica* tree, which besides its inferior quality compared to the rubber from *Hevea brasiliensis* trees, was rarely tapped: trees had to be felled for the extraction of the latex. This also meant that the upper Amazon caucheros engaged in constantly expanding exploitation of new areas, thus extending social and environmental impacts (Little 2001). Many of the rubber laborers were Quichua, because their history of contact with whites facilitated their interaction with market mechanisms; additionally, the Quichua served as “cultural brokers,” preventing a total loss of identity by indigenous groups, and translating power relations between Indians and whites (Little 2001). The dramatic collapse of the Amazonian rubber economy by 1913, gave place to a cattle boom in the Ecuadorian Amazon, through the hacienda (ranch) system that had started in the late nineteenth century and increased rapidly in the early twentieth century (Little 2001, Southgate, Sierra, and Brown 1991).

By the 1920s, the search for oil in the Ecuadorian Oriente began, but only after the 1960s did the oil age start in the Ecuadorian Amazon: in 1964 a consortium involving Texaco and Gulf oil companies received petroleum exploration concessions to almost 1.5 million ha of eastern lowland tropical forests. Petroleum was effectively discovered in 1969, and commercial extraction initiated in 1972, after the construction of a 500 km trans-Andean oil pipeline to the Pacific port of Esmeraldas (Perreault 2001). Consequently, oil wells, pipelines and roads were built, settlers arrived in large numbers, and given that the petroleum economy in Ecuadorian Amazon was expanding on behalf of development, the national government disregarded indigenous peoples’ historically-based territorial rights. Indigenous populations in the area thus
lost freedom of movement and suffered severe consequences of water and soil contamination and biodiversity loss caused by oil production (Little 2001). Extensive road construction undertaken to service oil production and agrarian reforms in 1964 and 1973, that encouraged colonization of lands considered inhabited as well as redistribution of land to smallholders and the landless, also led to a rapid expansion of agricultural colonization in the Orienté (Southgate, Sierra, and Brown 1991, Oldekop et al. 2012). Throughout the 1970s, governmental incentives induced forest clearing to plant marketable crops such as rice, cocoa, corn, grain and naranjilla fruit (Solanum quitoense; one of the principal market crops), stimulating the use of pesticides through government programs (Little 2001, Casagrande, Thompson, and Young 1964).

In the 1990s, the Ecuadorian Amazon presented the highest deforestation rates of any country’s Amazonian area (FAO 2007, Bilsborrow, Barbieri, and Pan 2004), with about 2% of forest clearing per year (Southgate, Sierra, and Brown 1991). Main causes of deforestation were agricultural settlement, followed by oil discovery, as well as cattle ranching, cultivation of naranjilla (Solanum quitoense) and logging of commercial species such as laurel (Cordia alliodora) (Rudel, Bates, and Machinguiaiashi 2002, Bilsborrow, Barbieri, and Pan 2004). Even though forests still cover over half of northeastern Ecuador, 36% of the region is claimed by agricultural settlers (Brown 2002, Southgate, Sierra, and Brown 1991). Since the Ecuadorian Institute of Agrarian Reform and Colonization (IERAC) has requested that those settled in forested areas clear their respective parcels to acquire formal property rights, many indigenous and settler communities sought to secure their land tenure by clearing forests for cattle and agriculture (Perreault 2001).

In reaction to the colonization influx following oil discovery and the agrarian reforms directed to the occupation of the Amazonian lowlands, indigenous peoples in Ecuadorian
Amazon started to claim their rights. By the 1960s and 1970s, through alliances with church-based institutions, as well as national and international NGOs, indigenous organizations were formed. Initial claims involved recognition of indigenous and civil rights, demand for land titles, and credit for agriculture and cattle, that is, the same benefits provided to recently arrived settlers. Throughout the 1980s and 1990s, a much more sophisticated hierarchical structure of the indigenous movement was taking form, with community organizations connected to regional federations (such as the Federations of Indigenous Organizations of Napo, FOIN, and the Confederation of Indigenous Nationalities of the Ecuadorian Amazon CONFENIAE) and to national federations (e.g., Confederation of Indigenous Nationalities of Ecuador, CONAIE). Demands evolved to focus on cultural revalorization, the links between territory and ethnic identity, and bilingual education - firstly as access to previously unavailable education and secondly as a means to revalorize indigenous (in this case Quichua) culture. An articulated indigenous movement in Ecuador developed political platforms and called for the acknowledgement of the nation as a “Plurinational State,” aimed at recognizing its various ethnicities as nationalities with their respective political and territorial rights (Perreault 2001, 2003a, b). Through these mobilizations, indigenous groups in the Ecuadorian Amazon had much of their lands recognized through community legal titles, with individual families gaining usufruct rights to up to 100-ha lots, and around 1000 ha of community reserve for future generations. Bilingual education was institutionalized in the country, through the 1988 creation of the National Directorate of Bilingual Intercultural Education (Jameson 2011, Perreault 2001). After many attempts by CONAIE advocacy and manifestos, in 2008, Ecuador was declared a Plurinational state, as part of the new constitution; Quichua and Shuar languages were also voted in the Assembly to become official languages along with Spanish (Jameson 2011). Nowadays,
indigenous struggles continue with legalization of territories for indigenous peoples, and resistance to state and corporation oil extraction on indigenous lands, among others.

1.3.3 Amazonian Estuary Region, Brazil

The Brazilian site of Abaetetuba is situated in the Amazon estuary, Pará State, at the easternmost point of the Amazon Basin. Its landscape is characterized by várzea floodplain forests, embedded in a network of channels, rivers, tributaries and a vast mosaic of fluvial islands (Hiraoka 1995). The PEN survey was conducted in two neighboring municipalities: Abaetetuba (three communities included) and Limoeiro do Ajuru (one community included). With an area of 1610.408 km², Abaetetuba hosts 141,100 inhabitants (87 inhabitants/km²), of which 42% are rural riverside dwellers (IBGE 2016). Limoeiro do Ajuru has 25,021 inhabitants within 1490.186 km², with a far lower population density (16 inhabitants/km²), and a higher proportion of people living in rural riverside areas (76%) (IBGE 2016). Abaetetuba is situated only about 80 km from Belém - the state capital and the Amazon’s largest city (Hiraoka 1995). The elevation throughout the region is between 9 and 15 MASL (SEPOF 2007) (SEPOF 2007); the climate is hot and super humid, as classified by Köppen’s scheme, with a mean annual temperature of 25° C and a mean annual rainfall of 3000 mm (Hiraoka 1995). In the Amazon estuary, fluvial dynamics are influenced by periodic floods: incoming oceanic tides push rivers and tributaries to flow upstream in freshwater tides so that daily and monthly (during the full and new moon phases) inundation occurs, in addition to annual flooding (Wittmann, Junk, and Piedade 2004, Parolin et al. 2004, Hiraoka 1995, Little 2001). These water dynamics are not only visually dramatic, but they have profound influence in the ways people organize their social and productive activities (Harris 1998). Moreover, the complex web of waterways allows relatively easy fluvial access and transport of goods within the Amazon estuary region (Hiraoka 1995).
The estuary region of Abaetetuba is composed of secondary forests combined with agricultural plots and some upland areas. Floodplain forest vegetation has a complex structure and is rich in palms, such as açai (Euterpe oleracea) and miriti (Mauritia flexuosa). As a consequence of poor drainage and daily floods, agricultural and cattle production is limited within várzea forests (Brondizio 2008). By contrast, not only do wild animals occupy várzea lands, since fish enter the forests in the high tides to eat fruits, berries and nuts (Harris 1998), but the diverse aquatic life of these ecosystems is extremely important to the local populations (Harris 1998, Little 2001). The floodplains of Abaetetuba are populated by caboclos, the mixed blooded residents derived from indigenous, Africans and European colonizers among other populations that migrated to the area, as well as some remaining communities of Afro-descendent (Quilombola) populations (Harris 1998).

Because of its easy fluvial access and the dominance of fertile floodplains, the lower Amazon Basin historically was one of the most densely populated areas of the entire Amazon, occupied by large pre-colonial sedentary indigenous societies based on intense use of these habitats’ resources (Little 2001). European intrusions through the mouth of the Amazon river initiated in 1500, when the Spanish navigator Vicente Yáñez Pinzón arrived at this great river and named it “Santa Maria de la Mar Dulce.” Yet, over the course of the 16th century, attempts to colonize lower Amazon lands were largely unsuccessful because of both the large indigenous population’s resistance, and the treacherous navigation around the encounter of the Atlantic Ocean with the Amazon river combined with its tricky tidal dynamics within a labyrinth of rivers. Around the early 17th century, English, Dutch, Irish and French started incursions into the lower Amazon basin, and succeeded with some colonization efforts through the establishment of friendly trading relations with indigenous groups. By mid 17th century, Portuguese efforts
systematically expelled other European powers from the region, initiated a cruel process of
capturing and trading Indian slaves, and gradually established control over the lower Amazon
basin (Little 2001).

During the next two centuries, Portuguese conquest of the lower and middle Amazon
River basin expanded, and more settlers arrived, demanding Indian labor, as “Portuguese settlers
refused to undertake almost any kind of manual labor and needed Indian labor for agricultural
activities; hunting; fishing; the building and paddling of canoes; the construction of houses,
churches and public buildings; the digging of wells; the blazing of trails; and domestic chores
such as hauling water, cooking, cleaning and gardening” (Little 2001). Consequently, armed
slaving expeditions on indigenous villages, called resgates, gradually dismantled indigenous
lifeways in the floodplains of the lower Amazon basin. Efforts to develop a large-scale
agricultural economy in Portuguese Amazonia failed because of adverse biophysical conditions;
however, demand for wild forest products export (such as cocoa and wild clove) initiated around
the mid 17th century. Since indigenous peoples had intimate knowledge of forest ecosystems,
more Indian labor was requested to find and extract these forest products. In 1652, Jesuit
intervention led by Father Antonio Vieira condemned the violent slaving raids and gained legal
control over Amazonian Indians - within a few years, the Jesuits established more than fifty
mission villages throughout Portuguese Amazonia. Jesuit villages were highly structured, and
Indians worked under rigid schedules; priests controlled production, transport and sale of
commercial goods, and thus, Jesuits became the wealthiest group in the middle and lower
Amazon basin. In the mission towns, the língua geral (general language, derived from the Tupi
language family, mixed with Portuguese words) was used as a single language that allowed the
mixing of varied ethnic origins. The Jesuits’ economic and political power was undermined in
the mid eighteenth century, when the Portuguese crown expelled them from the area. Indigenous affairs were then put under colonial government control; the língua geral was forbidden and the Crown decreed obligatory teaching of Portuguese as the official language of the Brazilian Amazon valley. Over three centuries of European colonization, a process that included invasion of indigenous homelands, demographic declines resulting from the slave system, warfare and epidemic diseases, and the congregation of numerous indigenous ethnic societies into settler and Jesuit villages, all provoked disruption of indigenous lifeways and breakdown of internal social structures, and culminated in the ethnogenesis of the tapuio population - full-blooded, detribalized Indians. The tapuio population did not survive, but served as the indigenous component for the caboclo population, derived from more culturally and racially mixed populations (Moran 1974, Parker 1985, Wagley 1976, Brondizio et al. 1994, Little 2001). Nowadays, caboclo populations living in the Amazonian floodplains represent the largest, non-indigenous population of the Brazilian Amazon (Brondízio, Safar, and Siqueira 2002a).

Even though extractive product commercialization and small farming have prevailed since the seventeenth century, it was the rubber era that strongly integrated the Amazon into the world market. Since the beginning of the nineteenth century, tapuio and caboclo populations started to engage in the collection of rubber; the increasing demand for the product led farmers and city dwellers to work in rubber tapping throughout the Amazon estuary. Moreover, a severe drought in Northeast Brazil starting in the 1870s led hordes of poor people to migrate to the Amazon. As in another parts of the Amazon, the debt-peonage, or aviamento system, was established in the lower Amazon basin, consisting of a nested hierarchy of commercial relations from the exporters, passing through various levels of intermediaries (aviadores) to the rubber tappers (seringueiros), who supplied rubber for very low prices in exchange for goods at
exorbitant prices, creating a vicious cycle of debt and control. Some *aviadores* who attained control of large tracts of rubber collecting lands - called *seringais* (rubber estates) - turned into powerful rubber barons. The formation of extensive *seringais* established a new territorial system in the Brazilian Amazon, but the rubber barons generally did not have legal titles to the rubber states they controlled (Little 2001).

Following competition from the successful plantations of *H. brasiliensis* in Asia, the Amazonian rubber economy collapsed in the 1910s. The *caboclo* population, dispersed along riversides, continued their adaptive livelihood strategies - which included fishing, hunting, extraction of forest products, and small-scale farming. While rubber barons left the area, many local *aviadores* continued to dominate local populations as intermediaries, thus maintaining the *aviamento* system (Little 2001, Hiraoka 1995). Commercial extraction of forest products, such as *andiroba* (*Carapa guianensis*) and *ucuúba* (*Virola surinamensis*) seeds, Brazil nuts (*Bertholletia excelsa*), *copaiba* (*Copaifera langsdorffii*) oil and an assortment of resins, continued after the rubber collapse (Hiraoka 1995). A short revival of the rubber economy occurred during the Second World War, when Japanese forces occupied Malaysia rubber plantations, although it did not last. Between 1950 and 1975, the cultivation of sugar cane, for the production of *cachaça* (distilled liquor) was one of the principal economic activities in the Abaetetuba region (Hiraoka 1995); logging activities across the estuary region expanded from 1950s onward, when the first veneer mills were established with foreign capital and directed to export markets, *V. surinamensis* and *C. guianensis* being the most exploited species (Barros and Uhl 1995). Palm heart exploitation from *Euterpe oleracea* represented another economic boom in the Amazon estuary, beginning in the 1970s, and later in the 1990s there were hundreds of canning factories in the region (Pollak, Mattos, and Uhl 1995). But availability of palm heart started to decrease as
a result of the unsustainable basis of extraction; still, the palm heart economy shrank only to give place to another forest product that came from the same *E. oleracea* palm: *açaí* fruits. *Açaí* has been a vital energy source for regional populations beginning in the pre-Columbian era and continuing throughout the following centuries until today, in both rural and urban areas of the Amazon estuary (Brondízio, Safar, and Siqueira 2002a). The *açaí* economy started to rise in the 1970s, to supply increasing demand due to regional population growth and urban expansion. Since the mid-1990s, *açaí* fruit has reached national and international markets; the *açaí* fruit economy continued to expand exponentially to the point of reaching a level of economic activity not seen for almost a century in this part of the Amazon (Siebert and Brondízio 2010). By the 2010s, the *açaí* industrial economy had exceeded several billion dollars, and shared a top position in the regional economy (Brondízio, Safar, and Siqueira 2002a). As a way to supply the growing demand for *açaí* fruits, the regional *caboclo* populations of the Amazon estuary intensified their production system through agroforestry, forest enrichment and management (underclearing and increasing the frequency of individual trees). Indeed, in stark contrast to the other parts of the Amazon, the *açaí* boom drove an inverse deforestation pattern in the Amazon estuary. Despite population density and proximity to urban centers, the region has, over the past 25 years, experienced decreasing rates of forest clearing and a transition from existing farming and annual crop agriculture to forest-based production systems (Brondízio, Safar, and Siqueira 2002a, Siebert and Brondízio 2010, Hiraoka 1995).

The land tenure regime in this area is composed of (1) individual land holdings, (2) landholdings registered within state-sponsored Agro-extractivist Settlement Projects (PAE), (3) Quilombola reserves for Afro-descendants, (4) ‘use concessions’ issued by the GRPU (*Gerências Regionais de Patrimônio da União* – a government branch responsible for ‘marine
territories’) and (5) landholdings with no recognized land titles. The size of family landholdings averages 20 hectares in Abaetetuba and 60 hectares in Limoreiro do Ajuru. Different forms of government support are available to rural smallholders in this area, such as Programa Bolsa Familia (a national poverty-reduction cash transfer program), a diversity of social programs provided by the federal and state governments, rural credit for the production of crops (i.e., cassava, açaí, coconut), as well as government assistance obtained through Fishermen’s and Rural Workers’ Unions. Social organization in the area includes Rural Worker’s Unions, Fisherman’s Unions and community associations.

1.3.4 Western Brazilian Amazon - Acre

The westernmost Brazilian state of Acre borders Peru and Bolivia, remote from the country’s main urban economic centers. This area of 16.4 million hectares used to be a Bolivian territory until 1903, when, during the boom of the rubber economy, it was integrated to Brazil as a territory, though becoming an official Brazilian state only in 1962 (ZEE 2006). It holds a peculiar place in Amazonian history because of a grass-roots movement initiated in the 1970s by invisible and powerless rubber tappers, which developed into an internationally-known struggle for social justice and environmental protection, and culminated in an important land use reform – the creation of “extractive reserves” -- that recognized collective management rights for non-indigenous populations in the Amazon, and a model for sustainable use areas elsewhere (Fearnside 1989, Allegretti and Schmink 2009, Schmink and Wood 1992).

The state’s population is about 670,000 (IBGE 2005), 66% of which is concentrated in urban areas, mainly in the capital, Rio Branco (ZEE 2006). The majority of the rural population is forest dwellers living dispersed in the old rubber estates, on the border between forest-based livelihoods and large-scale land use economies dominated by cattle (Ehringhaus 2006). The climate is humid tropical wet, and average precipitation is 2000 mm/year (IMAC 1991, ZEE
Annual temperatures vary between 24°C and 32°C (ZEE 2006). Until 2004, 88% of Acre’s natural forest cover was conserved. The vegetation of the entire region is characterized by lowland tropical forest (Duchelle 2009).

The indigenous peoples who originally occupied the territory that later became the state of Acre belonged mainly to the Panoan and Aruakan linguistic groups (Almeida 2002, Calixto, Souza, and Souza 1985). Colonization in that area began with the first economic cycle of rubber, in the second half of the 1800s. The encounter between indigenous cultures and non-indigenous arrivals was marked by cruel and violent confrontation (ZEE 2006, Ehringhaus 2006). Between 1880 and 1910, the intense pace of rubber exploration resulted in the extermination of countless indigenous groups. Furthermore, the establishment of rubber enterprises changed the form of indigenous peoples’ social organization. Some small groups still managed to take refuge in the most remote headwaters of the rivers, but the vast majority was pressed to change in order not to disappear (ZEE 2006, Almeida 2002).

The rubber boom (between 1880 and 1912) marked the Amazon region as a whole, associated with growing international industrial market demand in Europe and the United States due to the bicycle and automobile industries (ZEE 2006). The Brazilian Amazon became the world’s principal wild rubber producer (Barham and Coomes 1996, Ehringhaus 2006), and its rubber economy attracted tens of thousands of laborers from the Andes, and the northeast of Brazil that was experiencing a severe drought coupled with high levels of poverty (Dean 1987). To meet the demand for rubber, a complex circulation system of products and goods was established, connecting rubber tappers who ran production in the Amazon, the Amazonian merchants, and financial groups in Europe, laying the foundations of the rubber extractive enterprise (ZEE 2006).
Rubber tappers worked under debt patronage (aviamento), a system of social and market relations that persists in some form in many Amazonian regions until today (Weinstein 1983, Ehringhaus 2006). Each tapper extracted rubber from trees within a couple of trails; the rubber production was supplied at the end of the season to the trading posts (controlled by rubber barons), and paid against goods supplied in advance, often charged at exorbitant prices (Almeida 2002: 180). The rubber era generated extraordinary wealth for the elites, established widespread trading networks, built huge port facilities and allowed the creation of large urban centers such as Manaus along the Amazon River (Weinstein 1983). At the height of the boom in 1912, rubber production accounted for 40% of Brazil’s export revenues, second only to coffee (Rancy 1986).

After 1912, with the successful domestication of Hevea in Southeast Asia, fomented by the British and Dutch empires, Asia became the world’s leading producer, and the Amazon rubber economy collapsed (Weinstein 1983). The 1920s were marked by economic decline caused by the fall in international rubber prices (Dove 1993). During World War II, when Asian rubber supplies became unavailable to the United States, urgent demand for Amazonian rubber for the war effort stimulated the “rubber battle,” which brought a new wave of northeast laborers to the Amazon, conscripted as “rubber soldiers.” Even though this cycle was short lived, during the subsequent four decades, the Brazilian federal government kept supporting rubber barons with subsidies and market quotas, according to which the booming multinational car industry had to buy rubber from Amazonian suppliers at above international prices, prior to being allowed to import. This protectionism policy for Amazonian rubber ended in 1985 (Almeida 2002, Cunha and De Almeida 2000, ZEE 2006).

The rubber enterprise did not provide long-term economic development in the Amazon region (Schmink and Wood 1992, Weinstein 1983, Barham and Coomes 1996), as all the
accumulated wealth was drained (ZEE 2006). In Acre, families of rubber tappers continued to live in the forests after the price of rubber fell, maintaining their traditional isolated homesteads established for the *seringais*, even if these lands were sold by the rubber estate owners or abandoned to cattle ranchers (Weinstein 1983, Barham and Coomes 1996). As the rubber economy collapsed and rubber barons abandoned the areas, rubber tappers were freed to pursue independent livelihoods (thus decreasing dependence on imported goods), diversifying their productive activities to include small-scale agriculture, gathering, hunting, and commercialization of a variety of forest and agricultural products, including Brazil nuts, timber, jaguar skins, brown sugar, and manioc flour, among others (Almeida 2002, ZEE 2006). The harvesting settlements and forest product market chains followed the same patterns as those established for the rubber economy (Duchelle 2009).

After the rubber economy collapsed in Amazonia, forest extractivism was seen as a marginal and backward activity (Ehringhaus 2006). By the 1950s and 1960s, the Brazilian federal government undertook great efforts to industrialize and modernize the nation, and in the Amazon this was reflected in the rise of mining, the building of major roads connecting Amazonia to the rest of the country (Belém - Brasília) and the creation of a variety of new institutions (Schmink and Wood 1992). The military dictatorship, which started with the 1964 coup, targeted the Amazon as a classic capitalistic frontier, leading to land title manipulation, forest destruction and expulsion of traditional dwellers, who were considered an obstacle to Amazonian development (Almeida 2002, Ehringhaus 2006). Seen as a marginalized and undeveloped state, Acre was targeted for investments in livestock and agriculture that radically conflicted with the natural resource base and the lifeways of its population (ZEE 2006). Previous rubber tapper areas were sold to investors from southern Brazil at extremely low prices, leading
to the conversion of forested rubber tapper areas to cattle pastures, and resulting in increased land speculation (Ehringhaus 2006). This colonization wave resulted in drastic environmental and social consequences, with unprecedented deforestation rates and alarming violence against traditional dwellers. Vast territories became increasingly concentrated in the hands of a few, while local people were brutally expelled from their lands (Schmink and Wood 1992).

In response to these tensions, rubber tappers began to organize different forms of resistance to defend their livelihoods. Throughout the 1970s and 1980s, the Pastoral Land Commission and the Missionary Indian Council (both branches of the Catholic Church) supported the struggles of forest peoples in Brazil, such as rubber tappers and Indians, and assisted the formation of grassroots organizations (Schmink and Wood 1992). A nonviolent form of resistance in Acre that succeeded in calling the attention of media and ecologists was the use of human barriers by rubber tappers, to stop laborers from clearing the forests (Cunha and De Almeida 2000).

Alliances between rubber tappers organizations, indigenous movements, environmentalists and human rights activists emerged, and evolved to build an agenda of protests in opposition to mega-projects, and favoring indigenous land demarcation and the creation of extractive reserves (Schmink and Wood 1992, Fearnside 1989). By the 1980s, the gradual democratic opening by the military regime allowed the emergence of NGOs and environmental organizations that helped to strengthen rubber tapper and indigenous causes (Barbosa 1996, Viola 1988, Ehringhaus 2006). Such socio-environmental movements to defend local livelihoods and safeguard the Amazonian forest gained international resonance to the point that the World Bank suspended the funding of mega infrastructure projects (a road connecting Rio Branco to the rest of the country) (Schmink and Wood 1992). At the cost of many conflicts and deaths,
including the murder of important leaders such as Wilson Pinheiro and Chico Mendes, the rubber
tappers’ struggles helped to redirect the economic model implemented by the military
government (ZEE 2006).

In response to the rubber tapper social movement, and as a dual strategy of securing land
tenure and halting Amazonia deforestation, in January 1988, the first official Extractive Reserve
was created in Acre (Almeida 2002, Fearnside 2003), but became a national policy of land
reform when included in Brazil’s new constitution of October 1988 (Fearnside 1989). The
Extractive Reserve model was proposed by the rubber tapper organization and their allies, it
established as public property territories under federal protection (similar to Indian Reserves),
that granted permanent and collective use concessions to forest dwellers (rubber tappers, Brazil-
nut gatherers, and other forest product extractivists) (Almeida 2002, Schwartzman and Allegretti
1987). The Extractive Reserve policy thus was defined to safeguard usufruct rights for people
engaged in traditional forest-based livelihoods (especially based on the extraction of non-timber
forest products), while requiring residents to retain at least 90% of their lands in forest cover
(Fearnside 1989, 2003). The one-million-hectare Chico Mendes Extractive Reserve was created
in 1990 from 42 former rubber estates; the scattered distribution of houses and individual
landholdings (averaging 400 ha) based on the distribution of rubber trails established in the
rubber era was maintained (Ankersen and Barnes 2004, Ankersen and Barnes 2005). From the
early 1990s, protected areas in Acre have expanded considerably: by 2000, around 50% of the
state’s area was under some type of protection, including extractive reserves (21.6%), indigenous
reserves (14.6%), strict protected areas (9.5%), and federal and state forests (~5% ) (ZEE 2006).

1.3.5 Colonization Histories, Economic Cycles and Livelihood Adaptations

The Amazonian study regions of Abaetetuba and Acre/Brazil, Sumaco/Ecuador and
Pando/Bolivia were marked by divergent colonization histories: in the extreme upper (Sumaco)
and lower (Abaetetuba) Amazon basin, colonization events initiated early in the 16th century, and gradually transformed pre-Columbian societies through varied cycles of natural resources and human exploitation. The middle Amazon basin of Acre and Pando experienced later and faster transformations, as outsiders arrived with the rubber boom, in the 19th century. Throughout all these regions, the colonization processes were marked by invasion of indigenous homelands, warfare and violence, use of indigenous labor through slave systems, epidemic diseases and demographic declines, disruption of indigenous lifeways and breaking down of internal social structures. These events caused profound social transformations throughout the studied areas and resulted in different livelihood adaptations. The rubber boom largely contributed to these transformation processes as it strongly connected Amazonia with the world market and deeply affected multiple regions across the Amazon basin, including the areas investigated. The exploitative avimento (or habilito) system in which forest dwellers engaged in rubber tapping placed them at the bottom of a multiple-level market chain: they worked hard, were forced to supply production to a rubber baron for extremely low value, and in some cases, were prohibited to practice agriculture or engage in other productive/commercial activities. In that way, many rubber tappers were trapped in debt, domination and control. The avimento (or habilito) system, therefore, characterized and shaped the social and market relations that, because of isolation, persisted throughout many of these regions until today, and which may hinder the prospects of poverty reduction and improved wellbeing throughout these populations.

The economic rubber boom generated extraordinary wealth without forest destruction, but social justice and equity were out of the equation, and all the accumulated wealth was drained after the rubber bust. Livelihood adaptations following the rubber collapse took different forms across the regions studied: forest dwellers diversified livelihood strategies and were able
to benefit from subsistence agriculture and forest extraction, but state government development agendas and market forces appear to have largely influenced current scenarios that are present in each of these regions today. Later colonization waves related to cattle/agricultural frontiers, mining and oil that started taking place in varied parts of the Amazon in the second half of the 20th century took place without any regard for local forest dwellers: once again local Amazonian populations suffered violence, brutal eviction from their lands, and environmental destruction as the Amazon’s resources once again became a target of appropriation by national and international actors.

1.4 Organization of the Dissertation

This introductory chapter has laid out the research problem and research questions, as well as data sources used, and also described the key historical, geographical, and socioeconomic features of each of the four research sites encompassed in this study. In Chapter 2, I use quantitative survey results to focus on the economics of forest livelihoods. I explore (1) what kinds of economic contributions forests make in the livelihoods of populations in divergent Amazonian settings; (2) the extent to which NTFPs contribute economically to local livelihoods of local populations; and (3) the ways the observed patterns of forest use have shaped by their respective biophysical and geopolitical contexts. The findings illustrate that across all studied Amazonian settings, forests represented the most important livelihood strategy, with forest reliance ranging from 28-61% of total per capita income. Forest income shares were present year-round, implying that, for these livelihoods, forests were important not only in times of hardship or in between crop harvests. Additionally, in three of the four sites (Bolivia, Acre and Abaetetuba), NTFPs played a central economic role, representing the principal source of income. Patterns of forest use differed across study regions and the results suggest that market demand,
biophysical contexts and past government policies and programs have influenced different scenarios of forest use.

Chapter 3 turns to the analysis of the qualitative interviews related to local institutions in each site. In this chapter, I ask (1) in what ways do people from different adapted and transformed Amazonian settings perceive themselves to be allied to the forests? (2) Are any features of local resource management institutions (LIs) present across transformed Amazonian settings that have suffered numerous unfavorable interventions from centralized governments and economic frontiers? The findings show that even in intensively transformed settings, people displayed cultural and identity ties to the forest, but there was a strong forest-related cultural and identity continuum, from the shorter to the longer colonization histories. Forests were locally recognized as tightly linked to wellbeing and conservation interests, and attachment to place were also evident at all studied contexts. Local institutions have been transformed, adapted or created after cycles of colonization and adverse interferences from centralized governments and economic frontiers. Over the studied settings, LIs were not isolated, purely locally-developed and self-sustained: past and contemporary social movements, progressive branches of church-based organizations and the land regularization processes had clearly influenced and shaped them.

Chapter 4 also draws on qualitative interview data to explore local people’s views in each site on barriers to the prospects of sustainable livelihoods and the solutions to promote forest conservation and sustainable development. I ask (1) what barriers to the prospects of sustainable livelihoods (BPSLs) prevent successful reconciliation between livelihood improvement and conservation at each site? (2) Whether and how have local and government solutions managed to remove historically established BPSLs? (3) What are locally envisioned solutions towards the
reconciliation of conservation and sound development? Key findings include similarities and
differences of BPSLs operating across study areas, appearing to have been strongly influenced
by past historical events and government programs. Top-down projects and policies
implementation, ineffective legislation and burdensome bureaucracy were common BPSLs
taking place in the study regions. The local ongoing solutions that were common to all sites were
social organization and local cooperatives, and a number of context-specific local solutions
illustrated the creative capacities of forest-dwellers. Government solutions were present at all
sites, and more relevant than expected. We found a wide amplitude of locally envisioned
solutions towards the wise reconciliation of conservation and livelihood improvements. The
variety of thoughtfully envisioned solutions across contexts illustrated the rich potential of
including local voices and strategies into the design of sustainable development policies.

The concluding chapter summarizes key findings from the dissertation research, and how
they contribute to our understanding of the multidimensional importance of forests to Amazonian
livelihoods, the workings of local institutions across transformed settings, the operations of
major barriers impeding the prospects of sustainable and meaningful livelihoods, and the local,
government and envisioned solutions towards the successful reconciliation between sustainable
development and conservation. The chapter also provides policy recommendations based on
these findings.
Figure 1-1. Map of Amazonian research sites, South America.
CHAPTER 2
FOREST CONTRIBUTIONS TO LOCAL LIVELIHOODS ACROSS FOUR AMAZONIAN CONTEXTS

2.1 Introduction

Peoples use forests in many ways and to different degrees. Forest uses range from the provision of food, construction materials, timber, and medicine, to on-site ecological services (Panayotou and Ashton 1988, Menzies 2007, Charnley and Poe 2007). Nowadays, around 500 million people live in and around the world’s forests (Arnold 1992, Cavendish 2000, RRI 2012) while over 1.6 billion people rely to varying degrees on forests resources (Wasiq and Ahmad 2004).

Even though forest based livelihoods often follow complex portfolios and diversified production systems, forests were historically regarded in western scientific and development perspectives primarily as sources of industrial timber (Belcher, Ruiz-Pérez, and Achdiawan 2005), and policy makers frequently assumed tropical forests had no economic value until they were logged or farmed (Dove 1993, Hecht, Anderson, and May 1988). But as global concerns about environmental problems and rural poverty emerged, in the 1980s and 1990s, forests started to be recognized as also important for the livelihoods of forest dwellers (Nepstad and Schwartzman 1992, Plotkin and Famolare 1992, Belcher, Ruiz-Pérez, and Achdiawan 2005). Ethnobotanical studies demonstrated that forests are sources of multiple products upon which the livelihoods of rural households living within and near forests depend (Arnold and Ruiz Pérez 1998).

Consequently, numerous studies, publications and projects were conducted on non-timber forest products (NTFPs) in developing countries (see for example Panayotou and Ashton 1988, Falconer and Koppell 1990, Godoy and Bawa 1993, Plotkin and Famolare 1992, Nepstad and Schwartzman 1992, Perez and Byron 1999, Sheil and Wunder 2002). Studies documented the
apparent coincidence between conservation and human wellbeing that NTFPs could afford. As trees were not felled and forest ecosystems were not clear-cut, NTFPs such as fruits, nuts, resins, barks and leaves could be extracted without compromising ecosystem integrity, thus providing a less damaging type of forest use (Nepstad and Schwartzman 1992, Myers et al. 2000, Panayotou and Ashton 1988, Plotkin and Famolare 1992, Arnold and Pérez 2001). The maintenance of a forest-like structure also secured environmental services such as hydrological regulation, nutrient cycling, erosion control and carbon storage (Gillis, Nepstad, and Schwartzman 1992, Myers et al. 2000, Neumann and Hirsch 2000, Marshall, Newton, and Schreckenberg 2003).

Therefore, commercialization of NTFPs arose as a potential means to achieve sustainable development for forest communities in the tropics (Counsell and Rice 1992, Plotkin and Famolare 1992), and diverse projects were developed to explore their contribution to increasing the financial income from NTFPs for rural communities (Wollenberg and Ingles 1998, Richards 1993, Ruiz Pérez and Arnold 1996, Neumann and Hirsch 2000). Integrated conservation and development projects (ICDPs) emerged, widely focused on creating and developing NTFP based income for forest peoples, by improving NTFP production and processing, supporting forest management and developing markets (Belcher, Ruíz-Pérez, and Achdiawan 2005). However, many of these attempts to promote NTFP commercialization failed to deliver the expected benefits (Marshall, Newton, and Schreckenberg 2003). Some of the reported reasons were high transaction costs to meet market demand; low value of products; expensive transportation; and exploitative marketing chains (Sunderlin, Angelsen, and Wunder 2004, Angelsen and Wunder 2003, Arnold and Pérez 2001). The sustainability assumption of NTFP extraction was questioned by some ecologists, since populations of harvested species could decline over time (Arnold and Ruiz Pérez 1998, Perez and Byron 1999). Even though the outcome depends on the intensity of
NTFP extraction from a forest (Peters 1994, Witkowski, Lamont, and Obbens 1994), compared to timber harvests and other forms of land uses (i.e., agriculture, cattle and mining), the extraction of NTFPs was widely recognized as being far less deleterious to the local ecosystem and biodiversity at the landscape scale, and even at the species scale (Belcher, Ruíz-Pérez, and Achdiawan 2005, Arnold and Pérez 2001), besides being recognized to supply an array of social and economic benefits (Belcher, Ruíz-Pérez, and Achdiawan 2005).

Enthusiasm also decreased as studies documented NTFPs’ relatively low importance in household economies. A review of 61 cases from Asia, Africa and Latin America found that the sales of NTFPs, when traded, typically contributed to only a small portion of the household income (Belcher, Ruíz-Pérez, and Achdiawan 2005), and small contributions relative to agriculture and other types of land use (Costanza, d’Arge, De Groot, Faber, et al. 1997, Wilkie, Clark, and Godoy 2001, Illukpitiya and Yanagida 2010). Despite the expectation that NTFPs could be primary sources of income, studies suggested that NTFPs had only marginal contributions at subsistence economies (Belcher, Ruíz-Pérez, and Achdiawan 2005), and that these could even discourage sustainable forest management by providing only limited scope for enhancement of household incomes (Arnold and Pérez 2001). Although NTFPs seldom accounted for a large share of household’s income, they were nonetheless recognized to be important in filling cash flow gaps, as a subsistence and economic buffer in times of crisis (safety nets), to supplement diets in particular seasons of the year and to help meet medicinal necessities (Arnold and Pérez 2001, Illukpitiya and Yanagida 2010).

Some scholars have argued that NTFPs could be financially rewarding only in exceptional situations, with well endowed commercially exploitable products, and good market access (Arnold and Pérez 2001, Southgate 1998, Phillips 1993). The nature of government involvement,
market transparency, property and political rights, and the ability of local forest dwellers to claim and enforce these rights also determine the outcomes of NTFP development and its contribution to poverty reduction (Perez and Byron 1999).

About 30 years ago, scientists started to pay attention to the economic contributions forest products play in rural livelihoods. “Hidden harvests” and “supermarket of the wild” were terms used to represent the undisclosed diversity of uses rural people in the tropics make of non-cultivated environmental resources, including forests, information generally ignored by national and international statistics (e.g., Campbell and Luckert 2002, Cavendish 2002). Studies aiming to quantify the value of forests to local communities ranged from per hectare values (Peters, Gentry, and Mendelsohn 1989), to understanding the contribution of forests to household income portfolios. Yet, forest benefits to rural communities go beyond income shares alone. Valuation is one step towards understanding the roles forests play in the complexities of rural livelihoods (Campbell and Luckert 2002). Conceptual and empirical work has also classified different possible dynamics concerning the role of forests in rural livelihoods, such as: supporting current consumption throughout the year; providing safety nets in response to shocks and cash needs; filling gaps due to seasonal shortfalls; allowing a pathway out of poverty; besides other local non-material benefits (Angelsen and Wunder 2003, Cavendish 2003, Fisher 2004, Vedeld et al. 2007, Angelsen et al. 2014, Wunder, Angelsen, and Belcher 2014, Wunder et al. 2014). By these means, forests “can make the difference between good and bad nutrition, between recovered health and prolonged illness or between food security and starvation” (Angelsen and Wunder 2003:23), and finally between life and death (Belcher, Ruiz-Pérez, and Achdiawan 2005).

Studies also suggested that factors influencing local forest use relate to historical aspects, state policies, the availability of the product and the type of production system being used, as well as
community organization, recognition of legal rights, and cultural features (Perez and Byron 1999).

In this chapter, we intend to explore the ways by which forests are important to the livelihoods of rural Amazonian peoples in very divergent socio-cultural and geopolitical contexts, encompassing three countries - Brazil, Bolivia and Ecuador.

2.2 Research Questions

2.2.1 What Kinds of Economic Contributions do Forests Make to Local Livelihoods across Divergent Amazonian Socio-cultural and Geopolitical Contexts?

Hypothesis 1: Forests are important to local livelihoods in multiple ways and throughout the year, not just in times of crisis or economic shortfalls.

2.2.2 To What Extent do NTFPs Contribute Economically to Livelihoods of Local Populations across the Study Regions?

Hypothesis 2: Non-timber forest products play a marginal role in forest-based livelihoods, contributing small proportions of household incomes.

2.2.3 In What Ways Were Observed Patterns of Forest Use Shaped by their Respective Biophysical and Geopolitical Contexts?

Hypothesis 3: The sustainability patterns of forest use are influenced by market opportunities and socio-political contexts.

2.3 Methods

2.3.1 PEN Database

Through a partnership with the Center for International Forestry Research (CIFOR), I had access to the Amazonian set of the Poverty and Environment Network (PEN) database, which consists of a global survey of tropical forests and poverty. The PEN global database encompasses large data sets of socio-economic information from 8,301 households in 333 villages and 58 sites spread over 24 developing countries across Latin America, Asia, Sub-
Saharan Africa (http://www1.cifor.org/pen). During the period from January 2005 to May 2010 and through quarterly household surveys, 33 PEN research partners (PhD students and junior scholars) gathered comprehensive data on all cash and subsistence income sources, including forests, non-forest natural environments, agriculture, livestock, wage labor, and other sources of external economic support. Short recall periods (3 months) distributed over one full year were used to collect detailed questions on household income sources (Angelsen et al. 2014). Location within tropical or subtropical regions, close proximity to forests and site-level variation to the global data set were the criteria used for selecting study sites (Angelsen et al. 2014). The sample is considered representative of tropical and subtropical smallholder-dominated rural landscapes with moderate-to-good access to forests (Angelsen et al. 2014, Wunder et al. 2014). The criteria for selecting villages within study areas were based on variations regarding distance to market, vegetation type, population density, ethnic composition, sources of risk, levels of poverty, land tenure and local institutions (Cavendish 2003); within villages households were sampled randomly (Angelsen et al. 2014).

2.3.2 Amazonian Sample

The PEN Amazonian subsample utilized in this study included four Latin America sites in the Amazon region: (1) riverside and slave descendent communities in the estuary region of Abaetetuba in the lower Amazon basin (Pará, Brazil); (2) rubber-tappers in western Amazonia (Acre, Brazil); (3) non-indigenous forest extractivists in northern Bolivia (Pando, Bolivia); and (4) indigenous peoples and settlers in the upper Amazon basin (Sumaco, Ecuador) (Figure 1-1). Throughout, we will predominantly refer to the research sites as Abaetetuba, Acre, Bolivia and Ecuador, respectively. Our quantitative analyses draws on data sets from 48 communities, and 510 households, across four sites and three countries, including eastern, central and western Amazonia. In Bolivia and Acre, the data were collected from 2006 through 2007, while in
Abaetetuba and Ecuador, data collection occurred between 2007 and 2008. We evaluated forest contributions to rural livelihoods in 4 villages in Abaetetuba (140 households), 4 villages in Acre (55 households), 8 villages in Bolivia (122 households) and 32 villages in Ecuador (193 households). Different distances between households and villages, village sizes, and particular study interests of respective PEN research partners responsible for data collection precluded equal sample sizes between study sites.

2.3.3 Descriptive Analyses

The data were firstly selected from the global database, cleaned and organized into different categories according to the specific analysis: livelihood strategy, cash vs. subsistence incomes, poverty standards, seasonal income shares, type of forest use, and categories of sustainability. Within categories of livelihood strategies, ‘environment’ refers to non-forest environmental incomes, related to other ecosystems and natural resources rather than forests -- i.e., natural grasslands. Depending on the analyses, aquatic natural resources (i.e., fish and shrimp) were either disaggregated into ‘fish from environment’ (offshore fish) and ‘fish from forests’ (derived from streams and nearby forest rivers), or pooled in the ‘environment’ income category. Descriptive analyses were then performed using the statistical software Stata IC10. Household income was divided by the number of individuals living within each household to provide a measure of per capita income, and national currency values were standardized using purchasing power parity (PPP); therefore, income figures are reported as PPP adjusted SUS per capita. The Ecuador sample was compromised by a certain underestimation of subsistence uses. Despite this bias that may lead to underestimates of subsistence values of forest in this site, it does not compromise the general finding that the site lacks a well endowed non-timber forest product or a well developed market that could provide substantial household incomes.
A measure of total forest income was generated by summing the aggregated variables related to use or sale of unprocessed forest products, firewood and processed forest products. Total, cash, and subsistence income averages, and relative contributions of these aggregated categories, were summarized by study region. To access how forests effectively contribute to alleviating poverty, it would be necessary to compare total incomes of our sampled populations with other rural populations that are non-forest users in similar geographical and biophysical contexts. It would also be necessary to include, besides income levels, other dimensions of living standards, such as life satisfaction, health, capabilities and well-being in such comparisons. We will discuss these “beyond income” parameters in Chapter 3, while here, as an initial assessment on the role of forest income in diminishing poverty within our sampled sites, subsistence and cash incomes from forest were subtracted from the total incomes, and percentages of individuals living below the poverty line ($1.25 PPP per capita per day, established in 2008 by the World Bank) were calculated for the different scenarios (with and without forest income).

A simple correlation was performed to assess the dynamics between forest and non-forest incomes, and to evaluate the extent to which forest resources would serve as gap fillers (used in between crop harvests or other economic activities). For a visual analysis of forest reliance throughout the year, we built a graph displaying the main livelihood strategies (translated as income shares), by season and at each study site.

To analyze patterns of forest use, the data was be disaggregated and then reorganized into categories of forest use: food-plant, food-wild animal, medicine, resins: plant, structural and fiber: non-wood, fuel-firewood, structural: construction materials, structural: sown wood. Households with less than three quarters during the year sampled were excluded from these analyses, and the data were collapsed to obtain measures of quarterly forest income per product.
code for each household. We then calculated means, standard deviations and proportions of income by categories of forest use at each study site. This same procedure was performed for the categories of timber, NTFP and game. Forest products extraction has mixed impacts on various forest features (Zuidema and Boot 2002), so we also developed measures of ecological sustainability. To examine forest use in terms of sustainability patterns across sites, forest derived income data were further reclassified into categories of sustainability, according to the type of product harvested: (1) ‘more destructive’ (or unsustainable) refers to the harvest of forest products with slow stock replacement, or in which the individual plants must be killed in order to be harvested (i.e., timber and palm heart); (2) ‘depends’ refer to forest products that may or may not require killing the individual plants to be harvested, may or may not damage the health of individual plants and depending on the harvest levels will affect population stability and ecosystem integrity (i.e., firewood may or may not be dead wood, tree stems, palm leaves, vines, fronds). Also included in the ‘depends’ category was game meat (mammals, reptiles, birds and bats), whose sustainability depends on management practices adopted, harvest intensity, and well established local institutions for management (since those are generally common pool resources). ‘Low impact’ products are those for which damaging or killing the plant is not necessary, in which the probability of affecting forest structure is very low, and in which only very high harvest levels would compromise population stability in the long term, such as seeds, wild fruits, resins (rubber, copaiba, leite de sucuúba, Brazil nut, açaí fruits), honey, dyes, insects and worms.
2.4 Study Sites

2.4.1 Pando, Bolivia

The northern Bolivian Amazon, which contains the departments of Pando and Beni, covers an area of about 100,000 Km2 and borders with Brazil to the north and east and with Peru to the west (Stoian and Henkemans 2000, Cardona et al. 2014). The population of Pando department was counted at 110,436 inhabitants in 2012, 27% of which were rural (Zenteno Claros 2013). The northern Bolivia rural population is composed of indigenous and non-indigenous extractive communities (estimated at 90% of total rural population), as well as by other social groups such as cattle ranchers, loggers and miners (Zenteno Claros 2013, Duchelle 2009, De Jong, Ruiz, and Becker 2006). The climate is classified as tropical and humid; annual temperatures range from 24° C to 26° C, annual precipitation from 1.834 mm to 2.774 mm, and altitudes range from 100 to 300 m above sea level (Zenteno Claros 2013). The region is covered with mostly intact lowland wet tropical forest vegetation, with abundant Brazil nut trees (Bertholletia excelsa) and rubber (Hevea brasiliensis) (Zenteno et al. 2013).

The Bolivian Amazon remained isolated during most of the colonial period (Reyes-García et al. 2014, Assies 2006). Only by late-19th century, did commercial interests in rubber (Hevea brasiliensis) and quinine (Cinchona spp.) penetrated into the Bolivian Amazon (Stoian and Henkemans 2000, Fifer 1970), and rubber exploitation in northern Bolivia boomed (Bieber 1984, Stoian and Henkemans 2000). The collapse and subsequent steady decline of the rubber economy led to a gradual diversification of rural livelihood strategies as forest dwellers started to combine subsistence agriculture with Brazil nut extraction (Stoian and Henkemans 2000, Fifer 1970, Barham and Coomes 1996, Zenteno et al. 2014). After the late 1980s, regional entrepreneurs invested in shelling facilities and began to sell the end product in international
markets (De Jong, Ruiz, and Becker 2006, Stoian and Henkemans 2000, Helbingen and Alan 2001). Over the 1990s, the Brazil nut economy grew in Northern Bolivia (Stoian and Henkemans 2000), while minor extractive booms of timber, gold and palm-heart occurred in the 1980s and 1990s (Stoian and Henkemans 2000, De Jong, Ruiz, and Becker 2006). In response to Bolivia’s 1994 Popular Participation Law, municipal governments provided infrastructure and services, leading families to congregate into concentrated communities (Cronkleton et al. 2010, Duchelle 2009). Indeed, over the 1990s, important policy reforms affected rural communities in the Bolivian Amazon: a Forestry Law democratized forest resources and ownership and recognized indigenous subsistence rights (De Jong, Ruiz, and Becker 2006), and a national decree in the 2000s allocated rural communities legal rights to 500 ha of forest land per household, as part of a single collectively held communal title (Zenteno et al. 2014, Duchelle 2009). Compared to other tropical forest regions, the northern Bolivian Amazon exhibits minimal environmental transformation: in mid 1990s, around 94% of land surface was covered by largely intact forest, and until recently, the cumulative deforestation remains at only 5.8% of the department’s forest area (Zenteno et al. 2014, Stoian and Henkemans 2000). Such low pressure on forest resources is a result of low population density, limited accessibility and because of the region’s forestry dominated economy (Zenteno et al. 2014, Stoian and Henkemans 2000).

2.4.2 Sumaco, Ecuador

The Sumaco region is situated in the Ecuadorian Amazon, a region known in Ecuador as “Oriente,” and is part of the upper Amazon basin, next to the eastern slopes of the Andes mountains; the rivers born there flow through the lowlands gradually converging into the Amazon river (Little 2001). The proximity to the Andeans mountain range, and temperature differences promoted by varied elevations, make this one of the rainiest regions of the Amazon.
basin: rainfall averages 4000 mm per year, with rain occurring all year round (Little 2001, Rudel, Bates, and Machinguashi 2002, Bilsborrow, Barbieri, and Pan 2004). Elevation averages from 1500 meters in the west and 300 meters to the east (Bilsborrow, Barbieri, and Pan 2004) and temperatures from 20°C to over 24°C (Southgate, Sierra, and Brown 1991). The rivers run fast, and even though they can represent obstacles until bridges are built, some waterways, such as the Aguarico river, have represented important transit areas for indigenous societies (Rudel, Bates, and Machinguashi 2002, Little 2001). In the upper Amazon basin, dramatic topography, and the variety of elevations and climate regimes, make this an area of extraordinary biodiversity, among the very highest in the earth (Southgate, Sierra, and Brown 1991, Little 2001, Myers et al. 2000).

The total population in Ecuadorian Amazon (including the provinces of Napo, Orellana, Sucumbios, Páez and Morona Santiago) in 2010 was 648,438, less than 5% of the total Ecuadorian population (INEC 2010). The Sumaco Biosphere Reserve (SBR), established in 2000 by UNESCO, is located in the northern Ecuadorian Amazon, covering part of the Napo, Orellana and Sucumbios provinces, with an area of 931,215 ha (Oldekop et al. 2012). The population living within the SBR buffer zone is counted at 107,804 inhabitants of which 70% is made up of indigenous lowland Quichua, while the remaining 30% are settlers (Bio-Parques et al. 2001, Oldekop et al. 2012).

The region has a long history of colonization, with a pre rubber phase characterized by gold extraction, Jesuit interventions, and trading of forest resources (Little 2001), and a rubber economy (1880-1913) based on the Castilloba elastic species, whose trees should be felled for the extraction of latex, requiring constant expanding exploitation of new areas (Little 2001). In the post rubber era the region suffered from aggressive capitalistic frontiers, including large scale petroleum exploration through consortiums ceded to multinational companies (Texaco and Gulf),
agrarian reforms encouraging colonization of lands considered to be uninhabited and leading to a rapid expansion of agricultural colonization, and government incentives inducing forest clearing to plant marketable crops and stimulating the use of pesticides (Little 2001). In the 1990s, the Ecuadorian Amazon presented the highest deforestation rates of any country’s Amazonian area, with about 2% of forest clearing per year (Bilsborrow, Barbieri, and Pan 2004). Main causes of deforestation were agricultural settlement, followed by oil discovery, cattle ranching, cultivation of naranjilla (Solanum quitoense) and logging of commercial species such as laurel (Cordia alliodora) (Bilsborrow, Barbieri, and Pan 2004, Rudel, Bates, and Machinguiaishi 2002). Since the Ecuadorian Institute of Agrarian Reform and Colonization (IERAC) required that those settled in forested areas clear their respective parcels in order to acquire formal property rights, many indigenous and settler communities sought to secure their land tenure by clearing forests for cattle and agriculture (Perreault 2001).

2.4.3 Abaetetuba, Brazil

The Brazilian site of Abaetetuba is situated in the Amazon estuary, Pará State, at the easternmost margin of the Amazon Basin. Its landscape is characterized by várzea floodplain forests, embedded in a network of channels, rivers, tributaries and a vast mosaic of fluvial islands (Hiraoka 1995). The PEN survey was conducted in two neighboring municipalities: Abaetetuba, (three communities included) and Limoeiro do Ajuru (one community included). With an area of 1,610,408 km², Abaetetuba hosts 141,100 inhabitants (87 inhabitants/ km²), of which 42% are rural riverside populations (IBGE 2013). Limoeiro do Ajuru had 25,021 inhabitants within 1,490,186 km², making up a far lower population density (16 inhabitants/km²), and a higher proportion of people living in rural riverside areas (76%) (IBGE 2013). Abaetetuba is situated only about 80 km from Belém - the state capital and the Amazon’s largest city (Hiraoka 1995).
The elevation throughout the region is between 9 and 15 MASL (SEPOF 2007); the climate is hot and super humid, classified by the Köppen’s scheme, with mean annual temperature of 25º C and mean annual rainfall of 3000 mm (Hiraoka 1995). In the Amazon estuary, fluvial dynamics are influenced by periodic floods: incoming oceanic tides push rivers and tributaries to flow upstream in freshwater tides; a daily and monthly (during the full and new moon phases) inundation occurs in addition to annual flooding (Wittmann, Junk, and Piedade 2004, Parolin et al. 2004). These water dynamics are not only visually dramatic, but they have profound influence in the ways people organize their social and productive activities (Harris 1998). Moreover, the complex web of waterways allows relatively easy fluvial access and transport of goods within the Amazon estuary region (Hiraoka 1995). The estuary region of Abaetetuba is composed of secondary forests combined with agricultural plots and some upland areas. The floodplain forest vegetation across the Amazon estuary region has a complex structure and is rich in palms, such as açaí (Euterpe oleracea) and miriti (Mauritia flexuosa) (Brondizio 2008). As a consequence of poor drainage and daily floods, agricultural and cattle production is limited within várzea forests (Siebert and Brondizio 2010). The floodplains of Abaetetuba are populated by caboclos, the mixed blood populations descended from indigenous, Africans and European colonizers, among other populations that migrated to the area, as well as some remaining communities of Afro-descendent (Quilombola) populations (Harris 1998).

The Amazon estuary has been subject to a long history of colonization and transitions through different and varied economic cycles, including a pre-rubber era, with European intrusions starting from 1500, and involving a Portuguese conquest based on slave expeditions, that established small farming and the wild forest products export economy, and congregated numerous indigenous societies into Jesuit villages (Little 2001). The rubber era strongly
integrated the region into the world market (Weinstein 1983). Following the rubber collapse, in 1910s, the mixed-blood caboclo population dispersed along riversides, and continued their adaptive livelihood strategies - which included fishing, hunting, small-scale farming and commercial extraction of forest products, such as andiroba (Carapa guianensis) and ucuúba (Virola surinamensis) seeds, Brazil nuts, copaiba oil and an assortment of resins (Little 2001, Hiraoka 1995). Between 1950 and 1985, the region passed through varied economic booms, including the cultivation of sugar cane (Hiraoka 1995), logging activities with foreign capital directed to export markets (Barros and Uhl 1995), and palm heart exploitation of Euterpe oleracea palms, with hundreds of canning factories in the region (Pollak, Mattos, and Uhl 1995). The açaí economy started to rise in the 1970, attaining national and international markets in the mid-1990s, and continued to expand exponentially to the point of reaching a level of economic activity not seen for almost a century in this part of the Amazon (Brondízio, Safar, and Siqueira 2002b). As a way to supply the growing demand for açaí fruits, the regional caboclo populations of the Amazon estuary intensified their production system through agroforestry, forest enrichment and management. Indeed, in stark contrast to the other parts of the Amazon, the açaí boom drove an inverse deforestation pattern in the Amazon estuary: despite population density and proximity to urban centers, the region has, over the past 25 years, experienced decreasing rates of forest clearing and a transition from existing farming and annual crop agriculture to forest-based production systems (Hiraoka 1995, Brondízio, Safar, and Siqueira 2002b).

2.4.4 Acre, Brazil

The westernmost Brazilian state of Acre borders with Peru and Bolivia, remote from the country’s main urban economic centers. This area of 16.4 million hectares used to be a Bolivian territory until 1903, when, at the boom of the rubber economy, it was integrated into Brazil,
becoming an official Brazilian state in 1962 (ZEE 2006). It is a peculiar place in Amazonian
history, because of a grass-roots movement that was initiated by invisible and powerless rubber
tappers, which developed into an internationally known struggle for social justice and
environmental protection, and culminated in a large-scale land use reform – creation of
extractive reserves for traditional populations -- that became a model of sustainable development
in the Amazon (Allegretti and Schmink 2009, Fearnside 1989). The state’s population is about
670,000 (IBGE 2005), 66% of which is concentrated in urban areas, mainly in the capital, Rio
Branco (ZEE 2006). The majority of the rural population is forest dwellers living dispersed in the
old rubber estates and found in a frontier between forest-based livelihoods and large-scale land
use economies (Ehringhaus 2006). The climate is humid tropical wet and average precipitation is
24°C and 32°C (ZEE 2006). The vegetation of the entire region is characterized by lowland
tropical forest (Duchelle 2009).

Colonization in that area began with the first economic cycle of rubber, around the second
half of 1800 (Almeida 2002). The rubber enterprise did not provide long-term economic
development in the Amazon region (Weinstein 1983, Barham and Coomes 1996, Duchelle
2009), as all the accumulated wealth was drained (ZEE 2006). After the rubber economy
collapsed, families of rubber tappers continued to live in the forests (Weinstein 1983, Barham
and Coomes 1996, Duchelle 2009), but forest extractivism was seen as a marginal and backward
activity (Ehringhaus 2006). The Brazilian military dictatorship, which started with the 1964
coup, targeted the Amazon with a classic capitalistic frontier, leading to land title manipulation,
forest destruction and expulsion of traditional dwellers, who were considered an obstacle to
Amazonian development (Ehringhaus 2006, Almeida 2002). National colonization programs
offered incentives for land occupation by foreign and national private sectors, without any regard for the local indigenous and traditional populations (Ehringhaus 2006). This colonization wave resulted in drastic environmental and social consequences, with unprecedented deforestation rates and alarming violence against traditional dwellers. Vast territories became increasingly concentrated in the hands of a few, while local people were brutally dispelled from their lands (Schmink and Wood 1992). In response to these tensions, rubber tappers began to organize different forms of resistance to defend their livelihoods; throughout the 1970s and 1980s, rubber tappers and Indians’ grassroots organizations were formed (Schmink and Wood 1992), and at the cost of many conflicts and deaths, the rubber tappers’ struggles redirected the economic model implemented by the military government. In January 1988, the first official Extractive Reserve was created in Acre (Almeida 2002, Fearnside 2003), and became a national policy of land reform when included in Brazil’s new constitution in October 1988 (Fearnside 1989). The Extractive Reserve policy is intended to safeguard usufruct rights for people engaged in traditional forest-based livelihoods (especially based on the extraction of non-timber forest products), while requiring residents to retain at least 90% of their lands in forest cover (Fearnside 1989, 2003).

2.5 Results

2.5.1 Kinds of Economic Contributions Forests Make to Local Livelihoods

2.5.1.1 Forest reliance in relation to other livelihood strategies

Table 2-1 displays the income shares from all economic and subsistence activities surveyed. Composed of all cash and subsistence values, total mean annual per capita income ranged from $US 520 to $US 1340. Bolivia presented the highest income per capita, and Ecuador and Abaetetuba the lowest total income per capita averages, while Acre stood out
somewhat in the middle. Across the four sampled sites, household income was derived from varied sources, illustrating the complexities of forest-based rural livelihoods. However, throughout the four investigated areas, forests represented the most important livelihood strategy, contributing the top income share, ranging from around 30% in Acre and Ecuador, to almost 40% in Abaetetuba and over 60% in Bolivia. Wage income ranged from 10 to 21%, representing the second most important income source in Bolivia and Ecuador. Agriculture-derived income contributed less than expected, considering that we are dealing with rural livelihoods, but held as the second most important income in Acre (20%), third in Bolivia (8%), and fourth in Ecuador (13%); agriculture made only a relatively minor contribution in Abaetetuba (3%), although it may still represent an important contribution to household nutrition.

2.5.1.2 Cash versus subsistence forest use

Across all sites studied, cash income surpassed subsistence income, and the same pattern was observed for forest income (Figure 2-1). In effect, both Bolivia and Acre sites, which are located geographically next to each other, revealed higher subsistence shares when compared to Ecuador and Abaetetuba sites, probably due to the remoteness of the former sites, and consequently their lower level of integration with markets. Ecuador results showed the lowest rates of subsistence, but evidence suggested that subsistence sources were underestimated during data collection. Rural poverty is an issue throughout the developing world and the data confirm the generally low annual income per capita across the study sites. Still, as we subtract forest revenues, incomes across the sampled sites would average only from 327 to 542 $US, leaving 63% to 77% of households below the poverty line. However, this rate falls to only 40% or less when forest income is included (Table 2-2). The only site where forests did not show a marked
contribution to diminishing poverty levels was in Ecuador, but these estimates were likely partly compromised by the sub quantification of subsistence incomes.

2.5.1.3 Safety nets, current consumption or coping with shocks

Do forests function as seasonal gap fillers (is extraction of forest products higher during periods of predictably low income and between crop harvests) or do they contribute to local livelihoods as regular income generation? Figure 2-2 indicates that across all sites, forest derived incomes contributed regularly throughout the year, even though they displayed some variation across quarters. Such cross-quarter income fluctuations are likely due to seasonal availability of forest products and possibly also to market fluctuations. Table 2-3 displays the correlation between annual and quarterly forest and non-forest incomes, respectively. A negative correlation would suggest that forests are important in generating income when other income sources are low (thus functioning as a gap filler), and a positive correlation would suggest that forests serve as regular income generation. Analyzing all sites pooled, the only activity that would function as a ‘replacement’ for forest income in all four sites, was non-forest environmental incomes (other ecosystems and natural resources rather than forests). Wage, non-forest environmental and crop income could function as alternative sources of income to forests in Bolivia (reflected by the Brazil nuts harvest season), while business and wage incomes could be alternatives to forest incomes in Acre and crop, non-forest environmental, and wage incomes were possible alternative sources to forests in Abaetetuba (reflected by fishing activity, and their engagement in other activities in between açaí harvests). These findings suggest that, across studied settings, forests serve as regular source of income throughout the year, and not just in times of crisis or when other income sources are not available.
2.5.2 Patterns of Forest Use and Insights into Sustainability Patterns of Harvests

2.5.2.1 Absolute and relative income by categories of forest use

The disaggregation of forest income by categories of use indicated large regional variation (Table 2-4). In Abaetetuba and Bolivia, the overwhelming majority of forest-derived income came from the food-plant category: 93.2% ($US 131) and 77.5% ($US 466) of total forest income, respectively; this same category composed 36.8% ($US 64) in Acre. We found a high contribution of game animals to forest income only in Bolivia (16.7%, $US 100) and Acre (33.0%, $US 57). Plant-derived medicines and resins were a markedly high forest income category in Acre (22.6%, $US 40) due primarily to rubber production, but very low in the other sites (0.1 - 2.8%). Structure and fiber (non-wood) and woody structural construction materials represented modest contributions across all sites (maximum 2.4% of forest income). The fuel-firewood category contributed a maximum 5% of forest income at all four sites.

We found striking differences when contrasting NTFP with timber categories of forest income across sites (Table 2-4). While over 80% of forest income in Bolivia and Abaetetuba was derived from NTFPs ($US 492 and $US 135, respectively), less than 4% of forest income in these sites came from timber ($US 9 and $US 5, respectively). The opposite pattern was observed in Ecuador, as 98% ($US 200) of forest income was timber-derived, and less than 2% ($US 4) of forest income derived from NTFPs. In Acre, the biggest forest income share derived from NTFPs (60%, $US 103) while timber contributed 7% ($US 13). The wild-animal food category also varied across sites, representing 33% ($US 57) of forest-derived income in Acre, 17% ($US 100) in Bolivia, and very small fractions in Abaetetuba (0.6%, $US 1) and Ecuador (0%, underestimated rate).
2.5.2.2 Relative forest income shares by category of sustainability

We present forest income by different categories of sustainability in Figure 2-3. More than 80% of forest income in Bolivia and Abaetetuba sites was derived from low impact forest use; this rate contrasted starkly with Ecuador, where over 90% of forest derived income was based on high impact forest use (mainly logging). In Acre, 60% of forest incomes came from low impact forest activities, a tiny fraction from high impact extraction and over 35% from resources in the “depends” category (consisting of animal-food and firewood). Table 2-5 displays the relative contributions of the 10 most important forest products in each study site, where we can further disaggregate patterns of forest use. In Bolivia, 71% of forest income derived from the Brazil nut economy, followed by subsistence products such as game, firewood and medicinal plants. In Acre, the top forest incomes derived from Brazil nuts and rubber, also followed by game, firewood and subsistence forest uses. In Abaetetuba, açaí fruit topped the forest income products (78% of total forest income), followed by palm heart and timber; other important forest products included game, firewood, wild fruits and stems. Finally, in Ecuador, the overwhelming forest income share derived from timber products, with the exception of a medicine plant (Moringa, 3.9%).

2.6 Discussion

2.6.1 What Kinds of Economic Contributions do Forests Make to Local Livelihoods across Divergent Amazonian Socio-cultural and Geopolitical Contexts?

Our data demonstrate that, after so many cycles of exploitation, forests continued to be central to these Amazonian livelihoods: throughout the four regions investigated, income from forests represented the most important livelihood strategy, with forest reliance ranging from 28-61% of total per capita income. These findings, on average, surpassed global assessments on
forest reliance. A meta analysis of 51 case studies from 17 developing countries revealed an average of 22% of total household income being derived from natural forests (Vedeld et al. 2007). The PEN global comparative research encompassing 24 tropical and sub-tropical developing countries found an average environmental income (including forest and other non-forest natural resources) contribution of 27.5% to rural livelihoods (32.1% in Latin America, 30.1% in Sub-Saharan Africa, and 22% in Asia) (Angelsen et al. 2014, Wunder, Angelsen, and Belcher 2014).

The income differences between Acre and Abaetetuba, both in Brazil, evidence the diversity of contexts existing in the same package of national policies and level of national development. The diversity of livelihood strategies illustrates the complexities of forest based/rural livelihoods: in our sample, besides forests, livelihoods also are derived from multiple sources, including agriculture, livestock, fishing, business, wage, non-forest environments, and others. It is worth noting that, while there are a large number of cash and non-cash income sources complementing each other, the distribution of income from different sources is somewhat skewed, since the top income source represented 28-61% of the total income at each site. Empirical evidence has demonstrated that rural livelihoods are much more complex than previously assumed (Ellis 1999), as they pursue diverse portfolios of economic and subsistence activities, with income derived from varied sources. Rural households rely on diversified income portfolios as a way to spread risk, manage timing of income, enhance capabilities for survival and resilience in the face of adverse trends, and improve standards of living (Ellis 1998, Ellis 1999, Belcher, Ruiz-Pérez, and Achdiawan 2005). Yet although engagement in multiple occupations is recognized to be beneficial for households at or below the poverty line, few poverty reduction policies have thoughtfully addressed this behavior (Ellis 1999).
Evidence from our analyses demonstrates that forests contribute to rural Amazonian livelihoods in multiple forms. Our results suggest that across sites, forests are relevant in providing subsistence and cash needs, helping alleviate poverty, and contributing to household incomes throughout the year (not only as gap fillers or in time of crisis). Our figures indicated the importance of forests in providing cash income, while also affording for subsistence activities, the consumption of goods that are “freely” provided by the environment.

The availability of forests in helping households meet their subsistence needs is also important in allowing rural people to escape from extreme poverty. The elevated poverty levels observed across all sites might be explained by the history of social exploitation throughout these Amazonian regions, despite the extraordinary wealth already produced through different economic cycles (i.e., gold, rubber, petroleum, timber, cattle). Yet, in our sample, forests make a substantial contribution in preventing extreme poverty, since without forest incomes, up to 70% of households would lie below the poverty line in Abaetetuba, Ecuador and Bolivia, and 63% in Acre. With forest income, up to 40% of households are lifted from extreme poverty. Other studies have argued that the possibility to maintain access to forest products is critical for poverty alleviation (Angelsen and Wunder 2003, Sheil and Wunder 2002, Wunder, Angelsen, and Belcher 2014).

Even though the data exhibit some variation of forest income shares across quarters, and some level of substitutability by other economic activities over the four sites investigated, forest income shares were present year-round, implying that, for these livelihoods, forests were not important only in times of crisis or in between crop harvests. In fact, at least for Bolivia, Abaetetuba and Acre, the opposite might hold true: income from other productive-economic
activities is necessary between harvest seasons of high valued forest products, such as Brazil nuts and açaí.

2.6.2 To What Extent do NTFPs Contribute Economically to Local Livelihoods of Local Populations across the Study Regions?

Our results on the role of NTFPs challenge the current notion that these products contribute only marginally and in small proportions to household incomes: we observed that in Bolivia, 61% of income was derived from forests and from that amount, 82% was derived from NTFPs. In Acre, forests contributed 34% of total income, and 70% of this total was from NTFPs; in Abaetetuba, 37% of income came from forests, of which 96% was derived from NTFPs. Only in Ecuador, where forest income based on timber was the principal income source (28% vs. 13.6% from agriculture and 18% from livestock), did NTFPs not represent an important income source.

Previous valuation studies suggested that the potential income from sustainable extraction of NTFPs could be higher than timber income (Balick and Mendelsohn 1992, e.g., Peters, Gentry, and Mendelsohn 1989), but this notion has been refuted by later assessments demonstrating their low relative importance in subsistence economies and limited potential to enhance household incomes through sustainable forest management (Belcher, Ruiz-Pérez, and Achdiawan 2005, Wilkie, Clark, and Godoy 2001, Illukpitiya and Yanagida 2010, Costanza, d'Arge, de Groot, Farber, et al. 1997). With such assessments, expectations that NTFPs could provide a solution to conservation-compatible types of forest production in tropical forests fell apart. However, in three of our four study areas - Pando (Bolivia), Acre and Abaetetuba (Brazil), NTFP importance stood beyond the role of supplementing diets, helping meet medicinal needs and serving as an economic buffer in hard times (Arnold and Pérez 2001). In these regions,
NTFPs played a central economic role, representing the principal source of income. What are the key features of these regions that may make them different from global findings?

Our study samples are fairly representative of smallholder-dominated Amazonian landscapes (Angelsen et al. 2014, Wunder, Angelsen, and Belcher 2014, Wunder et al. 2014), including multiple communities and not limited to isolated case studies of exceptional situations (e.g., a target community that received NGO support to enhance NTFP revenues). The species that comprehend the bulk of economic activity in our sample (Brazil nut in Bolivia and Acre and açaí in Abaetetuba) can be seen as well endowed products, and many of the areas from which these NTFPs are harvested (including most communities of our study sites) are remote, yet dependence on these NTFPs characterizes entire Amazon regions, such as southern Acre, northern Bolivian Amazon and the Amazon estuary region, that benefit from NTFPs’ economies.

It has been argued that NTFP contribution to national and regional economies is typically small relative to agriculture (Wilkie, Clark, and Godoy 2001, Costanza, d'Arge, de Groot, Farber, et al. 1997). Yet, historical as well as current evidence bring another perspective to this conception. Throughout colonization trajectories, NTFPs not only held a long history of use and trade, but mobilized large overseas markets. For instance, demand was present in the lower Amazon since the 17th century for cocoa, forest seeds and wild clove for export markets, while market demand for vanilla, agave, wild coca and quinine in the Ecuadorian Oriente boomed in the 19th century (Little 2001). The rubber economy in the late 19th and early 20th centuries affected the entire Amazon basin, generating extraordinary wealth, creating large urban centers and huge port facilities, deeply transforming social relations, and establishing market mechanisms and territorial systems that are present until today (Little 2001, Ehringhaus 2006). In effect, the rubber economy reached 40% of Brazil’s export revenues, second only to coffee (Rancy 1986, Ehringhaus 2006), and 49% of Bolivia’s export value (Bieber 1984, Stoian
and Henkemans 2000). Later in the 20th century, the Brazil nut boom in northern Bolivia attained US$30 million in annual export value (Stoian and Henkemans 2000, De Jong, Ruiz, and Becker 2006), while in the lower Amazon, the açaí fruit economy has exceeded several billion dollars, sharing a top position in the regional economy (Siebert and Brondízio 2010).

2.2.3 In What Ways Are Observed Patterns of Forest Use Shaped by their Respective Biophysical and Geopolitical Contexts?

Our results show that forests are used differently across study sites, in terms of products harvested, categories of use and sustainability patterns. For instance, in a given context (Sumaco/Ecuador), the bulk of forest income derives from timber, categorized as high impact forest use; an opposite pattern is also identified (Pando/Bolivia), where forest uses are carried at a low impact, based on Brazil nut - an NTFP responsible for the largest income share. Below we discuss results on forest use patterns in light of their respective sociopolitical contexts.

In Ecuador, we observed elevated levels of unsustainable forest use patterns, with over 90% of forest income characterized by high impact use. Top forest products used were all timber derived, 36% made up of sawn wood, with canelo and laurel the most cited species harvested. In Bolivia, the overwhelming majority of forest-derived income came from low impact forest uses (80%), whereas only 1% fell under the high impact forest use. Brazil nut topped the ranking of forest income share (71.5%). In Abaetetuba, over 80% of forest-based income derived from the low impact category, and around 10% from high impact forest use. Açaí was the most important forest product, responsible for 76% of forest derived income, followed by palm heart (8.5% of forest income). In Acre, 60% of forest derived income was categorized by low impact, 35% of forest use “depends,” and less than 10% of income came from high impact forest use. The most
important forest products extracted were Brazil nut (35%), and rubber (19.3%), followed by
game and firewood.

We do not provide statistical evidence of causalities between current patterns of forest use
and geopolitical contexts, but we can draw some reflections. Biophysical context matters since
the availability of endemic species with high market value (such as Brazil nut and açai) can be
an important factor determining scenarios of low impact patterns of forest use. Conversely,
economic cycles of forest products are dynamic over time, in such a way that species that were
previously ignored may enter into international market demand (e.g., açai), while other products
with developed markets can lose demand (e.g., Amazonian rubber). Market demand seems to be
a key factor determining scenarios where NTFP based economies thrive. But beyond this, the
cases investigated may suggest that government programs that support either a culture based on
forest extractivism, or that foment capitalist development programs, based on land speculation,
large scale agriculture and cattle ranching, as well as mega-projects for mining or petroleum
exploration, can also shape different scenarios of forest use. In Acre, both realities appear to be
present, since the region has been targeted with aggressive development frontiers, but the social
movements were able to redirect this scenario to maintain a forest-based way of living through
the development of Extractive Reserves. Still, cattle ranching evolved to be an attractive
livelihood option in the region as a whole and, to a certain extent, within the Chico Mendes
Extractive Reserve (Ehringhaus 2006).

Thus, our analyses indicate that, in Acre forest income is high, but livestock income is also
high - so it becomes clear that without the Extractive Reserve model, the region would hardly
have an NTFP based economy (Brazil nut and rubber) and forest based livelihood systems. In
Bolivia, the diversification of livelihood strategies that followed the rubber boom was based on
subsistence agriculture and Brazil nut extraction, and the nation state policies influenced such a
scenario, given that Bolivia did not have the development forces based on cattle and land
speculation frontiers as happened elsewhere. The forest based economy prevailed in the region
and the absence of classic capitalistic frontier likely helped to maintain that scenario. A
contrasting scenario, in turn, is observed in Ecuador, where the aggressive capitalist economic
forces (i.e., oil industry, cattle and agriculture) may, at least to a certain extent, explain current
patterns of high impact forest use. The paucity of sustainable patterns of forest activity in
Ecuador may also be related to absence of market demand for high value non-timber forest
species. In Abaetetuba, the várzea landscape itself, with its flooding dynamic, prevents the
region to be predominantly a livestock and farming target frontier, despite the colonization
waves undergone in the Brazilian Amazon region as a whole. Proximity to urban centers entails
larger population densities and moderately small property size by family. Moreover, relatively
easy fluvial access facilitated the opening of varied economic cycles (NTFP-based extractive
economy, logging, sugar cane, palm heart, açaí), which may also explain the lack of availability
of commercial-size timber in the region. Nevertheless, the re-conversion of modified landscapes
into forests in Abaetetuba, as a response to the growing açaí markets, may represent a real world
example where, even after suffering numerous cycles of human exploration and forest
degradation in boom and bust economies, it may be feasible that a different scenario can be built,
one that gets closer to sustainable livelihoods. In this case, secure titles for local caboclos
population, a stable market for a NTFPs, and some governmental support programs (bolsa
familia, seguro defeso, minha casa minha vida, bolsa verde) appear to be contributing to that
direction.
2.7 Concluding Remarks and Policy Implications

Based on evaluations across four divergent Amazonian contexts, which included geographical, biophysical, social-cultural and geopolitical variations, we assessed the size and nature of forest contributions to Amazonian rural livelihoods. Forests not only represented the most important livelihood strategy across all sites, but they also displayed relevance functioning as regular source of income. Forest based livelihoods across study sites exhibited complex portfolios, diversified production systems, seasonal variation of activities, including subsistence and economic uses, encompassing timber and non-timber forest products with different specialization strategies. We also provided concrete examples where NTFPs play a central role in rural livelihood economies, contradicting the conventional wisdom that NTFPs are limited to supplementing diets, serving as economic buffer in hard times, and helping meet medicinal needs (Arnold and Pérez 2001).

Different patterns of forest use, including levels of sustainability, were observed among different geopolitical contexts; divergent colonization trajectories and government programs might explain some of these variations. These figures give place to a number of policy implications. In these contexts, policies directed towards forests should be prioritized. The diversified production systems also imply that policies should be developed in a way to correspond to the multiplicity of economic activities, needs and contexts. Moreover, poverty reduction programs seem to be essential to address conservation and human wellbeing across forested rural landscapes.

Some scholars have advocated against the congruence between conservation and development interests in NTFPs, suggesting the risks of over exploitation (Vasquez and Gentry 1989, Witkowski, Lamont, and Obbens 1994, Hansis 1998), and that NTFP extraction may not
maintain the same level of biodiversity of a primary forest (Arnold and Pérez 2001). In effect, some risk of overexploitation of NTFP species exists with elevated market demand, but recent ecological studies of Brazil nuts indicated that only extremely high harvest levels of forest seeds would lead to population instability, and only over a long period of time (Wadt et al. 2008, Klimas, Kainer, and de Oliveira Wadt 2012), and even Brazil nut harvests within the Chico Mendes Extractive reserves displayed ecological sustainability (Wadt et al. 2008). The Abaetetuba case, where modified landscapes have been reconverted to forests as a result of market demand for açai fruits, may be evidence of the potential role of some NTFPs in sustaining forest-based economies. In effect, the demand for conservation has been, in a large extent, driven by northern concepts of scientific forest management, oftentimes at the expense of the knowledge of local forest managers (Arnold and Pérez 2001). Much of what can be considered by ecologists as degradation of a forest resource may be, in fact, transformation or improvement of a resource through local management systems, and caution has been urgent against “too narrow an assumption about linkages between human activity and forest change” (Arnold and Pérez 2001, Leach and Mearns 1996, Forsyth, Leach, and Scoones 1998). Moreover, intermediate systems such as agroforestry and locally managed forests can afford relatively high biodiversity levels compared to extensive agriculture or cattle ranching, on top of helping local people meet their economic needs (Belcher, Ruíz-Pérez, and Achdiawan 2005). Other reported benefits associated with NTFP sale include strengthening community organization, improving social justice through the involvement of disadvantaged community members in economic activity (Marshall, Newton, and Schreckenberg 2003), and potentially diminishing gender imbalances (Cunningham, Shanley, and Laird 2008, Shanley et al. 2012).
Where a valuable product is available, the market sufficiently attractive, and land tenure secure, people will likely engage in NTFP management (Belcher, Ruiz-Pérez, and Achdiawan 2005). If properly encouraged, productive sectors based on NTFPs can generate income, maintenance of forest ecosystems and improve social justice allied to poverty reduction, while avoiding the destructive effects of boom and bust economies. However, local producers are commonly trapped in disadvantaged social structures, including patron/client relations, low bargaining power, and poor infrastructure, health and education facilities (Belcher, Ruiz-Pérez, and Achdiawan 2005, Lanjouw and Feder 2001, Browder 1992, Pendelton 1992, Arnold and Ruiz Pérez 1998), so if NTFPs are to deliver conservation and development goals, then investments in other areas become necessary. We do not advocate the creation of NTFP markets and supplies in contexts where NTFP economies do not occur, but recommend improvement of conditions where they already occur, in a way that the poor and marginalized producers will retain the benefits and improve their standards of living. Besides, integrated solutions should be developed as a way to enable alternatives to the more destructive forms of land use (Arnold and Ruiz Pérez 1998). NTFP markets should also be understood as a component of a wider conservation strategy, encompassing a continuum from intensively transformed landscapes (such as the Abaetetuba case) to little disturbed forests (such as the Bolivia case), aiming for diversity at species, ecosystems and landscape levels (Arnold and Pérez 2001).

The next chapters will deal with locally developed mechanisms to manage forests, as well as social, political and structural barriers faced by forest peoples in achieving conservation and wellbeing balances, and local visions of policy alternatives that support sustainable systems in a macro-scale as well as at situation-specific settings.
<table>
<thead>
<tr>
<th></th>
<th>Bolivia (n=122 households)</th>
<th>Ecuador (n=193 households)</th>
<th>Abaetetuba (n=140 households)</th>
<th>Acre (n=55 households)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± sd</td>
<td>%</td>
<td>Mean ± sd</td>
<td>%</td>
</tr>
<tr>
<td>Total income</td>
<td>1341.8±2234.6</td>
<td>100.00%</td>
<td>531.1±1151.2</td>
<td>100.00%</td>
</tr>
<tr>
<td>Total cash</td>
<td>982.5±1945.4</td>
<td>73.23%</td>
<td>463.8±1102.8</td>
<td>87.33%</td>
</tr>
<tr>
<td>Total subsistence</td>
<td>360.5±593.4</td>
<td>26.87%</td>
<td>70.1±140.1</td>
<td>13.20%</td>
</tr>
<tr>
<td>Forest (total)</td>
<td>818.7±1489.0</td>
<td>61.02%</td>
<td>149.6±705.8</td>
<td>28.16%</td>
</tr>
<tr>
<td>Environment</td>
<td>19.4±35.5</td>
<td>1.45%</td>
<td>4.9±33.7</td>
<td>0.93%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>111.5±239.1</td>
<td>8.31%</td>
<td>72.2±202.1</td>
<td>13.60%</td>
</tr>
<tr>
<td>Livestock</td>
<td>77.2±391.0</td>
<td>5.75%</td>
<td>96.3±206.6</td>
<td>18.14%</td>
</tr>
<tr>
<td>Fish from forest</td>
<td>20.3±31.0</td>
<td>1.52%</td>
<td>5.9±17.4</td>
<td>1.11%</td>
</tr>
<tr>
<td>Fish from environment</td>
<td>0.1±1.0</td>
<td>0.01%</td>
<td>0.0±0.0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Aquaculture</td>
<td>0.0±0.0</td>
<td>0.00%</td>
<td>8.0±37.7</td>
<td>1.50%</td>
</tr>
<tr>
<td>Payment for forest services</td>
<td>10.3±30.2</td>
<td>0.77%</td>
<td>0.2±2.3</td>
<td>0.04%</td>
</tr>
<tr>
<td>Wage</td>
<td>142.9±373.0</td>
<td>10.65%</td>
<td>114.2±249.1</td>
<td>21.51%</td>
</tr>
<tr>
<td>Own business</td>
<td>98.1±367.8</td>
<td>7.31%</td>
<td>29.1±251.7</td>
<td>5.48%</td>
</tr>
<tr>
<td>Others</td>
<td>43.2±134.8</td>
<td>3.22%</td>
<td>50.6±103.6</td>
<td>9.53%</td>
</tr>
</tbody>
</table>
Figure 2-1. Annual per capita forest income, stratified by subsistence and cash derived income.

Table 2-2. Mean annual income per capita with and without forest share and respective proportion of households below the poverty line.

<table>
<thead>
<tr>
<th>Site</th>
<th>Annual income without forest (mean $US PPP ± sd)</th>
<th>Households below poverty line</th>
<th>Annual income with forest (mean $US PPP ± sd)</th>
<th>Households below poverty line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pando</td>
<td>523.1 ± 919.4</td>
<td>70.5%</td>
<td>1341.8 ± 2234.6</td>
<td>33.6%</td>
</tr>
<tr>
<td>Ecuador</td>
<td>381.6 ± 623.1</td>
<td>77.2%</td>
<td>531.1 ± 1151.2</td>
<td>71.0%</td>
</tr>
<tr>
<td>Abaetetuba</td>
<td>327.1 ± 294.7</td>
<td>74.3%</td>
<td>520.1 ± 460.1</td>
<td>56.4%</td>
</tr>
<tr>
<td>Acre</td>
<td>542.7 ± 724.3</td>
<td>63.6%</td>
<td>825.2 ± 1015.6</td>
<td>41.8%</td>
</tr>
</tbody>
</table>
Figure 2-2. Seasonal income shares: relative quarterly per capita income by livelihood activity, by site.
Table 2-3. Correlation of forest income with other income sources by site ($US PPP).

<table>
<thead>
<tr>
<th>Income Type</th>
<th>All sites</th>
<th>Bolivia</th>
<th>Ecuador</th>
<th>Abaetetuba</th>
<th>Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non forest income</td>
<td>0.1201</td>
<td>0.0886</td>
<td>0.1844</td>
<td>-0.0273</td>
<td>0.0536</td>
</tr>
<tr>
<td>Crop income</td>
<td>0.0035</td>
<td>-0.0473</td>
<td>0.021</td>
<td>-0.0386</td>
<td>0.0822</td>
</tr>
<tr>
<td>Livestock income</td>
<td>0.0608</td>
<td>0.2003</td>
<td>0.0484</td>
<td>0.1151</td>
<td>0.006</td>
</tr>
<tr>
<td>Environment income</td>
<td>-0.004</td>
<td>-0.0472</td>
<td>-0.0119</td>
<td>-0.0371</td>
<td>0.0226</td>
</tr>
<tr>
<td>Wage income</td>
<td>0.0767</td>
<td>-0.0052</td>
<td>0.2416</td>
<td>-0.0555</td>
<td>-0.0318</td>
</tr>
<tr>
<td>Business income</td>
<td>0.0985</td>
<td>0.073</td>
<td>0.0899</td>
<td>0.0107</td>
<td>-0.0022</td>
</tr>
<tr>
<td>Category</td>
<td>Pando, Bolivia (n=118 households)</td>
<td>Sumaco, Ecuador (n=115 households)</td>
<td>Abaetetuba, Brazil (n=137 households)</td>
<td>Acre, Brazil (n=54 households)</td>
<td></td>
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<tr>
<td>--------------------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------</td>
<td>----------------------------------------</td>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mean ± sd</td>
<td>%</td>
<td>Mean ± sd</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Food-plant</td>
<td>466.3±535.5</td>
<td>77.5%</td>
<td>0.0±0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>131.1±115.1</td>
<td>93.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>63.9±86.0</td>
<td>36.8%</td>
<td></td>
</tr>
<tr>
<td>Food-wild animal</td>
<td>100.3±409.7</td>
<td>16.7%</td>
<td>0.0±0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.8±2.1</td>
<td>0.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>57.3±52.2</td>
<td>33.0%</td>
<td></td>
</tr>
<tr>
<td>Medicine, resins: plant</td>
<td>16.6±107.8</td>
<td>2.8%</td>
<td>3±30.5</td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1±0.6</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39.2±61.8</td>
<td>22.6%</td>
<td></td>
</tr>
<tr>
<td>Structural and fiber: non-wood</td>
<td>9.8±26.9</td>
<td>1.6%</td>
<td>0.8±3.9</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.4±8.6</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.4±1.6</td>
<td>0.2%</td>
<td></td>
</tr>
<tr>
<td>Structural: sawn wood</td>
<td>1.6±5.5</td>
<td>0.3%</td>
<td>1.1±6.1</td>
<td>0.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.0±0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.6±3.3</td>
<td>0.3%</td>
<td></td>
</tr>
<tr>
<td>Structural: construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural: construction</td>
<td>1.1±6.8</td>
<td>0.2%</td>
<td>193.1±443.7</td>
<td>94.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.2±10.7</td>
<td>1.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.0±11.4</td>
<td>1.7%</td>
<td></td>
</tr>
<tr>
<td>NTFP</td>
<td>492.7±545.3</td>
<td>81.9%</td>
<td>3.7±30.7</td>
<td>1.8%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>134.6±117.9</td>
<td>95.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>103.5±108.6</td>
<td>59.6%</td>
<td></td>
</tr>
<tr>
<td>Timber</td>
<td>8.8±13.2</td>
<td>1.5%</td>
<td>199.9±443.7</td>
<td>98.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.2±15.1</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12.8±19.4</td>
<td>7.4%</td>
<td></td>
</tr>
<tr>
<td>Wild animal-food</td>
<td>100.3±409.7</td>
<td>16.7%</td>
<td>0.0±0.0</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.8±2.1</td>
<td>0.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>57.3±52.2</td>
<td>33.0%</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2-3. Sustainability levels: absolute and relative forest derived income shares
Table 2-5. Comparative ranking: Composition of the top ten most important forest products in each site and their respective relative contribution to the total forest income.

<table>
<thead>
<tr>
<th>Forest product ranking</th>
<th>Bolivia</th>
<th>Ecuador</th>
<th>Abaetetuba</th>
<th>Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Brazil nut</td>
<td>71.50%</td>
<td>Sawnwood (timber)</td>
<td>36.30% Açaí</td>
<td>76.80% Brazil nut</td>
</tr>
<tr>
<td>2nd Queixada (animal)</td>
<td>8.50%</td>
<td>Timber</td>
<td>31.00% Heart of palm</td>
<td>8.50% Rubber</td>
</tr>
<tr>
<td>3rd Fuelwood/ firewood</td>
<td>2.40%</td>
<td>Laurel (timber)</td>
<td>10.20% Timber</td>
<td>3.10% Deer</td>
</tr>
<tr>
<td>4th Deer (animal)</td>
<td>2.30%</td>
<td>Canelo (timber)</td>
<td>5.60% Fuelwood/ firewood</td>
<td>2.90% Paca</td>
</tr>
<tr>
<td>5th Medicinal plants</td>
<td>2.00%</td>
<td>Isigo (timber)</td>
<td>5.30% Frond - structural</td>
<td>2.60% Collard Peccary</td>
</tr>
<tr>
<td>6th Collard Peccary (animal)</td>
<td>1.50%</td>
<td>Tornillo (timber)</td>
<td>4.90% Game meat- mammals</td>
<td>2.30% White-lipped peccary</td>
</tr>
<tr>
<td>7th Paca (animal)</td>
<td>1.40%</td>
<td>Moringa (Medicine- plant)</td>
<td>3.90% Moriche Palm Fruit</td>
<td>0.90% Howler monkey</td>
</tr>
<tr>
<td>8th Tapir (animal)</td>
<td>1.40%</td>
<td>Roble (timber)</td>
<td>1.00% Bacris fruit</td>
<td>0.80%</td>
</tr>
<tr>
<td>Other monkies (animal)</td>
<td>1.10%</td>
<td>Mahogany (timber)</td>
<td>0.70% Bacaba</td>
<td>0.60% Tinamou</td>
</tr>
<tr>
<td>10th Agouti (animal)</td>
<td>1.10%</td>
<td>Canelon (timber)</td>
<td>0.30% Miriti stems</td>
<td>0.30% Tortoise</td>
</tr>
<tr>
<td>Others (64 products)</td>
<td>7.10%</td>
<td>Others (6 products)</td>
<td>0.80% Others (24 products)</td>
<td>1.20% Other (36 products)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.00%</td>
<td>TOTAL</td>
<td>100.00% TOTAL</td>
<td>100.00% TOTAL</td>
</tr>
</tbody>
</table>
CHAPTER 3
LOCAL MEANINGS OF FORESTS AND THE WORKINGS OF LOCAL INSTITUTIONS ACROSS TRANSFORMED SETTINGS

3.1 Introduction

3.1.1 The Existence of Locally Developed Systems to Manage Natural Resources

Scholars have provided good evidence that because of forest peoples’ intimate relationship with the environment, they often have more knowledge about local resource dynamics than anyone else. This knowledge has been labeled traditional ecological knowledge, local knowledge, or indigenous knowledge, and has been documented in a variety of ways (Berkes, Colding, and Folke 2000, Pawluk, Sandor, and Tabor 1992). Moreover, as local people depend on forest resources for their survival, they may have greater incentives to conserve them than do outsiders (Ostrom 1999, 1990). Finally, since forest dwellers coexist in the same rural environmental conditions, they develop close social ties, trust, identities and a vision of a common future; these characteristics, in turn, facilitate the capacity to cooperate, take collective action and develop community institutions to manage natural resources over long periods of time (Byron 1992, Ostrom 1999, Gibson, McKean, and Ostrom 2000). Using detailed historical and contemporary studies, especially focusing on small user groups and communities, political economists, social scientists, anthropologists and human ecologists have demonstrated that, where common property regimes are in place, resource users often have developed a wide diversity of mechanisms to avoid overuse, including rich webs of use rights, rules, norms, and sanctions (Agrawal 2002, Dietz et al. 2002). Such management regimes and institutional arrangements have been created, modified, monitored and sustained over long periods of time, allowing natural resource users to allocate benefits more equitably and efficiently (Ostrom 1990, Agrawal 2002).
A simple definition of common pool resources (CPR) comes from (Ostrom 1990:30) who describes them as “a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use.” One key characteristic of CPRs is their “subtractability,” meaning that one person’s use subtracts from what is available to others and, as a consequence, they potentially are subject to overuse and degradation (Dietz et al. 2002, Gibson, McKean, and Ostrom 2000). Examples of common pool resources are lakes, rivers, oceanic ecosystems where fish are harvested, the global atmosphere where greenhouse gases are discharged, or forests from which timber, game and NTFPs are extracted (Dietz et al. 2002).

In addition to the problem of potential overuse, people who are dependent on resources of this type as a source of subsistence and/or economic activity are also subjected to the “free-rider” problem: one person can take advantage of the benefits generated by others, whether or not this person has paid a fair share of the costs (Burger et al. 2001, Ostrom 1990, Ostrom, Gardner, and Walker 1994). That is, if a group of fishers limits their harvest levels to ensure population stability of the species harvested, other beneficiaries (or even members of that same group) can still overharvest, thereby increasing their net individual gains. If only a few users free-ride, it will decrease the joint gain to a certain level, which might still be affordable. The problem, however, is that if most members of the group decide to free-ride, the resources will be depleted and everybody will end up worse-off. Moreover, since exclusion is difficult, the temptation to free-ride is high (Ostrom 1990, Ostrom, Gardner, and Walker 1994). This is basically what characterizes the “commons dilemma.”

3.1.2 Definitions of Local Institutions

Institutions devised to regulate the use of CPRs address the aforementioned overuse and free-rider incentive problems. Institutions are defined by Dietz et al. (2002:21) as “the rules that
people develop to specify the ‘do’s and don’ts’ related to a particular situation;” and by Ostrom (1990:51) as “the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions.” Rules in a CPR include prescriptions that prohibit, allow, or demand some action or outcome, and can be used to define access, harvest levels of different CPR products, monitoring, who participates in key decisions, and other issues (Ostrom 1990, Dietz et al. 2002). In this study, we define local institutions (LI) as a set of self-organized processes, which include common purpose, meetings, agreements, rules, duties, and locally legitimate collective activities.

3.1.3 What is Behind the Development of Local Institutions?

CPRs users are jointly affected by basically everything each of them does: when acting independently, the benefits obtained may be less than if they had, in some way, coordinated their actions (Ostrom 1990). Therefore, the CPR dilemma is a question of “how to change the situation from one in which appropriators (users) act independently to one in which they adopt coordinated strategies to obtain higher joint benefits or reduce the joint harm” (Ostrom 1990:39).

Netting (1976) predicted that whenever resources had certain features, such as low-value per unit production, large area needed for use, and required a large number of people to allow for capital investment, common property regimes would be established by their users; such regimes have in fact been sustained for centuries without depleting or overharvesting resources. Most CPR users, especially in developing countries, live in the same villages, share social and cultural identities, and commonly have some form of family ties (Dietz et al. 2002). In many cases they have lived in these places for generations and intend to remain there for generations to come. Because of poverty levels and dependence on natural resources by many of these villagers, Runge (1984)
stressed that it is questionable to assume that individuals would adopt free-riding as their dominant strategy, arguing that they would instead opt to mutually agree on limiting their use. Within a given local context, institutions would enable users to arrive at agreements, ensuring that everyone would be following the agreed upon set of rules.

3.1.4 Dismantled Local Institutions

According to Ostrom (1990:216), extensive centralization of political authority from the colonial period until the second half of the twentieth century resulted in perverse local effects, in which (1) CPR users were assumed to be incapable of “long-term reflections about joint strategies to improve joint outcomes,” (2) institutions that users may have carefully developed and established were ignored or rejected, and (3) the solutions imposed by the central government were based on models of “idealized markets” or “idealized states.” Therefore, nationalizing forests in developing countries has been justified on the grounds that local users cannot manage forests sustainably (Ostrom 1990, Dietz et al. 2002). However, these reforms have resulted in disastrous outcomes for both forests and its users. First, government agencies issued detailed regulations concerning forest use and management, but due to budget and other administrative constraints, were unable to enforce those regulations. Second, by rejecting any existing locally-developed institutions, central authorities undermined local actions to sustain and protect forest resources. Third, and as a consequence, nationalization of forests resulted in “de facto” open access regimes, where self-sustained common property arrangements used to exist (Ostrom 1990, Dietz et al. 2002). The advocates of centralized government solutions mistakenly assume that official environmental agencies have sufficient and reliable information to arrive at both sustainable levels of resource extraction and mechanisms to ensure local compliance of the legislation or enable cooperative behavior, and that they are interested in doing so, and not corrupt (Ostrom 1999, 1990, Ostrom, Janssen, and Anderies 2007). On the
other hand, market-based solutions that induce resource-dependent people towards efficiency and short-term profit maximization can be exactly the strategy that will lead to overuse and destruction of natural resources (Ostrom 1990, Schmink 2004, Pokorny et al. 2010).

In the majority of the world’s forests, local forest management regimes and institutions crafted and maintained by forest communities have been replaced by state bureaucracies controlling forest management, with negative consequences for forests and their inhabitants (Charnley and Poe 2007). Likewise, it has been reported that, by restricting traditional forest management practices, state control over forest use has damaged locally developed management regimes and increased poverty in forest communities (Friedman and Rangan 1993). Berkes (2002:300) highlighted the need to analyze the historical and cultural contexts of local institutions, and pointed out that some of the commons literature tends to focus on “local level institutions to the exclusion of the outside world that impacts them and shapes them.”

Across four distinct Amazonian groups of forest users, which encompass geopolitical, biophysical, and socio-cultural variations, we explore the extent to which forest institutions have adapted over different cycles of colonization, eviction, labor force exploration, and centralized governments, how different they are, and why certain forms of local institutions have developed/survived in some settings and not in others. We discuss perceived strengths and deficiencies of existing local institutions for managing natural resources, and the ways state governments could play a supportive role in enhancing their performance.

3.2 Research Questions: Revisiting the Workings of Local Institutions in Transformed Settings

Commons theory regarding complex webs of rules and sophisticated local institutions is based principally on examples from ancient populations and ethnicities that developed such systems over the course of many generations in the same setting, and transmitted these adapted
and effective social systems through generations. But what about the situation of most contemporary populations, who had their lifeways disrupted by many cycles of invasion, domination, violence, epidemic diseases and labor exploitations? Or populations who had to migrate from non-forested landscapes to the middle of the jungle to extract rubber, and have been living there for just a few generations (such as the northeast migrants from Brazil who migrated to Amazonian rubber estates, or the Andean populations who migrated to the Amazonian lowlands in Bolivia)? To what extent do people from such adapted and transformed cultures perceive themselves to be allied to the forests, and feel incentives to conserve, and to what extent do these populations manage to organize and make their rules? Specifically:

**RQ1: In what ways do people from different adapted and transformed Amazonian settings perceive themselves to be allied to the forests?**

Hypothesis 1: We hypothesize that contemporary populations that have been affected by adverse historical events, capitalist economic frontiers and increasingly influenced by globalization, modernization and rural-urban migration articulate less-strongly a forest-related culture, identity, and attachment, and, consequently, perceive fewer conservation interests. However, to the extent that perceived forest connections persist, we hypothesize that the indigenous populations studied in Ecuador will present the most prominent identification with local forest ecosystems.

**RQ2: Are any features of local resource management institutions (LIs) present across transformed Amazonian settings that have suffered numerous unfavorable interventions from centralized governments and economic frontiers?**

Hypothesis 2: We hypothesize that LIs no longer exist or function among these contemporary populations. However, if LIs have persisted, we hypothesize that regions with the
longest continuous history of local cultural adaptations will have the strongest institutions to
guide natural resource management.

3.3 Methods

3.3.1 Study Sites

The study sites encompassed in this research lie in the Amazon region and include: (1) riverside and slave descendant communities (*Quilombolas*) in Abaetetuba and Limoeiro do Ajuru (Pará, Brazil); (2) rubber-tappers within the Chico Mendes Extractive Reserve in central-western Amazonia (Acre, Brazil); (3) forest-extractivists in the Manuripi Reserve in northern Bolivia (Pando, Bolivia); and (4) indigenous peoples (*Quichua*) and settlers in the Sumaco Biosphere Reserve buffer zone, western Amazonia (Sumaco, Ecuador) (Figure 1-1). Throughout, we will refer to the research sites as Abaetetuba, Acre, Bolivia and Ecuador, respectively. In Ecuador, since the majority of the rural population in the region is composed of *Quichua* indigenous peoples, and most interviews were conducted with this ethnic group, we provide most results and discussions related to them, unless otherwise specified as referring to non-indigenous settlers. In the Amazon estuary region, we conducted the research in three communities in Abaetetuba and one community in Limoeiro do Ajuru municipalities: throughout we will refer our results to Abaetetuba as referring to both sub-sites, unless otherwise specified. The historical, geographical and socioeconomic features of the four research sites encompassed in this study are presented in Chapter 1.

3.3.2 Fieldwork: Qualitative Interviews

Fieldwork took place from June to December 2014, and was conducted across the four sites. The main activities included meetings with local researchers, members of the Environmental Ministry, professionals in conservation and development organizations, and leaders of indigenous social movements, and visiting communities, where we conducted
participant observation research by interacting in the daily life of local people as they carried out subsistence activities, building trust and talking about research topics more informally. We also conducted and recorded semi-structured interviews with 78 families (33 in Ecuador, 19 in Bolivia, 11 in Acre and 15 in Abaetetuba), which amounted to 73 hours of recordings and 1389 pages of transcriptions. At each study site, a subsample of the PEN sample was randomized for selecting the households where the qualitative interviews were conducted; this included ten villages in Ecuador; four villages in Bolivia, four villages in Acre, three villages in Abaetetuba and one village in Limoeiro do Ajuru. Proportions of major within-site ethnic variations were replicated in the qualitative sampling design using a stratified random sample. For instance, in the Ecuador study site, 70% of the population is Quichua while 30% is composed of peasant settlers; both the PEN sample and the qualitative research subsample replicated these figures.

The people interviewed in each household were the self-designated household heads, and could be the woman, the man, or the couple (according to their availability), but in some cases more family members participated. At the end of each interview, we asked if they would like to give a five to ten-minute filmed testimonial of their most important messages on the issues discussed. Those film recordings were conducted with those who were willing and comfortable with it, either the household heads interviewed, or other members of the family who participated. The fieldwork methods were carefully chosen to give respondents a choice for personal expression and to disclose their own reflections on the topics under investigation. An interview guide containing 22 guiding topic questions was used with open-ended questions designed to enhance the opportunity for genuinely expressing the perspectives of forest dwellers, and to provide richer qualitative data about: (1) importance of forests from the local perspective; (2) local
conservation interests; and (3) the existence of local institutions. The interview guide included the following questions:

I. The importance of forests in the local perspective

1. What uses do you make of forests?
2. Can you list the species (plant types), and their uses?
3. In what ways is the forest important for your life and the life of your family?
4. Are forests important to your and your family’s health? Why?
5. In what ways is the forest important for your culture?
6. Do you have any sense of identity with this place, this environment, this forest? Can you talk a little about it?
7. What is “quality of life” for you? What cannot be lacking for you to say that you have a good quality of life?
8. Do you believe that your quality of life is related in some way to the preservation of the forest and the environment?
9. Can you live without the forest?

II. Local conservation interests

10. How many hectares of land do you have?
11. How many hectares of forest do you have, how many hectares of crops, pasture, etc.?
12. How much of your landholding would you like to keep as a forest?
13. Are you interested in keeping the forest in good condition?
14. Would you mind if there were no more forests around here? Why?

III. The existence of local institutions

15. Here in this community, are there internal rules of what you can and cannot do?
16. What are these rules?
17. How are these rules constructed?
18. How do you monitor and enforce compliance with these rules?
19. Do you determine any punishments in case of non-compliance with the rules? What are they?

20. Do you have community meetings here?

21. How often do you get together (per year, per month)?

22. What are the main issues discussed at these meetings?

The questions were asked in many different ways, according to the flow of the conversation and the dynamics of the interviews. Concerning all these questions investigated, information was shared in both directions, and dialog was established. We listened with attention to their perspectives, valuing their worldviews, their solutions and their hopes. These methods embraced a commitment to involving people in the diagnosis of and solutions to problems, instead of imposing external solutions to pre-defined problems.

3.3.3 Qualitative Analyses

As a first step, general themes related to the research questions were identified by reviewing all transcriptions of the interviews. Subsequently, 40 interviews (10 for each study site) were selected following two steps: first by choosing, for each study site, the three most detailed and informative interviews, and then randomly selecting the remaining seven interviews. This set of 40 interviews were imported into the MAXQDA software, where responses were coded. A combination of ‘open coding’ and ‘selective coding’ techniques was employed, combining analysis of what are known as ‘induced themes’ (concepts and categories that emerge from the data) and ‘a priori themes’ (coming from prior understanding of the phenomenon studied) (Bernard, Wutich, and Ryan 2016). The selective or a priori codes were: importance of forests; conservation interests; local institutions; and local rules. Additional ‘induced’ codes and sub-codes emerged in the open coding process, including 13 sub-codes under importance of forests, 7 sub-codes under local institutions, as well as other codes that in some way related to
the research questions, such as common purpose, incentive to cooperate, organizational intelligence, land claims issues, and government rules. Then, a retrieval technique was applied in which all interview segments related to each specific code were grouped by study site and then exported to Excel spreadsheets. For each theme, or code, the retrieved segments of the spreadsheets were reviewed many times for each study site, organized by similarities of topics within each specific code, and then transported into Microsoft Word. In Word, the themes were reviewed again and further organized by sub-topic themes: for example, the theme local institutions was organized by sub-themes structures and workings, origins, multi-functionality, hybrid local-government institutions and underlying mechanisms. Subsequently the retrieved material was further reviewed, and the writing process started by describing and explaining the phenomena identified in the qualitative analyses. The quotes that illustrated written descriptions of the subject studied were organized, and the ones chosen that most clearly represented the points being made.

### 3.4 Results

#### 3.4.1 Forests in Local Perspectives: More than Just a Utility

Overall, local people expressed the different dimensions of forest relevance to their lives in direct and indirect ways. When asked the question -- can you live without forests? -- the overall majority answered “no,” not at all. When asked why, the majority of first responses were because the weather would become too hot; some also answered that there would be no water; other answers included references to air quality, the maintenance of wild animals, human health, and the intrinsic value of forests. But within peoples’ narratives, the themes that most emerged in relation to forest relevance to local livelihoods were conservation interests, forest culture and identity, forest uses and forest-based wellbeing (Figure 3-1). Forest culture was expressed mainly in terms of local knowledge systems, such as medicinal uses, local hunting and fishing
techniques and, mostly among the Quichuas in Ecuador and caboclos in Abaetetuba, rituals and myths. Forest identity was mostly related to a sense of belonging, of being born and having grown up in that environment, of developing an empathy with forests, which may have, in some cases, translated into other themes such as forest-based wellbeing and conservation interests. Everywhere, people recounted feeling happier, calmer and safer in the forest areas as compared to cities. Conservation interests were expressed in varied ways, encompassing statements about the importance of the future availability of natural resources, the desire to provide for future generations, because of the wellbeing they provide, because of an identification and attachment to nature, and because they saw conservation as a better strategy. They were predominantly in favor of conservation strategies, but in some cases, they also claimed the need for material incentives, since the influence of competing livelihood strategies could be very strong. In economic terms, forest uses were frequently expressed as having overall importance throughout the year, for income generation (such as açaí in Abaetetuba, timber in Ecuador and Brazil nut in Bolivia and Acre) and subsistence (hunting, collecting firewood, medicines, plant food, timber for construction, fiber and seeds for handicrafts, among others). Chapter II presented the quantitative information regarding forest incomes (including subsistence and commercialization) at each study site; here, we present the information on forest uses according to local narratives expressed through qualitative interviews. Below we describe the detailed elements related to each of these themes, for each site.

3.4.1.1 Forest and other local resource uses

Acre. In Acre, the frequency of forest-based activities varied between those who conducted them daily or weekly throughout the year, and those who conducted them more sporadically. During the Brazil nut harvest season, however, all families attested to working
every day in the forest. Brazil nuts had a central and major local importance due to the amount of income they provided; people made livelihood plans around the Brazil nut harvesting season, which was a much anticipated time. Rubber was still extracted, although not every family engaged in its collection and processing. They hunted regularly, with frequency varying from weekly to at least once a month, and they fished sporadically.

We use the forest for various purposes, wood to build things, açaí, Brazil nut, rubber, hunting that we often do to survive, there are fish in the stream… there are many things (Aderaldo Ribeiro, Acre).

Timber was also used for a variety of local construction needs, and commercialization in some cases. People used açaí fruits sporadically for consumption, but did not seem to make use of a wide variety of other forest fruits. Natural remedies from the forest were common, and said to be better than industrial remedies, for being natural, and containing no chemicals. In fact, people praised the effectiveness of natural remedies taken from forest from barks and leaves and resins. These included copaíba, jatobá (both tree resins and barks), farirí and boldo.

**Abaetetuba.** In Abaetetuba, forests also represented people’s everyday source of living. Açaí fruits were referred to as the most important product locally, but first as a cultural element of their diet, and only secondarily as their main source of income. They were used to eating açaí at every meal daily throughout the year: açaí managed forests can produce almost up to nine months a year, but fluctuate regionally. To compensate for this, they used to buy açaí fruits from neighboring areas in between harvests. In addition to açaí, unlike in Acre, there was an extensive variety of locally consumed and traded forest fruits, including bacaba, buriti (for consumption and commercialization, and also used for feeding pigs), taperebá, cupuí, cacu, remeleira, caramelo. Local people in the estuary region extensively consumed fish and shrimp. Eating fish and forest fruits daily was locally recognized as a healthy habit, as compared to eating industrial food from the cities. Unlike in Acre, hunting was not very intense because of the small average
landholding size and high population densities, which seemed to have reduced availability of
game, but hunting *mucura* (an Amazonian edible skunk species) was quite common. Firewood
was regularly used locally. Natural remedies from the forest were locally valued, appreciated and
widely used, including *ubuçu* (for stomachaches, traded in the nearby city), *jenipapo* licor (which
is good for curing hepatitis diseases), *andiroba* oil (widely used as medicine and used
traditionally to make homemade soaps), *sucuuba* tree bark, and honey from wild native bees. All
local construction used local timber (mainly *virola, anani, andiroba*), which was also sold in
times of crises. People used forest fibers, such as the *ubuçu* palm fiber for roofs, and *jupati* stems
for manufacturing shrimp traps.

**Bolivia.** In Bolivia, as in Acre, the most important forest product and the highest source
of income was the Brazil nut. Brazil nut harvest season was greatly anticipated, and people
expressed a sense of pride and identity in harvesting Brazil nuts, gaining happiness from this
activity. They extracted rubber to a limited extent, related to specific contracts that supplied
rubber to national industries. Some families wove leaf fiber for thatching roofs, an economic
alternative to Brazil nuts between harvest seasons. This fiber was sold locally and at nearby cities
such as Cobija and Riberalta. Hunting was common and an important element of their diet, as in
Acre; fishing was routinely practiced in communities nearby the Manuripi river, and they
recognized the advantage of not having to purchase animal protein. There was not a wide variety
of forest fruits consumed, but they extracted *açaí* and *majo* (or *patuá*) for subsistence, and some
reported modest commercialization of these products inside the communities. The use of
firewood was common as well as the production of charcoal for local consumption. Timber was
used for local construction and barely sold in the communities inside the Manuripi reserve, but
more commonly harvested in communities outside the reserve. Someone explained that, even
though the forest had a central importance for their livelihoods, they did not retain an extensive knowledge of the diversity of natural medicines the forests could afford: “we do not use other resins and medicinal plants from the forest because we do not have enough information, but we are aware they exist” (Ediberto Cartagena, Bolivia). Others did, however, exhibit knowledge and uses of natural remedies, including *patioba* bark, *pipa*, and *açaí* roots. “The vegetable remedy from the forest is better than buying in the city. Right now, we have plant remedies that we have prepared here” (Nancy Lengua, Bolivia).

**Ecuador.** In Ecuador, both *Quichua* and non-indigenous settlers demonstrated appreciation for living in a calm place where there was plenty of game, fish and wild fruits. The *Quichua* especially derived a whole variety of food from the forests, including fruits, game, mushrooms, worms, palm heart and herbs, which were complemented with products from the *chackra* traditional agroforestry system - plantains, cassava, bananas, and a variety of planted fruits and roots. “The food that we get without spending, economically” (Lino Shiguango, Ecuador). Even though in our quantitative assessments timber stood out as the most important economic forest use in Ecuador, they did not frequently mention logging as an essential element of their livelihoods. There were two possible reasons for this: first, they were aware of the negative impacts of logging; and second, the quantitative PEN surveys (used in this study as secondary data) had been conducted seven years before the qualitative interviews, and during this intervening time the activity may have decreased. *Quichua* populations used forests extensively for medicinal purposes. “The forest is a pharmacy - if you know all the remedies that are available in the forest you will know it is a huge and complete pharmacy” (Oswaldo Cerda, Ecuador). People provided rich testimonies regarding their experiences in attempting to cure diseases using conventional medicinal treatments in the cities, and using industrial
pharmaceutical remedies versus using forest derived remedies. The contrast was stark: they said their health would get worse while using prescribed drugs from industrial pharmacies, while they would be cured and become healthy using local forest-based traditional medicine recipes. They complained that industrial remedies were full of chemicals that were bad for one’s health. The Quichua commonly provided the example that previous generations who had lived exclusively from the forest, having diets based on natural food, did not die from diseases; they died from old age only, and would commonly live up to or more than a hundred years.

In all sites studied, the forest was used for a range of purposes, but contextual variations were evident. Acre and Bolivia were similar in that Brazil nut was the most relevant forest product locally, and many other forest activities were conducted around Brazil nut harvests. Game was commonly used, likely due to the average larger landholding sizes as compared to the other two sites. Forest fruits and medicine were consumed but not extensively. Geographical proximity, related biophysical characteristics, and similar colonization histories might also explain observed similarities in forest use patterns between Acre and Bolivia. Abaetetuba presented a much higher diversity of local forest uses, including, in addition to açaí, a wide variety of fruits, medicines, and fibers, which may be explained by the geo-physical characteristics of the Amazonian estuarine floodplains and the region’s longer process of cultural adaptations. Finally, people in the Ecuador site displayed stronger traditional forest-based knowledge systems, for the variety of medicine, food and plant domestication through indigenous agroforestry systems; as in Abaetetuba, we attribute this diversity to the region’s longer history of colonization, allied to the Quichua indigenous culture and knowledge.
3.4.1.2 Forest culture and identity

In Acre, people’s cultures appeared to be linked to the forests to the extent that their lifeways were connected to the forests. They explained that people who were born within the reserve area, grew up tapping rubber, harvesting Brazil nuts, hunting, fishing, and living isolated lives in the *colocações* (individual landholdings based on rubber trails), held a forest-based rubber tapper derived culture. They very often related the fact of having been born and raised in the forest as an explanation of their attachment and sense of belonging; informants narrated how they identified with their environment and lifeways. They often referred to forests as being an essential element of their lives as well as their inherent source of life. Some even mentioned the word “love” for the forest. Identity could also be interpreted through their accounts of forest elements (such as rubber trees) as lifelong references.

If you go on felling the Brazil nut trees, it will offend the Brazil nut, offend the rubber trees. Because it was from rubber trees that I was born and raised, this is my blood; if you fell a Brazil nut tree or a rubber tree, this is the same as knocking down a person (Antonia Silva, Acre).

The forest is our source of life; this is part of our lives (Maria Francisca da Silva, Acre).

On the other hand, the more recent allure of cattle-cowboy culture was somewhat seducing some of the young population within the reserve, and was being merged with the forest-based rubber tapper culture (see Hoelle 2011). Forest myths did not appear to be common at all; however, forest-based knowledge systems existed for a variety of timber species, and people had a moderate knowledge of forest-derived medicinal products.

In Abaetetuba, forest culture was expressed by the rich diversity of river and forest-based daily life activities which were very specific to riverine communities from the estuary region, including complex knowledge systems on a variety of forest uses; fishing techniques tailored to tidal and flood dynamics; medicinal recipes based on forest products; shamanism; and myths.
They made handicrafts with the muriti (*Mauritia flexuosa*) fiber, and sold them in Abaetetuba and in Belém once a year. The culture of *açaí* extraction and consumption was very prominent in the region, inherited across generations and economic cycles. Young people demonstrated a preference for working with traditional forest practices such as *açaí* fruit harvesting, fishing, or weaving *matapi* (shrimp traps), rather than engaging in urban labor activities. Forest culture was also related to local knowledge in a variety of medicinal uses. *Garrafada* was a quite common type of forest-based medicine, which consisted of recipes for making extractions from a combination of forest leaves, barks and herbs that were commonly prescribed by a local shaman and used for different medicinal purposes. In an interview in Limoeiro do Ajuru, when asked if they used medicine from forest plants, the woman answered: “Sometimes we have a stomachache, we take the *anoerá* tree bark, a palm heart root, the *veronica* herb and the *jupindá* that is known as *mão de gato* [cat’s claw]” (Maria Elza Magno, Limoeiro do Ajuru). Even though these were not indigenous populations, shaman (*pagê*) culture was quite common for curing diseases. They contrasted many experiences between treating diseases in the cities versus with a local shaman, and they reported that they were cured for good only when consulting a good local shaman and using natural remedies from the forest; examples included the cure of hepatitis, gastritis, scorpion bites and others. Forest related myths and rituals were commonly recounted. For instance, the São João traditional party is a Catholic-derived event that occurs in June across the country, but in the Amazon estuary region it was expressed as a serious ritual with a variety of forest-based elements. They made a bonfire at daybreak, danced and jumped in the river, and then took a bath made with a mix of forest herbs and leaves; they also washed the house with this water at dawn, saying it brings health throughout the year. A very prominent legend from the Amazonian floodplain forests consists of a diversity of stories related to
freshwater dolphins (*botos*) turning into men and enchanting people (see also Slater 1994). In Abaetetuba, people also expressed deep love for the forest, and satisfaction about working in forests. They identified themselves as *ribeirinhos* and *caboclos*, relating these identities to a set of traditional ways of working with forests and waters; their knowledge systems; their profession; and their way of living.

Like the musician, each one with his instrument, right? We live here, we have been born and grown up in this environment and this is the type of living we are identified with. If I go to any other place, I feel strange (Francisco Baia, Abaetetuba).

In Bolivia, forest related culture was based in their knowing how to pursue forest based activities, such as hunting, collecting *açaí* and *majo* fruits, and harvesting Brazil nuts; people referred to the knowhow of Brazil nut harvesting as culturally specific, that is, one had to know how to do it properly. They expressed identity as Brazil nut harvesters, as adapted to a forest-based way of living, as well as from being born and having grown up in that environment; they displayed attachment and good feelings about the forest. “This is our culture, our nature and this is our way of living” (Omar Villalobos, Bolivia).

You already know how to live in the city, right? We do not have a profession, but we already know the work here. We are better here (Gilberto Gonzales, Bolivia).

I've grown up here and I know the forest, I like the forest. I like to go see and admire the things that we have in nature, and I would not like to see it deteriorated. I feel happy to be part of this place (Armando Amuruz, Bolivia).

Some people demonstrated specific knowledge on medicinal plants from the forests. A few people engaged in making handicrafts from forest products, but apparently it was a recent innovation, as opposed to a traditionally inherited activity.

In Ecuador, a forest related culture (*Rukucawsay* in *Quichua* language) was expressed in many ways. *Quichua* people collected fiber from the forest and wove baskets, to both sell and use in their livelihood activities; for example, locally-made basket bags made from forest fiber
were used to load cassava and plantain. Additionally, women went to the forest to extract NTFP resources to manufacture handicrafts for local use and commercialization. At local parties, they dressed in traditional clothes and accessories (necklaces, bracelets, etc), using forest seeds and fibers. Additionally, they manufactured indigenous handicrafts with wood, gourds and clay, and sold them in larger quantities to intermediaries or stores. Most Quichua communities maintained alive the Quichua language, which was also used to name and categorize a wide diversity of forest species, including mammals, birds, reptiles, amphibians, insects, trees, palms, vines and herbs. In essence, culture was also expressed through local knowledge on traditional agroforestry systems and domestication of plants, and on traditional tree nursery techniques and reforestation. People attested to transmitting these knowledge systems across generations. For instance, they ate six different types of insect larvae (*patascuro, tucuricuro, guanburacuro, chinchicuro, pacaycuro, chantacuro*) that grew inside a species of palm; these were locally appreciated as food, but also used medicinally. Another example was the *Guayusa* - a traditional tea that they drank in the morning; according to them, it brought vitality and protection to the body. They recounted that after drinking *guayusa* and going to conduct a certain activity in the forest, such as hunting, they would sense a snake before it got too close; the body would feel the danger in time to protect itself. Knowledge of forest-derived medicinal plants was present in all Quichua communities interviewed. Shamanism was commonly mentioned as being associated with power, knowledge, cure, *ayahuasca* (a hallucinogenic beverage made from a vine) and forest elements’ spirits. Shamans could be either men or women, and according to them, the spirits would choose a wise and strong individual to be a shaman. But people affirmed that both shamans and spirits of nature were becoming less common with the arrival of oil industries, machines, pesticides, chainsaws and as contamination and population growth advanced. Some
communities were investing in rescue and local valorization of indigenous culture, which was also used for tourism purposes; in one community where they invested in tourism, a group of young people studied their ancient culture and histories. A young man interviewed described in detail all the historical events from the local perspective, knowing the names of different indigenous warriors and their confrontations with Spaniards and other outsiders. People also described in detail how their ancestors made a living in terms of community norms, traditional hunting and fishing techniques, diet, typical parties, burial rituals, dress, medicinal knowledge, shamanism and so on.

There is the spirit that comes from the mountains, the jungle, the lagoons, the waterfalls, millennial trees, the anacondas, snakes; they have spirits of nature, so any of the spirits can contact them. The shamans have the same spirit and power. They heal. They are wise, they have their power (Guillermo Andi, Ecuador).

*Quichua* identity overlapped with forest identity to the extent that knowledge, customs and practices were specific to Amazonian *Quichua* culture. Forest identity also overlapped with territory and their struggles to defend their lands. Some reported feeling affectionate and loving about the forest, love for the jungle, love for the river, and said many times they wanted to go there even at moments when there was no need, just because they felt attracted to it. They also related to the forests as being friends, by having wisdom and by interacting with plants and animals. Forest and ethnic identity had common ties to conservation motives, as they acknowledged that forest degradation was linked to their loss of identity.

Identity is our knowledge more than anything. Through the *Quichua* identity, we value ourselves. Then we, as *Quichua*, defend our value purpose (Guillermo Andi, Ecuador).

As identity matters, I am a *Quichua* family and a forest native (Alberto Shingua, Ecuador).

We live with the forest. We and the forest are a tremendous congruence. It hurts me when I see deforestation; I don’t like for people to cut trees (Lino Shiguango, Ecuador).
In different ways across the study regions, forests were linked to local populations’ culture and identity, even among populations that had more recently migrated to forested landscapes. In Acre and Bolivia, we observed cultural appropriation of forests, based on their pride of working with forests, their affection and sense of belonging. In Abaetetuba and Ecuador, on the other hand, we found rich elements evidencing a long history of interaction and cultural adaptations with forests, illustrated by knowledge systems, traditions, histories, myths and beliefs. As such, there was a strong forest-related cultural and identity continuum, from the shorter to the longer colonization histories.

3.4.1.3 Forest-based wellbeing and conservation interests

Acre. In Acre, living in a forest environment was in many ways viewed as being positively related with wellbeing. People said that living in the forest was always healthier, cooler, more comfortable, not violent, calmer, and that these characteristics were locally valued; they explained that living near the woods, and eating healthy food, were locally seen as elements of a good quality of life; “one breathes pure air, one gathers everything natural” (Maria Francisca da Silva, Acre). They affirmed that working in forests was laborious, but in the end, it was worth it. They commonly reported they could not imagine themselves living without forests with regard to their wellbeing; there was a consensus that they did not feel comfortable or safe in the nearby cities, and that living in nearby forests was linked to living in peace and tranquility. When asked if they would be willing to move to the city, they promptly answered “not at all.” “Not at all, not for the difficulty, but for the forest, for the good that the forest does” (Maria Vera Teixeira, Acre). In spite of many obstacles and difficulties related to living in the forest, such as difficult market access and transportation, they believed that moving to an urban center was not the solution for their problems.
We live in paradise. I like it very much, I feel very good here. What we would like is to live the same life that we are living in a better way; we do believe that we can survive here without having to leave (Aderaldo Ribeiro, Acre).

Perspectives on conservation interests were polarized between those having a conservation-oriented mentality, and those who were more influenced by the strong and expanding cattle frontier in the region; however, within this spectrum, there were those who lay in between, and believed that they could attain complementary diversified forest-cattle production systems. They needed and wanted to practice agriculture since this was an important local livelihood strategy, related to food security and autonomy; indeed, they defended the idea that they could not live without subsistence agriculture. But they also wanted to be able to raise cattle to some extent, since the market was highly favorable, and cattle provided a crucial source of savings at times of crises. Still, they provided varied evidence of not being aggressive about the expansion of cattle, and articulated their motivation to maintain forests for other purposes. They explained that the condition of family farming itself did not allow them to work in large scale agriculture, and they did not want to clear more than they were able to manage. Others defended the strategy of opening secondary forest parcels where agriculture had already been practiced, instead of clearing new areas of primary forests. A local leader explained that there were those who were more ambitious in converting forest into pastures. But she also described the ways some individuals manifested forest conservation interests, such as maintaining minimal forest openings; planting small scale and diversified agricultural systems using leguminous plants as soil fertilizers as a way to avoid opening new forest areas; and advocating for forest conservation in community meetings. Some people preferred rubber tapping rather than working in the fields of agriculture and cattle, but still cleared their forests for agriculture, asserting that the value of rubber and Brazil nuts alone was not sufficient to supply their needs. They expressed consciousness about conservation-oriented behavior in not hunting young wild animals, pregnant
females or females that recently gave birth. They wondered how they would be able to survive without the forest, without the availability of game, Brazil nuts, fresh air and water, and expressed the desire to leave forests for their children and future generations.

**Abaetetuba.** In Abaetetuba, people attributed forest-based wellbeing to the possibility of breathing fresh and uncontaminated air, and the availability of many sources of fresh and natural food (fish, shrimp, game, fruits). They often related quality of life to the availability of *açaí* to consume locally in abundance and with no monetary cost. They expressed satisfaction about living and working in the forest, and expressed happiness in pursuing their forest-based lifeways. Working in forests also was valued as allowing them to work in the shade as compared to farm labor in the hot sun. They consistently reported that they could not get used to the cities, where they did not feel safe and the temperatures were too hot.

Here we sleep with the door open and are not worried about having our boat stolen (Francisco Baia, Abaetetuba).

For us who are accustomed here to the middle of the forest, that pleasant and fresh wind, it flavors the air that comes from the woods (Maria Conceição Cardoso, Abaetetuba).

We are *ribeirinhos*, and here it is a hundred percent better. Nature provides so much life to us (Edigio Monteiro, Limoeiro do Ajuru/Abaetetuba).

Conservation interests could be identified in varied ways. People in Abaetetuba had smaller landholding sizes (average of 20 ha per family) when compared to the other study areas, and they usually planned their land use activities around small-scale agricultural planting for subsistence, *açaí*-enriched forests and a reserve of natural forest that they used for hunting, firewood and NTFP gathering. Therefore, conservation interests could be identified by their strategies to use the land, opting not to expand the *açaí*-managed system above a certain limit, even though the economic gain of expanding *açaí* production would far surpass the economic gain from natural forests. In addition, their choice of managing natural *açaí* forests instead of
creating açai plantations was expressed as a function of their appreciation for maintaining a forest-like ecosystem. They also demonstrated interest in preserving forests for their own future use and to provide resources for future generations. Some of them shared their past experiences of living in upland forests, along with their observation of the loss of wellbeing as a consequence of forest clearance, including detrimental changes to the weather and the quality of soils for planting. They also said that people in general were more conscious of not overharvesting resources than before, because they had experienced the consequences of degradation and lack of resources. Despite regional demand for charcoal, they opted not to engage in charcoal production because it was very environmentally destructive; some would rely on timber as a form of savings, only harvesting the largest trees in times of crises. The conservation preference was said to be inherited from previous generations, indicating that their parents and grandparents opted to maintain forests, despite so many cycles of market pressures inducing degradation of forest resources (such as timber and palm heart booms). They were also interested in engaging in other environmentally friendly activities, such as andiroba oil production, and commercialization of other NTFPs.

We do not clear forests because we are not the only living inhabitants and we need to live in a better environment (Raimundo Quaresma, Abaetetuba).

**Bolivia.** In Bolivia, people said that in the forest environment, the temperature was much cooler when compared to the cities, and that they benefitted from the quality of the pure air; they consistently expressed that in the forest they felt healthier, more protected and calmer when compared to the cities; they indicated that they were happy with their source of life and work in the forest.

I would not change my life here for a life in the city. I am happy here. When I go to Cobija [nearby city], I stay at most two days, the heat suffocates me already. No, I do not want to be there, I'm coming back. That is why we mostly calculate the days
we spend there, two, three days and we get back. Here one lives happily (Armando Amuruz, Bolivia).

Conservation interests across the communities interviewed were very prominent; in that context, there existed a clear synergy between economic uses (primarily Brazil nut) and conservation: conservation supported local livelihoods, and people were aware of that. They alleged to take care of the forests as a way of defending their source of living, securing their forest-based wellbeing, and leaving this patrimony for future generations. Moreover, in many ways, they demonstrated an appreciation for being supported by a protected area (the Manuripi Reserve), because the reserve’s apparatus in partnership with local residents managed to impede outsiders from invading and carrying out illegal logging and commercial hunting. They affirmed that they had good relationships with park guards, and agreed with most of the reserve’s resource rules, which set clear limits for extracting timber and for converting forests into agriculture and prohibited commercial hunting. “Now we have more control, we feel calm because we are in a protected area” (Ediberto Cartagena, Bolivia); “Here as I said we coordinate well with the Reserve” (Franklin Banegas, Bolivia).

Local forest dwellers also acted as conservation advocates across political and regional scales. They explained that through organized peasant/indigenous social movements, they defended conservation policies inside the movement and made their voices heard by the state. In that way, they were able to influence social and environmental policies and the legislation under the national institute of agrarian reform (INRA). As small peasants, they also attested to be concerned to giving a positive conservation example for the large and powerful landowners.

We have had meetings in Santa Cruz and we have explained to the government that the Amazon is not there to deforest, it is not for large scale agriculture, because if we destroy the forest, we will destroy what exists in the forest, the wildlife, the medicinal plants that can be used for research, for medicine. The forest regulates the climate, the forest absorbs carbon dioxide, regulates oxygen, then, all this has been explained to the government and it has been able to understand. In the 500
hectares, we can work with Brazil nuts to be able to live from nature and not destroy nature. So, we have explained so far. Now the law is being modified again, the INRA Law (Omar Villalobos, Bolivia).

**Ecuador.** In Ecuador, people commonly expressed happiness due to living in a forest environment, with abundance of wild flora and fauna; they also attributed clean air, beauty and security to their explanations of forest-based wellbeing. They claimed to feel good, safe and comfortable living in the forest. They appreciated the possibility of making a living with a low cost, and being able to produce food through their traditional agroforestry systems, whereas in the cities they would have to pay for everything they consumed.

We feel much freedom living in the forest (Merci Grefa, Ecuador).

One lives are happy here; it is pretty, peaceful and the air is clean. We live like we are in paradise (Rodrigo Grefa, Ecuador).

For us, a good living is to live healthy as the Quichuas say: without money, but healthy. Because we plant cassava, and all that the jungle provides. With the forest, we end up living better, because the jungle protects us. We have so many natural resources (Eliberto Cejua, Ecuador).

The Quichua claimed that they had long been conservation stewards, that their ways of living for generations had been based on a respectful and sustainable use of the natural resources as opposed to greed for enrichment. They clearly identified that outsiders and national policies trapped them in unsustainable practices. Still, local efforts demonstrated their willingness to reverse that scenario. In previous times, conservation was also motivated by beliefs of forest spirits getting angry and punishing individuals who had offended the spirits’ home. At the time the interviews were conducted, they alleged to no longer be motivated by such beliefs, but conservation motives were manifested in different ways. First, as described in previous sections, they recognized that forests were important sources of wellbeing, food, timber and medicine. Second, they saw forests as an entity that was important to their culture and identity, and maintaining forests was seen as a way of maintaining their knowledge systems and transmitting
these to the next generations. Third, conservation motives were manifested through: their efforts in engaging in tourism initiatives; planting trees based on traditional nursery systems; engaging in a locally developed initiative to produce organic crops while all the regional production used pesticides; as well as expressing the desire to engage in new environmentally-friendly forest-based economic activities, such as opening markets for a local NTFP called *Guayusa*. They demonstrated no ambition to clear more land than what was required for meeting their basic needs, but they sometimes had to finance children’s studies outside the community when these children reached a certain age and there was no education offered in the forest. So, in cases like these, they would end up overharvesting timber resources. In certain communities, they coordinated with park guards to monitor the Reserve limits and impede invasions of outsiders stealing resources. Many of them expressed the need for conservation consciousness-building, and claimed to be working along with local institutions towards that goal, since many individuals were still being driven by external influences (including market drivers such as timber intermediaries as well as conventional agriculture based on forest conversion and pesticides).

The forest is very important to me because it gives us good health, clean air, a land without pollution, rivers, animals, all that. On the basis of the forest we benefit from good, healthy foods and live well. We have contact with the trees, with the snakes, everything. The medicinal plants give us wisdom, contact with animals, all our relationship with the earth. It’s our life. Without forests, we cannot live. Sometimes money wants to destroy us but we do not want to let ourselves be convinced. We want to leave our history and the forests conserved to our children, so that they will live in a good, healthy environment and everything. Now I am 51 years old and I am fighting for the community so we will continue to conserve the forest (Lino Shiguango, Ecuador).

We had virgin forests, we had beautiful flowers, we lived quietly and we had nice *chackras*, no contamination, no pollution. That’s when a foreigner came; he brought a chainsaw, machinery. Outsiders came with a deforestation mentality and persuaded us; before we did not even know how to saw the wood. They taught us and there they began to destroy, so we, as we did not know, were still destroying woods until recently, and now, lately, we realized that the forests, the trees were our lives (Benjamin Shiguango, Ecuador).
Forests were locally recognized as tightly linked to wellbeing across all sites, which was based on air and water quality, weather, availability of fresh natural food, tranquility, safety, and an overall sense of satisfaction (often times expressed as happiness). The preference for living in the forest-rural environment as opposed to the cities was also consistent across contexts. Conservation interests were manifested in different ways across the study sites, but seemed to be a more conflictive issue in Acre.

3.4.2 Local Institutional Structures and Workings

Local institutional structures, workings and mechanisms existed across the four study sites (Table 3-1), contrary to our hypothesis. Structures encompassed local community leadership (president, director or a board of directors), and a local statute generally containing a set of rules, norms and duties; workings included meetings, collective work, enforcements and sanctions; and mechanisms were based on the elements behind local institutional processes such as listening, persistence, patience, reciprocity and sense of mutual responsibility (see section 3.4.3.6). At all sites, topics reported to be approached in community meetings encompassed organization of collective work, conflict resolution processes, resource use issues, market arrangements, community improvements and needs, and rights to be claimed outside the community (Table 3-1). Everywhere, informal rules existed that were not necessarily incorporated into the community statute, and some environmental rules were attributed to the state and, in some cases, these were confounded with local rules (more details in section 3.4.3.4). The origins of local institutions were variable, but they had been created or adapted by the influence of social movements, land claims, land devolution processes, and church-based organizations (section 3.4.3.3).

In Ecuador, rules regarding individual behavior, collective work contributions, and community meetings attendance were very strict, while resource use rules were somewhat loose
and oftentimes seen to belong to the state. There was a perceived distinction between traditional rules and the rules that were state-influenced. Examples of traditionally established rules were collective contributions to marriage, and organizations and duties for collective work such as planting agroforestry systems. They stated that many of their traditional rules had changed as the “outside rules” have been imposed.

Here there was an assembly where the majority approved the prohibition of selling wood, but people need money to educate the children, all that. So, by necessity, there are arguments that justify the occasional commercialization of timber. But so, they always make it illegally, without permission from the environmental agency (Benjamin Shiguango, Ecuador).

In Bolivia, in each community there was a president (dirigente), a vice president and, in some instances, a secretary for managing financial resources (secretario de hacienda), a conflict secretary, an education secretary, a health secretary and a secretary of lands and territory. As in Ecuador, rules on attending meetings, contributing to collective work, and living full time in the community were very strict, while environmental rules were coordinated with the Manuripi reserve’s resource use rights, which were locally legitimated and widely incorporated.

Community enforcement mechanisms related to environmental rules were reportedly successfully conducted in collaboration with park environmental agents, who made frequent patrols for verifying Brazil nut harvests and logging activity.

All community members must leave a part of the Brazil nuts without harvesting, otherwise the wild animals migrate to other areas and we are left with less game. Everyone complies with this rule (Ediberto Cartagena, Bolivia).

Here we work in coordination with the Reserve, we mutually help each other (Franklin Banegas, Bolivia).

The fellow who does not come to the first meeting pays his fine, the second time they do not come their fine is raised to 150 Bolivians according to our statute, and the third time they do not appear, they will be suspended. It's very serious (Ediberto Cartagena, Bolivia).
In Acre, local institutions were organized around local associations, unions and a subdivision of associations called the “núcleo de base” (core base). Residents of the Chico Mendes Extractive Reserve had a Reserve Management Plan, containing a set of locally agreed norms that were created back in the 1990s, when the reserve was established. These rules were officially incorporated by the state, but since then, had not been readapted or renegotiated as the contextual regional reality changed. Apart from the formal Reserve Management Plan, local communities and associations developed their own specific working agreements and rules (Table 3-1).

In Abaetetuba, the structures of local institutions were based upon community associations and fishing colonies (in the latter, units encompassed multiple neighboring communities). In some cases, these local institutions appeared to be interconnected via church-based community activities, so during the weekly church mass they might discuss local agreements, and normally community meetings happened right after these church worship services. Abaetetuba was the only site that displayed detailed environmental rules, which included closed seasons for fishing, regulation of various fishing techniques, and patrolling enforcement mechanisms (Table 3-1). They recounted that the application and enforcement of local rules had been effective in conserving previously overused natural resources.

The person cannot harvest palm hearts and sell them, cannot sell timber, this is why some laws were included in the statute, to ensure that the owner does not do this. But some people do not respect the law; they take what they want, devastate, sell the wood, sometimes the land, then the association sanctions, the association searches for these people, sanctions them because they know it is irregular (Raimundo Quaresma, Abaetetuba).

The fishing net must be at minimum 30 cm. But sometimes, there are those who still use smaller nets, but when we see it, we call their attention: ‘it is forbidden; here in the river nobody uses those’ then the guy takes the net out, and goes away (João Cardoso, Abaetetuba).
Resource preservation generates income. Over one hundred families benefited in each association, for example in Araraim, Saracá, Prainha, Cardoso, Piquetuba. Then they maintain surveillance, day and night, they call the environmental police to stay there with them, everything recognized by the Ministry of the Environment (Edigio Monteiro, Limoeiro do Ajuru/Abaetetuba).

Contrary to the hypothesis, we found functioning LIs in all study regions but, as we expected, they operated differently. While in Ecuador, Bolivia and Abaetetuba, each individual community appeared to retain its own statute, in Acre they had one “statute” for the entire extractive reserve, characterized by the official Use Plan. The meetings varied in frequency, from being conducted monthly throughout the year and requiring mandatory attendance (Ecuador and Bolivia) to sporadically, according to specific internal topics and demands, where attendance was not mandatory (Acre and Abaetetuba).

Local rules varied substantially across sites: in Ecuador, rules about contributing to collective work, educating children locally and in Quichua language, and attending meetings were very strict, while, contrary to what we expected, environmental use limits did not appear to be very strict or detailed. In Bolivia, rules on participating in collective efforts, attending meeting and educating children were also strict, while environmental rules were coordinated with the Manuripi Reserve. In Acre, environmental rules such as limits on forest clearing for crops or pasture were locally elaborated, but then appropriated by the state and not readapted as the local reality changed, thus resulting in conflict, as most local residents were no longer in accordance with the established resource use limits. By contrast, Abaetetuba, even though situated in the same nation-based geopolitical context as Acre, displayed a substantially different institutional configuration: locally developed rules on resource use were meticulous, functioning and effectively enforced. In terms of natural resource management, the local institutional scenario observed in Abaetetuba was the most developed, even though its
creation was recent, dating from the land regularization process that happened a decade ago (see section 3.4.4.3).

Finally, local coordination between LIs and external government institutions was extremely variable among study regions. The findings presented on existing local institutions operating across divergent geopolitical settings raised a number of additional questions: why did Abaetetuba have effective (if not perfect) institutions guiding natural resource management and generating conservation, while in Ecuador, local institutional mechanisms for resource use limits were not functioning? Why in some places did the state allow and support the successful development of LIs, while not in others (i.e., Abaetetuba vs. Acre)? Why in some settings was coordination with park guards or enforcement agents collaborative (i.e., Bolivia) while in others it seemed to be repressive (i.e. Acre)? Although we do not have all the answers, we will further discuss these puzzles here and in the following chapter.

3.4.3 The Evolving Nature of Local Institutions across Transformed Settings

3.4.3.3 Origins of existing local institutions

**Ecuador.** In Ecuador, the *Quichua* commonly claimed that, traditionally, their ancestors had local institutions which were structured around collective organization of daily life activities, meetings, rules, and rituals; twenty families would share a single community house and its domestic routines. Many of the environmental rules were allied to shamanism; for instance, people were prohibited from cutting certain centenary trees, or fishing in certain parts of the river because of a connection with spirits of the forest. Since then, their local institutional processes have been influenced by missionaries, by the state through land regularization processes, and by indigenous social movements. They recognized a distinction between traditional indigenous rules of behavior and adapted rules deriving from the land regularization processes, and in many instances, they attested to erosion of traditional local institutions. The ancient rules regarding
family care, collective behavior and traditional mechanisms of avoiding conflicts had been gradually disregarded as state rules had been imposed. “Now especially the young people no longer want to heed the community and family rules, it is state law that they want to meet” (Benjamin Shiguango, Ecuador). For instance, rules regarding internal conflict resolution processes: traditionally they had a community mediator responsible for listening to the different parties in disagreement, and then establishing a resolution and talking back to them until they reached peace. This mediator had the authority to make a final decision and people should respect their final word. In a given case discussed in an interview, they appealed to the state to solve conflicts and had to find their way through overwhelming bureaucracies, pay lawyers, wait for a long time for a sentence to be made, and in the end the conflict was not resolved. So, they reflected upon how much money and time had been lost in this process, and then established an internal rule that all internal conflicts should be resolved internally.

If we had talked here the divergence between the two of them would be solved, there would be no problem and we would not have wasted the time and the money. Instead of giving to the children, we gave to the lawyer (Benjamin Shiguango, Ecuador).

On the other hand, there was an example where the state had adopted and institutionalized a local rule regarding child education in the *Quichua* language: in response to indigenous movement demands, public rural schools adopted bilingual education.

Abaetetuba. In Abaetetuba, the land regularization process provided the means for the creation and establishment of local institutions. A clear and recurrent example was the fact that before the land regularization took place, those areas were under an open access regime; they had some informal individual limits but invasions and thefts were routine. People explained that simply not allowing others to exploit individual landholdings was enough to generate a perceived increase of resource availability. The land devolution program called *Projeto de Assentamento*
Agroextrativista (PAE) (agro-extractive settlement program) devolved lands in Abaetetuba through a settlement unit embracing all landholdings within a community; in this process, an Association had to be formed and became responsible for delimitating individual parcels, organizing the community and selecting a board of community representatives who were responsible for interacting with government structures and for creating a management use plan. What happened in this study context was a local appropriation of the government-induced local institution for discussing rules and agreements - some rules would be formally included in the Association statute, but others would be established only verbally. So, the Association was created along with the land devolution process, and every member of the community that benefited from the land regularization program automatically became a member of the Association.

The settlements created a strong organizing power and a strong body of political leadership (João Cardoso, Abaetetuba).

Acre. In Acre, local Associations emerged with the creation of the extractive reserve, so the local institutions there were rooted in both the rubber tapper social movement (which provided an identity and a strong sense of common purpose) and the resulting land devolution reform (which required them to form internal organizational structures). As such, a series of community meetings and Assemblies provided the ideas and elements for the reserve’s use plan that included a set of rules and norms regarding deforestation limits, livestock raising, hunting, among others. In this case, each Association represented a group of communities within a sector (such as Amopreab in Brasiléia municipality and Amoprex in Xapurí municipality) and each community had an organizational unit called a Núcleo de Base (core base); each core base would carry out meetings and discuss proposals to be included in the reserve statute, and then these proposals would be discussed in the Assemblies involving all core bases and Associations. Only
then, by general voting, would the proposals be approved; according to interviews, this was how it worked upon the creation of the reserve. However, afterwards an “extractive reserve council” was created involving representatives of other entities that were not reserve residents, such as members of universities, federal police, government entities, and prefectures of the municipalities. The extractive reserve council became responsible for approving all the decisions regarding extractive reserve policies and rules, and according to those interviewed, this reform took decision-making autonomy away from the communities, and forced them to share it with external entities. Consequently, it demobilized community involvement in the council to some extent, as the reserve residents did not feel properly represented in the decision-making processes that affected their lives.

Bolivia. In Bolivia, the \textit{caucheros} used to live isolated in the forests in the \textit{barraca} system until being congregated into communities, but it was the peasant/indigenous social movements and land devolution process (including the creation of the Manuripi reserve) that stimulated the existing local institutions. The social movement provided them with organizational strategies, structures, knowledge, political intelligence and common purpose; the land demarcation process provided them an opportunity to form community organizational units, where they created their own rules, and at the same time coordinated them with state environmental rules.

\textbf{3.4.3.4 Hybrid local-government institutions}

Local institutions over the studied settings were not isolated, purely locally-developed and self-sustained. Even in Ecuador, where traditionally they had indigenous organizational strategies and workings, the institutional systems taking place, by the time this research was conducted, had elements that were both indigenous-derived and state-influenced. So, if not
created by the requirements of land devolution processes, influenced by social movements and sometimes guided by progressive branches of Catholic Church organizations, as it occurred in Acre, Abaetetuba and Bolivia, such local institutions were at least adapted and transformed by these external processes.

Across all studied sites, coordination between local and government institutions was common regarding enforcement mechanisms: if there was an infraction of a local rule (like hunting in someone else’s landholding), they would first call the attention of the transgressor; if that did not work, they would report the transgression to the local organizational unit, who would notify them and maybe apply some sanction. If that still did not work, they would inform the environmental agency or other government institution. Joint monitoring systems against outsider invasions and resource exploitation were present, in which local forest dwellers would notify environmental agencies, and the environmental agency would, in turn, enforce frontiers.

Also at all sites, in land devolution processes, governments had required local mobilizations for the construction of land and resource use plans, through assemblies, where forest peoples discussed and agreed on environmental and other community related rules to be included in the statute. But still, afterwards some local rules were only verbally established and some environmental rules were either created or incorporated by the state. Oftentimes there was a subtle line regarding if a certain rule was locally agreed upon or state imposed, but two-way influence held true as well, such as harvesting limits being imposed by the state in Bolivia and the community adopting them as a legitimate rule monitored locally, and a traditional rule in Ecuador of children being educated in Quichua language being incorporated in the official inclusion of indigenous languages in public schools.

They [Supayaco indigenous community] have the management plan because it is inside the park as a plan. But like I told you, they did it themselves. We only
systematize what they say. Because the management plan is theirs (Jose Hurtado-Environmental Agent, Sumaco, Ecuador).

Of course, as we are here in the national park, we are not allowed to cut wood to sell to the market, or to hunt animals to enter the market. That is not allowed, well, for consumption it is allowed (Alberto Shingua, Ecuador).

3.4.3.5 Multi-functionality of existing local institutions

Across the four settings investigated, LIs were not limited to governing local common pool natural resources; rather, different realms of collective endeavors, articulations and processes were taking place. Through the local institutions, multiple mechanisms were present for improvements to livelihoods, including networks for community aid; planning and conducting collective work efforts; managing internal conflicts; organizing market arrangements; accessing government institutions; defining common needs and claiming rights; and establishing consensus of mutual responsibility, respect and care. These LIs also encompassed different levels of organization and collective engagement, from small groups for community projects (tourism, gardens, construction, child parents) to cross-community articulation for market arrangements, up to nationwide social movements to increase voice and make demands on governments. To illustrate the diversity of functions performed by local institutions across sites, some examples are given below.

In Bolivia, a group of leaders representing seven communities inside the Manuripi reserve travelled to Cochabamba city, where the rubber industries were located. They looked at prices and established a contract for rubber commercialization, up to four tons of rubber, according to what the industry required, and they received the payment in advance. Meanwhile, as a branch of the Sindical Unica Campesinos de Pando (Pando Peasant Union), they grouped communities by sector representing sub-regions, that is, 62 communities were grouped into Centrals (sus centrales) of about seven communities each, and each Central had a leader or a
board of leaders, apart from each community’s president. Whenever there was a demand or a necessity to fight for, each Central’s communities met, then the directories met and called the departmental level, and then the departmental representatives went to the national confederation to place demands before state bodies.

In Acre, the organizational structure that was formed through the Associations provided them the means to achieve improved market arrangements for Brazil nuts and increased the product prices. External actors were involved such as the state government and some NGOs, but according to the people interviewed it would not have been effective if they had not been organized internally. Through these internal processes of organization, they found the space for discussing priorities and demands to improve their life conditions; this allowed them to dialogue with the public sector and attain gradual community improvements, such as access to infrastructure and education. Communities in Acre also invested in common mechanisms for optimizing production systems, such as purchasing a community owned boat or truck for transporting crops and forest products to outside markets, and oxen for transporting production inside the community.

As Associations, we are the voice of the people who are in the forest; we access the municipalities and the state councils to be able to claim benefits for the communities (Luiza Carlota, Acre).

In Abaetetuba, whenever someone in a given community had a serious illness, they organized community bingos and related events to raise funds so the ill person could afford trips to the city, and the cost of the treatment. In addition, every family of the community contributed basic goods and food. Also in Abaetetuba, the Associations served as a gateway for receiving government programs and benefits, and this entailed overall participation as every member of the community became affiliated. This resulted in greater flow of information as they talked about
projects, programs and equitable share of benefits, which increased the local relevance of the internal organization.

Here there are many types of working activities we engage in, and we work along with family, neighbors and friends, and we greatly appreciate it, it is good to say that we have this mutual benefit (Raimundo Quaresma, Abaetetuba).

The association has strength over the inhabitants of the place, for example, our association here represents our river, represents the Sirituba bay, every island here has an association and has a team of leaders that takes care of it, we have the Campopemba island, the Santa Maria island, the Tabatinga island. It's all split and organized that way, so the association has access and control to these people, then it's easy to enforce the law, enforce the law or educate those people to protect and take care of lands, islands and forests. Because this is where we derive our lives from (Raimundo Quaresma, Abaetetuba).

Local Institution processes in Ecuador formed a strong mechanism of different sorts of collective engagements. Monthly meetings were often used to plan mingas (collective work) on different fronts: agriculture, basic community infrastructure construction, housing construction, opening and cleaning trails, and others. They formed specific directory groups, or commissions, for specific issues, such as a group to discuss priorities and necessities for child education, a group for planning and advancing projects of tourism, a group responsible for executing a small traditional agriculture and school gardening projects. In the meantime, connections with higher levels of social organization were taking place as regular assemblies attained attendance by representatives of over 60 communities, articulating common demands for improving local livelihoods.

3.4.3.6 Underlying mechanisms behind local institutions

Local institutions were complex and contradictory across communities and field sites. There were instances where folks showed some distrust of organizational efforts, complaining about the lack of commitment by other community residents, or expressing a lack of trust in community leaders. But, most people interviewed talked about institutional processes simply as
an inherent element of their lifeways, and some individuals stressed what mechanisms lay behind the local institutional workings throughout the different studied contexts. In Acre, focusing on careful dialogue and on finding common ground, rather than just settling rules as a response to an external incentive, was viewed to be critical in building functional collective agreements. People stressed the need to engage in discussions without causing embarrassment, which was said to be a hard task. Mechanisms of dialogue and negotiation among community members were alleged to be effective in preventing acute conflicts. An example was given on the occurrence of Brazil nut thefts where the owner discussed with the offender, and they both agreed to share. “We seek to find ways to get along, so that we will not have a fight” (Luiz Sousa Silva, Acre).

This is not merely a law what will resolve the problem, of course; every house has its rules, every legislative power has its regulations but, along with it, nothing better than a good conversation, of finding a way together (Walmir Brito, Acre).

In Ecuador, what seemed to be a strong element behind the workings of local institutions was a notably communally oriented culture: specifically, livelihood activities were largely planned and executed collectively. It was remarkable how seriously committed they were to attending meetings and contributing to community collective efforts, involving planting and harvesting of different crops, building, trail opening and cleaning, and educating children, among others. They expressed as well that their behavior was communally expected to be based on reciprocity, respect and a sense of mutual responsibility. Mechanisms of dialogue that took place through assemblies, working groups or among individuals during their daily lives were said to be carried out with honesty, listening and care. They attributed effective agreements and the success of collective working efforts to lots of talking and listening, and lots of meetings.

Here everything has been that way, in grouping, in organizing, in collaborating. That way everything gets done faster, just anything can be done like that (Alberto Shingua, Ecuador).
Here we act as we are one family - we must take care of each other (Marcos Cubi, non-indigenous peasant, Ecuador).

Things that do not work are fixed, and talked about respectfully; this is how new strategies are born (Alberto Shingua, Ecuador).

In Abaetetuba, different sorts of agreements were discussed during the meetings; whenever a new issue emerged, (e.g. a proposed cohabitation agreement, or an idea for community collective work, or a resource use strategy, or even a market arrangement) then everybody’s opinion had to be heard until a decision was made. Patience and listening were terms commonly used when people were asked to describe how collective decisions were made. At times, a certain issue would reoccur over consecutive meetings until an agreement was reached. Perseverance was also mentioned as being vital for effective arrangements to be established as people had to invest time, be persistent and tolerant.

But also, acute conflicts were mentioned as processes that led to successful institutional arrangements. The mapará (*Hypophthalmus edentatus*) is a commercial fish species. The process of establishing limits for the sustainable fishing activity of mapará was so conflictive that, according to them, it almost resulted in death. It began as a minority of fishers within a community trying to determine fishing limits, while a majority was strongly resisting the set of proposed rules, but as the negotiation process evolved, they finally agreed to respect the rules that entailed a closed fishing season. They developed an effective enforcement mechanism with alternating patrol efforts, and ultimately, they included other commercial fishing species as they observed the positive results of the establishment of and compliance with the fishing agreements.

During the closed fishing season, they seriously patrol it and nobody fishes; it is really a sacrifice, but it is worth it. The day the fishing season opens, it is a great party in the river; then, tons of fish are gathered and they earn good income from it. They reap the fruits of preservation. Absolutely (Edigio Monteiro, Limoeiro do Ajuru/Abaetetuba).
Another instance of conflicts resulting in working agreements in Abaetetuba referred to a case where an outsider who moved to a community was overhunting wild animals for commercialization purposes, whereas most of the hunting activity was for local consumption. But as land regularization took place, and a local institutional structure was being formed, the association presidents and collective pressure were able to establish clear hunting limits and to discontinue the activity as a commercial venture. People attributed these successfully-established working rules as the reason for the perceived increase of game availability. In fact, they also indicated that the realization of the erosion of available resources itself led to the process of discussing and creating local rules. Such rules could be incorporated into the statute, but some of them were agreed just verbally, and re-discussed as necessary.

In Bolivia, careful listening and dialogue also were mentioned as foundations for agreement building. Elaborating and transmitting ideas among all community members regarding how local institutional processes should work, how to choose a legal representative for the community, and the process of discussing agreements and rules, were considered important institutional mechanisms. Mutual respect towards divergent working strategies and different cultures was a commonly agreed means in Bolivian communities where members of different social origins coexisted.

3.5 Concluding Remarks

3.5.1 In What Ways do People from Different Adapted and Transformed Amazonian Settings Perceive Themselves to Be Allied to the Forests?

Based on our findings on local meaning of forests across transformed Amazonian settings, we reject the hypothesis that forests are no longer relevant in terms of identity, culture, attachment and conservation interests. Consistent with the findings presented in Chapter II, we found here that forests represented an essential component of peoples’ livelihoods across studied
sites, but the nuances of the spectrum and meanings of forest uses were further identified through our qualitative assessments, and these can be illustrated by their appreciation for natural forest remedies and cultural preference for consuming forest-derived products (e.g., açaí in Abaetetuba). Indeed, beyond subsistence and economic incomes, forests were locally valued in multiple aspects across all sites. Even in Bolivia and Acre, where most of the local population had migrated into the forest during a comparatively more recent historical period, attachment to place, and forest-based self-cultural identification were evident. However, as expected, forms and intensities of people’s connections with forests varied across study regions. As hypothesized, the communities in Ecuador did display the strongest forest-based identity and culture, but it was unexpected that Abaetetuba, even though not inhabited by indigenous populations, would also display complex and deep forest-related cultural systems. This can be explained by the longer history of interactions between both of these populations and the local natural environment.

At all sites, forests were unanimously recognized as critical to people’s health and wellbeing; this did not mean that their livelihoods were perfect, but it certainly meant that forests were locally perceived as important to their overall quality of life. Again, our assessments suggest that even non-indigenous or less traditional populations that had been living in forested landscapes only for a few generations had developed a forest-based identity and sense of belonging. We found a long list of reasons why forests are important to local livelihoods across the studied sites: the range of themes that emerged went beyond and surpassed the utilitarian relevance of forests. Therefore, besides safety nets, coping with shocks or alleviating poverty, these lines of evidence suggest that forests actually comprise much broader and deeper roles throughout many rural people’s lives. For policies that seek ways to reconcile conservation and wellbeing, this should be useful information.
Conservation interests, although present across all study sites, varied and were perceived to be stronger in Bolivia and Abaetetuba, where forest reliance was higher and livelihoods were mostly derived from NTFPs. In Acre, conservation interests were not as strong, probably due to the conflictive economic scenario with its emphasis on cattle; and in Ecuador, conservation motives seemed strong even though logging and commercial agriculture were widely practiced. The existence of unsustainable patterns of forest use in some places (such as presented in the previous chapter) might not have been driven by a lack of conservation interests locally, but rather by the scarcity of environmentally-friendly alternatives and by the contextual factors such as past colonization policies (i.e., Ecuador) or national programs that introduced a cattle frontier (i.e., Acre). As outsiders see local overharvesting, they may conclude that greed is local peoples’ main incentive. However, if we look more closely, we may find that this happens in circumstances where there were no better choices available, and where market forces induce (sometimes more vulnerable) forest dwellers to overharvest. Our argument is that only a small percentage would be motivated primarily by greed; this can be confirmed by the amount of evidence presented of perceived benefits forest can afford locally. This evidence suggests that conservation interests are not enough to sustain forests if external political and market forces are not favorable. But it may also imply that policies that induce environmentally-friendly alternatives, if thoughtfully implemented, are bound to be effective, while poverty-reduction policies designed to enhance rural people’s wellbeing will be better designed if they acknowledge that forests and a preserved environment are essentially connected to local quality of life.
3.5.2 Are Any Features of Local Resource Management Institutions (LIs) Present across Transformed Amazonian Settings that Have Suffered Numerous Unfavorable Interventions from Centralized Governments and Economic Frontiers?

We reject the hypothesis that LIs are no longer operating in these transformed settings; however, they did not appear as commons theory typically describes them. In different ways, LIs have been transformed, adapted or re-created after cycles of colonization, violence, epidemic diseases, migration, exploitative economic booms, and government capitalistic-development programs. Their structures were clearly defined, their elements included different set of rules, enforcement and sanctions, and even though environmental management systems were, for most sites, not very robust, ongoing LIs displayed diversified functioning arrangements for the improvements of local livelihoods. Past and contemporary social movements, progressive branches of church-based organizations and the land regularization processes had clearly influenced and shaped the existing LIs throughout Amazonian geopolitical contexts.

In Bolivia, the highly organized structure of LIs seem to have been influenced by the peasant social movements, while environmental use limits were clearly externally influenced by the state environmental institutions. In Ecuador, past traditional local institutional forms seemed to explain the perceived culture of collaboration, as people tended to act as a group rather than individually. To some extent, this might also explain the seriousness of local institutional elements such as monthly meetings with full attendance, the obligatory nature of collective working activities and even some rules that could be applied only within a nuclear family basis (such as children having to be properly enrolled in school). However, while LIs in Ecuador displayed elements of ancient indigenous institutional arrangements, they lacked a set of distinct locally determined environmental use rights. In fact, due to ancient indigenous institutional adaptations, we expected that Ecuador would display the strongest institutional arrangements to guide natural resource management; but while LIs in Ecuador did display strong collaboration
and compromise mechanisms, those were not applied to guide resource use rules. We suspect that in that geopolitical context, state intervention that induced agriculture, logging and mining economies had undermined some of the previously existing locally developed resource use strategies.

On the other hand, in Abaetetuba, local institutions that were recently established along with the land devolution process encompassed detailed and functional locally established environmental use limits. In Acre, the rubber tappers’ struggles to secure land, resources and rights in the face of national colonization programs that were expelling people from their homes, resulted in the emergence of a social movement and culminated in the design and creation of the extractive reserve model. Both social movements and the model of land devolution reform designed for sustainable forest extrativism, resonated for other parts of the entire Brazilian Amazon region. The CNS (Rubber Tapper’s National Council) was born in Acre and became a nationwide organization, with affiliations across all Amazonian states, and encompasses many sorts of non-indigenous traditional populations. As in many other parts of the Amazon, the Abaetetuba land devolution program was an unfolding result of this process, but our results indicate that different institutional repercussions took place across divergent contexts. In Abaetetuba, the land regularization process that required the structuring of internal organizations and the establishment of environmental use limits sparked the local creation of working environmental rules; however, differently from Acre, likely by not applying repressive enforcement efforts, the government environmental agencies, in the Abaetetuba case, allowed forest-dwellers some autonomy, which we believe to have been a key element in their successful institutional development. We suspect that the longer cultural adaptations of the caboclo population in the estuary region have provided some ingredients, which allied to favorable and
less-repressive influence from state institutions, provided the means for the observed local institutional processes operating in Abaetetuba. As such, we observed that in a same country (Brazil), the government environmental agency intervened in different fashions. Biophysical characteristics might also explain these different institutional scenarios, since Abaetetuba communities are embedded in a mosaic of fluvial islands where many of the subsistence and economic fishing activities are based on aquatic common pool resources, which may favor local institutional arrangements (Ostrom 1990), even though low levels of mobility of the resource have been identified as one of the enabling conditions for sustainability on the commons (Agrawal 2002). Moreover, the average land size is only 20 ha in Abaetetuba compared to 400 ha in Acre, which probably led people living in the former to more strategically plan the use of natural resources.

We also assessed the complex and evolving nature of existing local institutions across Amazonian contemporary populations, through their interconnection with state institutions (hybrid local-government institutions), their multi-functionality evidencing the holistic nature of their workings, and the underlying mechanisms behind them. With this, we learned how the local institutions studied go far beyond strategies for managing natural resources. Our results also indicate the potential of supportive and non-repressive government institutions in allowing the creation and development of effective institutional arrangements that may, ultimately, enable locally developed and applied strategies for managing resources.

It was evident that local incentives to cooperate were present across very divergent geopolitical contexts and historical legacies. Such cooperation incentives can be easily identified in routinely practiced collective work efforts, in common purposes leading to organization of market arrangements, and in mobilizations to claim rights as well as through the difficult and
time-consuming process of building agreements and establishing local rules. Moreover, local creation of alternative strategies for collective engagements were further demonstrations of local people’s abilities to organize and come up with mechanisms to improve their lives. This is consistent with the Common Pool Resources dilemma, entailing the ways people manage to “change the situation from one in which appropriators (users) act independently to one in which they adopt coordinated strategies to obtain higher joint benefits or reduce the joint harm” (Ostrom 1990:39), as well as with the argument that people living in the same village, sharing social identities and often times kinship, would not adopt self-interest as the dominant strategy (Dietz et al. 2002, Runge 1984).

Policy alternatives that are positively related with effective institutional performance, that account for ecological sustainability and social benefits, and that are likely to stimulate local institutional innovation include mechanisms for: (1) allowing substantial local autonomy in creating, implementing and enforcing institutional arrangements that are locally legitimate, and providing generalized institutional choices (Ostrom 1990, Agrawal 2002); (2) strengthening the performance of enforcement agencies (Ostrom 1990); (3) improving dialogue and accountability between office-holders and local resource users, so that users are able to count on the help of government officials at relatively low cost (Ostrom 1990, Agrawal 2002); (4) encouraging equitable distribution of benefits derived from natural resource use (Agrawal 2002); (5) institutionalizing low cost conflict resolution arenas (Ostrom 1990, Agrawal 2002). Nevertheless, these are just some policy alternatives that illustrate how regional and national governments can play a positive role in providing conditions to support and improve the ability of local resource users to design and maintain effective institutions for sustainable resource use.
<table>
<thead>
<tr>
<th>Code System</th>
<th>Acre</th>
<th>Abaetetuba</th>
<th>Bolivia</th>
<th>Ecuador</th>
<th>SUM</th>
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<td>11</td>
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<td>40</td>
<td>40</td>
<td>60</td>
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<tr>
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<td>11</td>
<td>21</td>
<td>11</td>
<td>33</td>
</tr>
<tr>
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<td>5</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Forest identity</td>
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<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>Health</td>
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<td>22</td>
<td>22</td>
<td>22</td>
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</tr>
<tr>
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<td>24</td>
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<td>24</td>
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<td>5</td>
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<tr>
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<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
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<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Beauty</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Intrinsic value</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Notes: coded segments related to 40 interviews (10 for each study site); mentioned themes are not mutually exclusive; wild animals theme refers to the intrinsic value of animals beyond human use (e.g., people’s appreciation for biodiversity).

Figure 3-1. Local importance of forests. Visual presentation of the frequency of mentioned themes across interviews, by study sites and in descending order of most frequent total responses.
<table>
<thead>
<tr>
<th>Table 3-1. Local institution elements by research site.</th>
<th>Sumaco, Ecuador</th>
<th>Pando, Bolivia</th>
<th>Acre, Brazil</th>
<th>Abaetetuba, Brazil</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General structure</strong></td>
<td>Community statute containing rights, duties and sanctions; a president and sub-directors for specific issues.</td>
<td>Community statute containing a set of norms, rights, obligations; a president, vice-president and secretaries for different purposes.</td>
<td>Local Associations, “núcleos de base, unions; a Reserve Management Plan, with norms recognized and enforced by the state.</td>
<td>Community Associations, fisher’s colonies; statute containing a set of locally agreed norms; president and board of directors.</td>
</tr>
<tr>
<td><strong>Rules</strong></td>
<td>Attend meetings and assemblies; contributing to collective work; prohibition of logging, commercial hunting and barbasco (poison root that kills lots of fish at once); marriage collective contribution; children had to be educated locally and had to maintain the Quichua language; monetary contribution to the LI; conflicts must be resolved internally; behavioral rules regarding respect and mutual responsibility.</td>
<td>Attend monthly meetings; living full time in the community; participating in collective work efforts; maintaining children at school; contributing with a payment rate for the LI; hunting restricted to family consumption; not collect Brazil nut seeds from 20-25 trees per landholding.</td>
<td>Not planting crops next to internal roads or streams; maintain an open corridor as the internal roads (ramaís) pass inside the colocações (individual landholdings); no locks were allowed on gates; fence raised animals; restrictions for hunting with dogs and using specific traps; limits for clearing forests; resource use restricted for individual families’ landholdings (no common use forests).</td>
<td>Resource use restricted for individual families’ landholdings; raised animals must be fenced; logging and palm heart restrictions; hunting restricted to family consumption; prohibition of timbó (poison root that kills lots of fish at once); fishing net size must not be bellow 30 or 25 cm (depending on the community and on the fishing season); some species of fish were prohibited from fishing during the reproductive period; for commercial activity, fishing zones restricted for established groups of fishers; use of ecological matapi (a shrimp fishing trap from which the smaller and younger individuals can escape).</td>
</tr>
<tr>
<td><strong>Frequency of meetings</strong></td>
<td>Monthly</td>
<td>Monthly</td>
<td>Varies, according to demand, average of 4-6 times a year.</td>
<td>Varies, according to specific demands, may take up to four months to reoccur.</td>
</tr>
<tr>
<td><strong>Attendance of meetings</strong></td>
<td>Mandatory</td>
<td>Mandatory</td>
<td>Flexible</td>
<td>Flexible</td>
</tr>
<tr>
<td></td>
<td>Sumaco, Ecuador</td>
<td>Pando, Bolivia</td>
<td>Acre, Brazil</td>
<td>Abaetetuba, Brazil</td>
</tr>
<tr>
<td>---------------------</td>
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<td>---------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Main topics</strong></td>
<td>Organization of collective work; conflict resolution; discussion, agreements, definition and adaptation of local rules; discussion of either locally based or state fomented community projects; articulation with higher levels of social organizations.</td>
<td>Deliberation of tasks and organization of collective work; conflict resolution; discussion of potential and ongoing projects, programs and policies that benefited the community; discussions about state rules regarding environmental uses; market issues; deliberation of rights to be claimed with state bodies.</td>
<td>Market issues; organization of collective work; conflict resolution; reports on outside issues (could be policies, programs, higher level decisions); agreements on specific demands to be claimed at the state level.</td>
<td>Organizing and planning the distribution of government social programs and benefits; conflict resolution; discussing occurrence of inappropriate behavior; discussion of what should be improved in the community; organization of collective aid activities; discussion and agreements on resource use strategies.</td>
</tr>
<tr>
<td><strong>Enforcement</strong></td>
<td>General observation only.</td>
<td>Mutual monitoring and collaboration with state environmental agents.</td>
<td>General observation; monitoring each other’s behavior while conducting activities in the forests; calling each other’s’ attention when necessary.</td>
<td>General observation; mutual monitoring; calling attention; structured patrolling; report infractions to the state environmental enforcement agency or the regional police station.</td>
</tr>
<tr>
<td><strong>Sanctions</strong></td>
<td>Fines for not attending meetings and assemblies; fines for not contributing with community ‘payment.’</td>
<td>Fines for failing to attend meetings; fines for not contributing to collective work; and for complying with Brazil nut harvesting rules; expulsion for consistently not participating in LI processes (attend meetings, collective work, follow local rules), if leaving the community for a long time without notice, or in the case of a proven theft or crime.</td>
<td>Denouncing the infraction to state environmental agency, if internal enforcement mechanisms do not work. No local fines established or applied.</td>
<td>Calling attention; in case of resource theft were levying fines in the amount of the value of the resource stolen (i.e., palm heart, açaí, fish) to be paid to the owner of that resource; denouncing to state environmental agency.</td>
</tr>
</tbody>
</table>

Note: coded segments related to 40 interviews (10 for each study site).
CHAPTER 4
TOP-DOWN VERSUS BOTTOM-UP STRATEGIES: BARRIERS TO THE PROSPECTS OF SUSTAINABLE LIVELIHOODS AND LOCAL SOLUTIONS ACROSS GEOPOLITICAL CONTEXTS

4.1 Introduction

4.1.1 Forest Peoples’ Loss of Rights Over Land and Resources around the World

Over the course of the centuries following European occupation and establishment of colonial rule, governments around the world appropriated much of the forest lands, declaring control over forest resources, displacing many forest peoples from their original lands, and often undermining longstanding customary forest tenure and management regimes (Ribot and Peluso 2003, Charnley and Poe 2007, Menzies 2007). By proclaiming public interests over forests, governments and state resource management agencies have regulated forest access and use, in a process that has favored industrial and commercial interests to the detriment of local peoples (Menzies 2007). In the majority of the world’s forests, local forest management regimes and institutions crafted and maintained by forest communities have been replaced by state bureaucracies controlling forest management (Charnley and Poe 2007).

Until the 19th century, timber extraction and commercialization were mostly unregulated and practiced by large corporations that left a legacy of boom-and bust cycles as harvests moved from one region to another (Menzies 2007, Guha 2000). Following WWII, industrial-scale timber extraction through logging concessions and other forms of access became the dominant form of forest management of public forests, when governments started to establish centralized bureaucratic forest departments to put in practice European models of scientifically based approaches to forest management (Guha 2000, Perlin 1991). In other instances, in the guise of conservation of pristine landscapes and preservation of endangered species, local peoples have lost access to forest resources on which they have traditionally and historically depended.
According to Menzies (2007), ways of local communities’ dispossession from their forests varied between regions, including: (1) increasingly restrictive legislation leading to a gradual takeover, (2) violent withdrawal (by the state or other stakeholders), (3) removal of tenurial rights, or (4) as a result of a dramatic shift in the state itself (such as the case of the Chinese revolution). The discourse defending state control over forests has been that “ignorant forest dwellers” are not capable of the scientific management necessary to extract forest products and ensure environmental protection, thus justifying state intervention to protect forests against population pressures, and the demarcation of political (or public) forests (Menzies 2007).

4.1.2 Grassroots Claims and the Resultant Devolution Policies

Based on a careful analysis of forest communities’ trajectories around the world, Menzies (2007) offers an alternative narrative telling not only about local communities’ loss of access to forest resources on which they have depended, but also the loss of forest cover resulting from timber harvesting, cattle ranching, mining and other activities declared by the state to be of the public interest. This narrative also tells the story of how forest communities mobilized to claim their right to be involved in the decisions that affect their lives and the fate of the forests. Such movements marked a turning point, in which formerly invisible forest peoples and their allies began to articulate legal demands and political actions of many types, allowing them to start a process of negotiating different forms of partnership with the state. Many struggles of forest peoples around the world illustrate how their passive or active resistance allowed them to retain access and prevent destruction of forest resources (Menzies 2007, Guha 2000, Almeida 2002, Allegretti and Schmink 2009, Deere and Royce 2009). Grassroots struggles converged with human rights campaigns concerned with rural poverty, equity and social justice, as well as with conservationists frustrated with the failures of top-down forest conservation models and policies.
(Mulder and Coppolillo 2005). In the late 1960s, the United Nations Education, Scientific, and Cultural Organization (UNESCO) declared that “conservation of environmental resources could and should be achieved alongside of their utilization for human benefit” (Mulder and Coppolillo 2005:37). At the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, and the World Summit on Sustainable Development in Johannesburg in 2002, world leaders agreed that biodiversity and resource conservation should be fully integrated into strategies for economic development, and a commitment was established to involve local communities in environmental management and development (Adams et al. 2004). The idea that conservation and development could be linked through sustainable use by forest communities became mainstream (Mulder and Coppolillo 2005) and culminated in demands for the inclusion of local peoples in forest planning and management (Baker and Kusel 2003, Colchester et al. 2003). As a result of an unprecedented devolution of lands and forest management authority that took place over recent decades, local communities today own or manage at least one quarter of the world’s forests (White and Martin 2002, Sunderlin et al. 2008). By definition, devolution means the “transfer of power and assets to non-state bodies (e.g., citizens, forest user organizations), not created or controlled by the state” (Charnley and Poe 2007:306). Lands and rights have been devolved to forest communities in different ways, and community forest management schemes vary widely on the ground.

4.1.3 Post Victory Challenges

It has been documented that real devolution of rights and responsibilities over forest management decisions to local communities is related to both ecological sustainability and social benefits (Colfer and Byron 2001, Salafsky et al. 2001, Brooks et al. 2006, Pagdee, Kim, and Daugherty 2006). However, due in part to the lack of trust by governments in communities’
ability to sustainably manage resources (Cronkleton et al. 2010), devolution of forest management authority in practice has been frustrated and, in most places, has happened only partially. Despite this impressive move toward devolution and recognition of forest peoples’ rights around the world, it is hard to find models in which communities have received full legal authority over forest use and management. In the majority of cases, devolution policies are in place but, in reality, forest management authority remains in the hands of the state (Ribot, Agrawal, and Larson 2006, Larson et al. 2010). By restricting traditional forest management practices, state control over forest use has damaged locally developed management regimes and increased poverty in forest communities (Friedman and Rangan 1993). Forest communities face critical challenges in managing their natural resources sustainably, improving their livelihoods and working towards their varied visions for a better future.

Rooted in deep historical social inequalities, lacking formal educational levels, and embedded in implicit or explicit elitist oppressive systems, forest-dwellers are in a disadvantaged position to negotiate their interests and make their voices heard. Not only may forest residents be exploited by market actors, but their locally developed management systems (based on traditional ecological knowledge) and carefully crafted local institutional arrangements for sustainable management are rarely recognized and incorporated into official forest use laws and regulations (Larson et al. 2010). Moreover, even though forest peoples can and do form alliances and networks to expand their political support, unbalanced power relations are still in place (Edmunds and Wollenberg 2001). For example, in policy debates over conservation and development, local communities, when included, do not enter negotiations as equal stakeholders (Brosius, Tsing, and Zerner 1998).
In a historical perspective, there have been undeniable successes in the recognition of forest communities’ rights, such as: the growing land area under community ownership; protection of regions and peoples from the aggressive forces of development in forest frontiers; financial support by external donors and NGOs; and increased visibility of marginalized forest peoples and their organizations, providing the means for improved dialogues in the future. It remains to be seen, however, how communities will cope with changing market and political forces, whether effective bottom-up approaches to conservation and development will emerge, and if lasting solutions tailored to local socioeconomic realities and sensitive to environmental limits will be established. Community Forest Management schemes that draw on local people’s capacities, support cultural diversity, reduce poverty, address social inequalities, enhance livelihoods and ensure ecological sustainability are still envisioned by devoted community leaders, committed NGOs, dedicated scholars and enthusiastic students, but not commonly witnessed on the ground.

4.1.4 Top-down National and Cross-national Policies

Devolution processes have been primarily planned by distant policy makers and delivered by bureaucracies that treat communities as recipients rather than active participants (Paudel, Monterroso, and Cronkleton 2010). In addition, governments sometimes devolve rights to forest communities, and then “take them back through regulations” (Ribot, Agrawal, and Larson 2006). The conservation thinking shaping these regulations often derives from elite and scientific standardized notions of forest management, with little account for local customary practices and institutions for managing resources (Cronkleton et al. 2010, Larson et al. 2010). Most governments then impose burdensome bureaucratic procedures for forest management, making the activity a “daunting undertaking” for forest dwellers (Menzies 2007). In addition to undermining local governance and management capacity, this exclusionary pattern of devolution
and forest regulations limits local livelihood options for both subsistence and commercialization (Larson et al. 2010). In the substitution of local institutions by centralized ones, traditional ecological knowledge is replaced by “internationally accepted scientific practice,” and this shift of knowledge systems is accompanied by a change in control over forest resources (Berkes 2002).

In the decades that followed the second world war, a global mission named “development” undertook an unprecedented effort to address social injustice, inequality, poor health, low education, gender imbalances, and violence in the world’s developing countries (Barret and Swallow 2005, Todaro and Smith 2009). Additionally, due to increasing concerns regarding environmental degradation, “sustainable development,” came to complement concepts such as “poverty reduction,” “human rights” and “social justice” in the development lexicon. However, standardized measures of production, employment and poverty typically applied in development efforts started to be criticized as being too simplistic to encompass the reality of the rural poor. For example, deprivation measured by a single poverty line (in terms of income or consumption) failed to capture other dimensions of poverty such as lack of power and voice; similarly, the idea of “full employment” failed to acknowledge that in rural areas, people pursue diverse strategies and activities to make a living (Jodha 1998). According to Chambers and Conway (1992), such concepts were designed in central places, and applied in a top-down fashion to extract data that fit into preset boxes.

4.2 Research Questions

Across the four study areas, violent colonization histories, aggressive market frontiers, and state policies based on capitalistic development models have left legacies that trapped local forest dwellers in deeply-rooted oppressive systems. Elements of the debt-peonage market
arrangements are still present in many Amazonian regions (Weinstein 1983), and even after the
devolution of lands to local communities, local resources and land use rights are still largely in
the hands of the state (Larson et al. 2010). Moreover, it has been argued that top-down policy
implementation and centralized governments have damaged local livelihoods and increased
poverty among rural communities (Ostrom 1990). Poverty levels and lack of investment in rural
areas leave local communities in a situation of low living standards, which include low access to
educational and health systems (Celentano et al. 2012). All of these factors can be identified as
major barriers to the prospects of sustainable livelihoods (BPSLs), which may hinder the
successful reconciliation of conservation and sound development.

As such, it has been documented that BPSLs exist across forest communities in the
Amazon and around the world. But we would like to understand which barriers predominantly
operate in different geopolitical contexts, and to what extent these are related to historical events
as well as past and present policies. We also would like to know whether some BPSLs have been
successfully overcome, and learn what elements have contributed to the removal of BPSLs in
different contexts. Could local institutions hold some of the solution for ways to reconcile
conservation and development in forest communities? Are there any government policies and
programs that succeed in supporting forest communities in overcoming barriers and improving
the prospects for sustainable livelihoods? Evidence has pointed to the potential of locally-based
knowledge, mechanisms and strategies to come up with effective and lasting solutions towards
the improvement of sustainable livelihoods (Chambers 1983). Therefore, we ask what are local
forest peoples’ priorities, ideas and visions across divergent contexts. We discuss how locally
envisioned strategies for the reconciliation of conservation and development could be
incorporated into better-informed policies.
RQ1: Which BPSLs predominantly operate across distinctive Amazonian geopolitical contexts?

Given different geopolitical contexts derived from distinct colonization histories, and targeted with different government programs, we hypothesize that BPSLs across the four study sites operate differently. Specifically, since Acre and Ecuador were targeted with the most aggressive post-rubber development policies (land speculation, cattle expansion, oil exploitation, introduction of pesticide-based agriculture), we expect that the number and relevance of BPSLs will be higher in these study sites.

RQ2: Which BPSLs have been successfully removed and by which means?

We hypothesize that local institutions hold some of the solutions for the removal of BPSLs. We also hypothesize that in some spheres, government solutions have successfully removed major historically developed BPSLs.

RQ3: What are the locally envisioned solutions towards the reconciliation of conservation and sound development, and how do they vary across divergent geopolitical and biophysical contexts?

4.2.1 Definition of Key Concepts

**Sustainable livelihoods.** In its simplest sense, a livelihood is a means of making a living (Chambers and Conway 1992). The term “sustainable livelihoods,” however, is a combination of many ideas and interests and encompasses broader debates about the relationships between people and the environment (Scoones 1998). Chambers and Conway (1992:6) explore the concept of sustainable livelihoods based on the ideas of capability, equity and sustainability. They provide the following definition: “a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its
capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term” (Chambers and Conway 1992). Scoones (1998:7) asserts that “at any scale, livelihoods are composed in complex ways, with multiple and dynamic portfolios of different activities.” A livelihood is environmentally sustainable if it maintains or improves the local and global assets on which it depends, as well as producing beneficial effects on other livelihoods; and socially sustainable when it can cope with or recover from stresses and shocks and provide for future generations (Chambers and Conway 1992).

**Barriers to the prospects of sustainable livelihoods (BPSLs).** Factors preventing rural individuals and families from building pathways out of poverty, and the constraints experienced by citizens in pursuing viable and improving livelihoods have already been approached and discussed in the literature (Ellis and Mdoe 2003, Ashley and Carney 1999, Carney 2003, Ellis and Freeman 2004). These include a range of political, social, institutional, market and environmental factors operating from the regional, national or international levels. In this study, we approach BPSLs as the factors that inhibit or hinder local forest-dwellers in improving their livelihoods without depleting local resources.

We approach “ongoing local solutions” as working strategies at the local level that enable forest peoples to remove barriers to the prospects of sustainable livelihoods. By “government solutions,” we mean state or national policies, programs and incentives that have been successful in removing BPSLs and contributing to improvements for sustainable livelihoods. Similarly, “locally envisioned solutions” are measures, policies and strategies conceptualized from the local perspective, that would enable the removal of BPSLs and the development of diverse and multiple sustainable livelihoods schemes.
4.4 Methods

4.4.1 Study Sites

The study sites encompassed in this research lie in the Amazon region and include: (1) riverside and slave descendant communities (Quilombolas) in Abaetetuba and Limoeiro do Ajuru (Pará, Brazil); (2) rubber-tappers within the Chico Mendes Extractive Reserve in central-western Amazonia (Acre, Brazil); (3) forest-extractivists in the Manuripi Reserve in northern Bolivia (Pando, Bolivia); and (4) indigenous peoples (Quichua) and settlers in the Sumaco Biosphere Reserve buffer zone, western Amazonia (Sumaco, Ecuador) (Figure 1-1). The historical, geographical and socioeconomic features of the four research sites encompassed in this study are presented in Chapter 1.

Throughout all these regions, the colonization processes were marked by invasion of indigenous homelands, warfare and violence, use of indigenous labor through slave systems, epidemic diseases and demographic declines, disruption of indigenous lifeways, and breakdown of internal social structures. These events caused profound social transformations throughout the studied areas and resulted in different livelihood adaptations. The rubber boom largely contributed to these transformation processes as it strongly connected Amazonia with the world market and deeply affected multiple regions across the Amazon basin, including the areas investigated. The aviamento (or habilito) system characterized an exploitative market system in which forest dwellers engaged in rubber tapping were placed at the bottom of a multiple-level market chain: they worked hard, were forced to supply production to a rubber baron for extremely low value, and in some cases, were prohibited to practice agriculture or engage in other productive/commercial activities. In that way, rubber tappers were trapped in debt, domination and control. The aviamento (or habilito) system, therefore, characterized and shaped the social and market relations that, because of isolation, persisted throughout many of these
regions until today, and which may function as social-structural barriers to the prospects of poverty reduction and improved wellbeing throughout these populations. The economic rubber boom generated extraordinary wealth without forest destruction, but social justice and equity were out of the equation, and all the accumulated wealth was drained after the rubber bust.

Livelihood adaptations following the rubber collapse took different forms across the regions studied: forest dwellers diversified livelihood strategies and were able to benefit from subsistence agriculture and forest extraction, but state government development agendas and market forces appear to have largely influenced current scenarios that are present in each of these regions today. Later colonization waves related to cattle/agricultural frontiers, mining and oil that started taking place in varied parts of the Amazon in the second half of the 20th century acted without any regard to local forest dwellers. Ecuador and Acre suffered more aggressive post-rubber development policies. Bolivia is the study site that received less influence from capitalist frontiers, while in Abaetetuba, even though situated in a state targeted with development mega-projects in the 1960s, its location in the estuary landscape enabled the region to receive much less influence from these development forces. While top-down policies and institutions contributed to social injustices and environmental destruction, bottom-up institutions and initiatives such as progressive lines of church based organizations, social movements and their allies, contributed to the devolution of lands and rights to local forest-dwellers, the slow-down of destructive capitalist frontiers, and reduced rates of deforestation.

4.4.1 Fieldwork

Field work methods and sampling scheme are described in Chapter 3. An interview guide containing eight guiding topic subjects was used with open-ended questions designed to enhance the opportunity for genuinely expressing the perspectives of forest dwellers and to provide richer
qualitative data about their visions on how to reconcile conservation and development. The interview guide included the following questions:

1. Do you believe that it is possible to reconcile the forest and environmental preservation with the improvement of the quality of life of the people who live here?

2. In what ways could this happen?

3. What are the main difficulties in achieving this reconciliation?

4. Are there ideas and solutions here that are difficult to implement due to lack of dialogue with government, bureaucracy, and other difficulties?

5. In what ways does government help and in what ways does government disrupt?

6. What kind of policies do you believe could help the functioning and lasting reconciliation of wellbeing and conservation?

These questions followed a broader conversation related to their histories, the local relevance of forests, and local institutions. The questions were asked in many different ways, according to the flow of the conversation and the dynamics of the interviews. For example, for envisioned solutions (related to questions 4 and 6 above), we asked them to carry out a mental exercise: “if you were a policy maker, or a minister and had to create policies and solutions that help local people improve their lives without overharvesting resources or conserving the forests, what would that be”? Then we asked if there were already some solutions towards that end taking place locally. Concerning all these questions investigated, information was shared in both directions, and dialogue was established. We listened with attention to their perspectives, valuing their worldviews, their solutions and their hopes. These methods embraced a commitment to involving people in the diagnosis of and solutions to problems instead of imposing solutions to pre-defined problems.
4.4.2 Qualitative Data Analysis

The qualitative data analyses followed systematic approaches based on coding procedures (Bernard, Wutich, and Ryan 2016) that are described in Chapter 3 (section 3.3.3). A priori themes included barriers to the prospects of sustainable livelihoods and envisioned solutions. Through the coding process, these themes were complemented with local ongoing solutions and government solutions, as the open coding proceeded there produced over a hundred sub-codes. Using tools available on MAXQDA, frequency tables of absolute numbers of coded segments were constructed and stratified by study site. With the most relevant codes and sub-codes, a retrieval technique was applied in which all interview segments related to each specific code were grouped by study site and then exported to word documents. These retrieved segments were reviewed many times for each study site, and organized by similarities of topics within each specific code. Subsequently the retrieved material was further reviewed and the writing process started, by describing and explaining the phenomena identified in the qualitative analyses process. The quotes that illustrated written descriptions of the subject studied were organized and the ones that most clearly represented the cases were chosen for inclusion.

4.5 Results

4.5.1 Barriers to the Prospects of Sustainable Livelihoods (BPSLs) across Geopolitical Contexts

We found variation in the nature and number of barriers to the prospects of sustainable livelihoods across the four research sites (Table 4-1). Abaetetuba was the site that displayed fewer BPSLs: a total of ten different BPSLs were mentioned throughout the interviews, of which the most relevant were: “river pirates” who steal goods; limited infrastructure; lack of access to health and education services; and burdensome bureaucracy and ineffective legislation. By contrast in Acre, there were a total of 30 types of BPSLs mentioned across the interviews.
The most important were repressive authoritarian enforcement agents; limited use rights; limited access to infrastructure, health and education; lack of socially and environmentally-friendly solutions; top-down projects and policies implementation; and burdensome bureaucracy.

Twenty-one BPSLs were cited in Bolivia, including: limited use rights; conservation policies limiting local livelihoods; and burdensome bureaucracy. Lastly, in Ecuador, there were 25 BPSLs mentioned, of which the most relevant were: intermediaries/exploitative marketing chains; lack of socially and environmentally friendly solutions; burdensome bureaucracy; pesticides; and oil companies.

Top-down projects and policies implementation, ineffective legislation and burdensome bureaucracy were common BPSLs operating across all study regions. However, as we expected, different BPSLs prevailed across different geopolitical contexts: limited use rights were a major barrier in Acre; surprisingly, intermediaries/exploitative marketing chains were problems in Ecuador but were lightly manifested in the other sites; lack of socially and environmentally friendly alternatives were cited more in Acre and Ecuador; repressive and authoritarian enforcement agents were especially mentioned in Acre. Other context-specific BPSLs, were “river pirates” who steal goods in Abaetetuba, as well as oil companies, pesticides and erosion of traditional and indigenous knowledge in Ecuador. These findings contradict the literature suggesting that some BPSLs are common across forest communities, such as limited use rights and exploitative marketing chains. These various responses will be explored in more detail below.

4.5.1.1 Top-down/elitist social structures

**Top-down projects implementation.** In Abaetetuba, respondents recounted that extension projects on livelihood diversification, including small agriculture, raising small animals and aquaculture, were not tailored to local realities and not combined with local expertise. For
example, an EMATER (state extension agency) technician trained to work in the uplands introduced upland-related technology for the floodplain environment, which did not work. Also, an extension project aiming to promote local aquaculture production built fifty tanks, but the local fertilized eggs (*alevinos*) provider did not supply the seed; people were forced to buy fertilized eggs from another region but they were not granted the authorization for that. The result was fifty empty aquaculture tanks with no production.

In Acre, respondents were very upset about a timber management concession project in which the ICMBio brought foreign enterprises from Japan, who evaluated their tree stands and made contracts to buy standing timber in the forests. However, after the contract was made, people realized that it was actually a horrible deal for them, since the compensation was very low and their forests became much damaged. Local residents regretted it, but could not go back and undo the contracts. They complained about the ICMBio administration that repressed people for harvesting timber for local domestic use, while promoting a foreign concession that used heavy machinery and large-scale logging operations.

In Bolivia, there were also an aquaculture project that never succeeded for lack of appropriate knowhow; investments were made and the project personnel left without finishing. A technology for extracting *açai* and *majo*, for climbing trees instead of having to fell them, was discussed with an NGO but never implemented. Because of these concrete experiences, local people had learned to mistrust outsider interventions. In Ecuador, an externally-fomented reforestation project invested in tree nurseries but always used seeds brought from other regions; local people invested time and effort in the project but after all, the seeds did not adapt and the initiative was unsuccessful. They clearly expressed the top-down nature of externally
implemented projects: “they come with their own rules, they want to do everything in their own way, they do not listen, and we have to invest our time” (indigenous resident, Ecuador).

The government should come here and ask us directly what we want, get a study to really know, but there it goes, send projects, send it and nothing is good, money thrown away, they invest in things that do not work (former rubber-tapper, Acre).

The people who came from the outside, Chinese and Japanese, came and observed that in the forest there were many types of wood that were not used here, it dies and it grows there, and then they thought that they could buy that wood from us, but you see, they pay a very low price and leave your forest only a mincemeat, until the little branch you have is gone, there remain only holes in our forest. They take it out and they come with a tractor; after a few years, they come again and that part is left for them (former rubber-tapper, Acre).

I think these projects should draw more on our realities and ideas, like we ourselves should find the ways and get their [government or NGOs] support. But it is really difficult, people outside seek to do everything so fast and are not transparent, I think they get attached to the money (non-indigenous forest extractivist, Bolivia).

**Repressive and authoritarian enforcement agents.** In Acre, the existence of repressive environmental agents was reported to be a major BPSL. Many reports, testimonials and stories illustrated how federal government environmental agents dealt with local residents, which included a lack of dialogue, repressive behavior, brutality, humiliation, intimidation with guns, and abuse of power. First, people in Acre argued that even if people violated laws about clearing forests, hunting or fishing above legal limits, environmental enforcement agents nonetheless should treat people with respect, should explain to people what was wrong, and listen to people’s explanations for why they were acting irregularly, and try to find a solution together. Second, some agents were punishing people for conducting subsistence activities that were in fact legal, such as fishing and hunting for subsistence or using timber for building local houses and fences. They expressed a lot of resentment about how disrespectfully and violently federal environmental agents dealt with them, and that they felt intimidated and trapped, as if they were in prison. For example, there was an external extension program for producing charcoal, and
some residents built ovens and produced it mostly for subsistence; others were also selling the charcoal, and a few were using an abandoned landholding within the reserve to extract timber above the permitted limits. Regardless of whether residents were doing it legally, or for subsistence, whenever the agent entered a household and encountered a bag of charcoal close to the kitchen, he would brutally throw things to the floor and intimidate people with a gun. As for the people who were producing charcoal to sell, the environmental agents tied a steel cable to the charcoal oven and connected it to the winch of the car, then the agent would enter the car and pull the oven, destroying everything, and so on with the next oven, while another agent pointed a gun at the residents.

They [federal environmental agents] humiliate us and fine us. They use words of low slang, saying you will go to jail, you can be kicked out, these things, real humiliations. They say you do not own the land, you do not command anything, that the owner is the government, that you have to be up to date, cannot be irregular, that you can lose your place depending on the fine. You've been taking care of it all your life here, you've managed it, and because of a piece of land that you strip down to make a living, you run the risk of being expelled, leaving you with nowhere to go, nowhere to stay, and still with a fine that no one can pay because it is very high, no rural producer can pay the ICMbio fines anyway, even if you sell your children, or sell the place (former rubber-tapper, Acre).

There is no alternative, the people have to survive, so oftentimes they end up running the red light; then, the environmental agents appear only to fine, repress, but not to bring production alternatives; they do not come to discuss together and find alternatives, discuss the social environment of each community within the Reserve (former rubber-tapper, Acre).

4.5.1.2 Incoherent/ineffective legislation and burdensome bureaucracy

In all study sites, since legalization of certain forest product extraction activities was not viable due to bureaucratic obstacles, they oftentimes extracted forest resources illegally, but the price for the illegal product was much lower and, as a consequence, they had to sell more; this in turn, led to a trend of unsustainable patterns of resource use. Difficulties in legalizing logging activities impeded local people’s ability to add value to local timber, for example, by closing
community veneer mills in Abaetetuba; as a result, people ended up selling standing trees or logs, which drastically reduced timber prices (since it was an illegal and non-processed product). In Abaetetuba, local people were not informed about the procedures for timber and palm heart legalization, and when they managed to access the information, they did not have the skills and financial resources to conduct scientific-based inventories, or write and issue management plans. However, at times, by building partnerships with NGOs, or even through the efforts of local cooperatives, they overcame these technical and financial BPSLs. The management plan was submitted and approved, but later, due to malfunctioning bureaucracies at the environmental agencies, the license was never released.

In Acre, people recounted that it took three years just to get a timber management plan approved, and then the license was not issued. As a consequence, people got used to illegal logging, but a piece of legalized wood would sell for over R$ 300, while the same piece if illegal would sell for no more than R$ 60. Also, legalized timber was supposed to yield more income, but the legalization process was so time consuming and expensive that, in the end, even monetarily it was not worth it.

In Bolivia, people complained that large landholders had the right to exploit large amounts of timber, while the small peasants were prohibited – they were not allowed to exploit even the dead wood. They said this was not fair; even harvesting timber for their own consumption, they had to get a license; and for that license, they had to go to the city, and spend time and money. Within a community outside the reserve people even said it was not financially rewarding to legalize the timber activity through management plans.

In Ecuador, burdensome bureaucracy for timber legalization also represented a major obstacle and a driver of illegal logging; as in the other study sites, people said they did not have
the required information, time and financial resources to be included in the legalization procedures. In community assemblies, they had agreed not to sell timber, but due to the lack of environmentally friendly alternatives, at times, they did it illegally. Most of them were aware that the logging activity was not sustainable and the timber prices sold illegally to intermediaries were too low, but they did not have better options at hand.

Legalization is difficult and expensive. We worked to legalize the sale of our palm heart, we spent a lot of money, had to make a forest inventory for the whole area, we got financing and we did it in the whole community. Then we did the documents to send to IBAMA, and there the legalization did not proceed. That is why it is clandestine, they are doing it because that’s the only choice (riverine inhabitant, Abaetetuba).

The government has good intentions but it is very bureaucratic. It is very expensive. People just do not know how to go about it, so they give up. We have to submit a document, one thing, go there, go back, come and go another day, then it ends up not being viable. Cost. Cost. And people get bored. Many people get frustrated and give up. We stay like this. I wish things were more viable, better, more straightforward, right? To be able to have more help. But the way it is, it’s very bureaucratic (non-indigenous forest extractivist, Bolivia).

The Environmental Ministry says that everything has to be done legally, clear a parcel of forest to plant our chackra, harvest trees, for everything we must get permission, but we do not have money and it is too complicated, so we do it illegally (indigenous resident and park guard, Ecuador).

Apart from forest product legalization procedures, other BPSLs related to unsustainable/ineffective legislation and burdensome bureaucracies emerged across sites. In Ecuador, they recalled past policies in which, in order to access rights to land, settler and indigenous communities had to clear at least 50% of their lands. In Abaetetuba and Acre, they reported burdensome bureaucracy in regard to accessing financial credits for agriculture, agroforestry and aquaculture. In Acre, just to practice small agriculture, every year, every landholding had to request a license, and this was expensive since they had to make several trips to submit and get the license; additionally, they had to pay for the license. The ICMBio environmental agents went to check on whether households had their licenses, and if not, local
people had to pay fines even if the land used for agriculture was under the legal limits. In Acre, there were subsidy programs for rubber production, but some families did not benefit because they did not manage to overcome the bureaucracy required. In Bolivia, local people have to request permission to plant subsistence agriculture.

4.5.1.3 Exploitative marketing chains

Exploitative marketing chains seemed to be a major barrier mainly in Ecuador and for some products also in Acre. In Acre, the lack of infrastructure access was blamed for forcing people to depend on intermediaries. In Ecuador, intermediaries were seen as major drivers of deforestation, since, for a long time, they pressured and persuaded local people to extract timber. According to most accounts, intermediaries stimulated illegal and unsustainable logging and dominated markets of basically all local products (including agriculture, timber as well as emerging NTFP markets, such as guayusa). People felt exploited since, despite owning the land and working on production and harvesting, they got the lowest compensation, while intermediaries and other levels of the market chains were enriched from their products. In Abaetetuba, a very violent and oppressive form of exploitative market intermediary consisted in the so called “river pirates” who, using guns and fishing net traps, steal goods and boats from local residents who are transporting their products through the river. The presence of “river pirates” in Abaetetuba seems to be related with high population densities and proximity to urban centers. Other market-related BPSLs were present in Acre, Ecuador and Bolivia, including the lack of market demand for specific products, especially NTFPs, and low prices for forest and agricultural products. Unsustainable market pressures were attributed to lack of political attention, since timber and other industries were not properly charged or controlled to address the pressure they generated for the environment.
They only come to take advantage, we sacrifice and we do not get a fair price. Those who take advantage are the intermediaries who buy the products. That is our concern here (indigenous resident, Ecuador).

The intermediaries came with cars: “sell, sell, but cheap, at one dollar, for a laurel tree [high-value tree species]” (indigenous resident, Ecuador).

4.5.1.4 Barriers to the prospects of sustainable livelihoods in relation to historical events

We found similarities and differences of BPSLs operating across our study areas, and these appear to have been strongly influenced by past historical events and government programs. In Ecuador, government colonization programs that stimulated land speculation, timber and cattle booms, and pesticide-based agricultural expansion, seem to have resulted in the locally perceived BPSLs there, which encompass exploitative markets, pesticides and oil companies. In Acre, the government-induced expansion of the cattle frontier during the military dictatorship still seems to resonate today, even after the land reforms resulting from the rubber-tappers’ struggles, and has largely influenced the high number of BPSLs operating there. Limited use rights appear to be driven by top-down conservation thinking across sites, but repressive enforcement mechanisms vary from being more acute in Acre, and less so in Ecuador and Bolivia; Abaetetuba residents did not suffer from repressive agents nor from limited use rights, and we suspect that this was a function of the historical context in which the caboclo population had been adapting to the varied economic cycles and the land tenure modality. Agro-extractive settlements and land use concessions were less targeted for conservation modalities compared with extractive reserves and sustainable development reserves that were more targeted to conservation through sustainable use. Top-down social structures were present everywhere, and histories of colonization that were based on domination, exploration, power and control seem to explain the still-present oppressive scenario. However, interestingly, in general local people across the study
contexts did not perceive themselves as vulnerable or helpless, and some barriers to the prospects of sustainable livelihoods have been successfully addressed.

### 4.5.2 Local Ongoing Solutions

The local ongoing solutions that were common to all sites were social organization and local cooperatives (Table 4-2). People perceived social organization as a way to overcome invisibility, diminish power imbalances, and increase their voice to claim rights from state governments, allowing improvements such as access to education and health services. Social organization also enabled improved internal mechanisms of cooperation, including the establishment of market arrangements and local cooperatives. Local cooperatives were viewed as critical to improving life conditions without depleting local resources. For example, in Acre, the creation of the COOPERAC, which was supported by the state government, allowed the Brazil nut price to increase from R$ 1.50 to R$ 35 (2300%); in Bolivia, leaders of a cross-community organization travelled to Cochabamba to establish commercial rubber contracts with national industries, while leaders of the national peasant union confederation (*Federación Unica de Trabajadores de Bolivia*) travelled to Europe to set up direct international market contracts. In Abaetetuba, people sold *açaí* in the city ports, but also supplied regional processing industries, and between 2008 to 2014, the *açaí* price increased from R$ 5 to R$ 35 (also as a response to increased national and international market demands). In Ecuador, there were incipient market arrangements around the commercialization of fruit crops. Livelihood diversification appeared as an ongoing solution in Acre, Abaetetuba and Bolivia, while NTFP management and commercialization were seen as conservation-based solutions in Abaetetuba and Bolivia. Site-specific locally based solutions included ecological fishing traps in Abaetetuba, as well as organic cultivation and processing, tourism, indigenous cultures in local school portfolios, wild mushroom production, and indigenous handcrafts in Ecuador (Table 4-2).
The local initiative for organic production in Ecuador is one that is worth describing. In a Quichua community called Wamany, situated in the foot of the Sumaco volcano, people explained that they got tired of extension projects that never succeeded. They were realizing on their own that the use of pesticides (which was externally influenced) was generating several negative impacts on the environment and in the local population’s health. They formed a group and started a community project to produce naranjilla limpia (organic naranjilla), using traditional knowledge systems on agricultural cultivation. The organic cultivation was successful; then, they partnered with the local school and engaged children and teachers in the processing of juice and sweets, and also succeeded. Later, the government organized an event in the region with 5000 people in attendance, and they negotiated with the organizers to supply bottled organic naranjilla juice: they produced 6000 bottles and sold them at US$ 1 each. Subsequently, they struggled to overcome obstacles related to sanitary regulations; they were building a laboratory and community processing industry, and were engaging in regional based market arrangements. Naranjilla limpia was double the price of non-organic fruit and juice. Other neighboring communities were influenced and expressed a desire to engage in similar initiatives. Meanwhile, in another Quichua community not very far from Wamani, a big international NGO was introducing a project to build little houses for storing pesticides outside the families’ households.

Apart from local organization and cooperatives, local solutions varied according to study contexts. Tourism was a successful and expanding local solution in Ecuador, and this might be influenced by a number of geographical and socioeconomic factors: Ecuador is a small country but contains very diverse landscapes, such as the pacific coast, the Andean mountains, volcanos
and the rainforest. The government invested in tourism, and the northern Ecuadorian Amazon is situated only a five-hour drive from the capital, Quito.

NTFPs represented a locally recognized ongoing solution in Abaetetuba and Pando, where açai and Brazil nut economies respectively thrived. Even though Brazil nut was also a major commercial activity in Acre, it did not emerge as a local solution, probably as a function of the competing cattle economy, resulting in conflicting scenarios of land and resource use. Handcrafts were specific to Ecuador and related to the Quichua indigenous culture, but contact and proximity with the tourism sector was contributing to making it an alternative and sustainable source of income. Ecological fishing traps in Abaetetuba were a solution related to the reality of the Amazon estuary region, with its abundant rivers, while wild mushroom production in Ecuador was a case-specific individual initiative that was generating income in one mixed Quichua-settler community (Pacto Sumaco). Finally, incorporation of traditional culture and indigenous affairs in local school portfolios was specific to Ecuador, and related to the BPSL erosion of indigenous culture.

Therefore, to answer our second question, we found that some ongoing local solutions had successfully removed major BPSLs. As hypothesized, local institutions, held some of the solutions for the removal of BPSLs: social movements addressed invisibility, lack of voice and enabled education, health and infrastructure access improvements; local cooperatives addressed unfair market chains, which had hindered improvements of livelihoods for at least a couple of generations.

For example, people used to exploit us because nobody controlled it. Out there they sold forest products for very high prices, and here they paid very little, that is, a unique exploitation and life was very bad. The capitalists getting bigger and bigger. So that's it, now we are no longer in their hands (non-indigenous extractivist, Bolivia).
Other ongoing local solutions, such as the *naranjilla limpia* in Ecuador, and the *matapi ecológico* in Abaetetuba also might have been influenced by local institutional mechanisms. Other local solutions seem to be contributing to the improvements of sustainable livelihoods.

### 4.5.3 Government Solutions

Government solutions were present at all sites, and more relevant than expected. From the perspectives of local forest dwellers, left-oriented social policies represented functioning and effective solutions that enabled unprecedented livelihood improvements and contributed to conservation (Table 4-3). To illustrate this, in Abaetetuba they explained the need in the past to overharvest palm-heart and timber in the period in between *açaí* harvests, but after the implementation of federal poverty reduction policies in Brazil, they drastically reduced these unsustainable activities. State-owned processing industries and support of local cooperatives also appeared to have made a huge difference. The COOPERAC in Acre and the EVA enterprise in Bolivia established fair prices for Brazil nut harvesters, and their net gains increased dramatically, which according to their accounts, helped to take pressure off the environment while improving their living conditions. Additionally, in both contexts, these government solutions provoked a real change in regional market mechanisms, as intermediaries started to pay the prices set by the state industry, serving as complementary buyers. Forest product subsidies and a state-private condom factory in Acre represented functioning solutions, but not all families benefitted; people articulated the need to expand the reach of these ongoing government solutions. Successful support for livelihood diversification was present in Bolivia. Payments for environmental services were taking place in Acre, Abaetetuba and Ecuador, but perceived differently across sites: in Acre, people unanimously evaluated the amount received (R$300 every three months) as not sufficient to compensate for not practicing their slash and burn agriculture. In Abaetetuba, since their livelihood systems is predominantly based on forest and
river resources, and slash-and-burn agriculture is not a priority, people perceived it as a good complementary help, which allied to other social policies, allowed them to better conserve natural resources.

4.5.3.1 Left oriented social policies

Overall, the standards of living, education, health, infrastructure, local voice and in some cases dialogue have improved under the historically recent cycles of left-oriented political governments and its social policies (Rafael Correa in Ecuador, Lula da Silva and Dilma Rousseff in Brazil and Evo Morales in Bolivia). These social policies were viewed as an astonishingly positive government solution, contributing to both social and conservation improvements. In the three countries investigated, the past decade of social policies seems to have benefitted these forest peoples in many different ways. In Ecuador, people said that under the Raphael Correa administration, the dialogue between government and local peoples had improved as a result of the decentralization process that took place. Government branches were restructured to include federal, state, province, municipality and paroquias; the latter was at the community level, made up of local leadership members. Additionally, inclusion and diversity policies in Ecuador such as the Plurinacionalidade, Interculturalidade, Buen Vivir and the inclusion of the Quichua language as officially taught in schools represented important steps towards the recognition of traditional peoples’ customary rights and cultures. In Bolivia, the majority of forest peoples interviewed were clearly satisfied with the Evo Morales administration, confirming that, for the first time, they were not invisible and marginalized from government policies and budgets, and that dialogue with the government had improved. Additionally, in every community, investments were made in infrastructure, roads, health and education. In Brazil, numerous social policies and programs implemented under Lula and Dilma Rousseff’s administrations were unanimously recognized as improving many dimensions of peoples’ lives. The Bolsa Família program was
given to women according to the number of children they had, and under the condition that all of
them were attending school and had up-to-date required vaccines; there were also subsidies for
pregnant woman (Bolsa Maternidade), and another subsidy in the case of disease (Auxílio
Doença). A large housing program called Minha Casa, Minha Vida provided decent and good
quality homes to basically every low-income family. The educational system was amplified to
reach remote areas, and adult literacy programs technically eradicated illiteracy in these rural
areas. Bolsa Verde and Seguro Defeso were programs designed to support people in preserving
local resources. The Seguro Defeso was a payment made to fishermen during the months the
fishing activity was forbidden, to promote sustainability. According to the interviews, the reach
of all these government programs was widespread. Such integrated government programs appear
to have transformed peoples’ lives in different dimensions: reducing poverty, increasing
educational levels, providing new economic opportunities, improving living conditions and, as a
consequence of all these, increasing dignity and self-esteem. This in turn appears to have
decreased vulnerability levels and increased resilience in the face of shocks, and helped
overcome unfavorable market and political structures. It was also recognized that the integration
of the aforementioned social policies contributed to conservation standards, by decreasing
vulnerability, and strengthening peoples’ positions vis-a-vis unsustainable market forces.

Pando was a neglected department, where the president used to come only once a
year, and now the government comes every weekend; Evo [Morales] comes all the
time. The government launches the laws, but then as time goes by, we have had
more exchange to create some rules, help create the regulations. The government
now has been supporting us to protect the forest and prevent invasion by powerful
loggers and entrepreneurs. Before, we constantly struggled with them, often dealing
with death threats. Now we no longer have these problems (non-indigenous forest
extractivist, Bolivia)

Before, everything was scarce, the road system, everything had to be transported by
the river, everything was difficult. Now everything has improved. There is a
school, there is a telecenter, there is the mini hospital, there is the cell phone
provider, we have potable water, there are always sources of jobs (non-indigenous forest extractivist, Bolivia).

A few years ago, there were four families living in a single house, and it was not a decent house. Now, you can notice that every nuclear family has a house. Now we have electricity too; the Luz para Todos program installed electricity in the Abaetetuba islands three or four years ago, and made everything easier here: today we have a mechanic on our island, we have a cabinetmaker who works with furniture, we have a technician, so it also generated new work opportunities. Additionally, before, the fishers had to buy ice in the city to be able to store the fish, and now many people have bought refrigerators and freezers. The schools have been improved and amplified; now we have six classrooms, before we had only two. There are classes taught at night for adult literacy: before people were ashamed for not knowing how to sign their names, now most of the people who had documentation as an illiterate traded in their documents as literate (riverine inhabitant, Abaetetuba).

As such, we accept the hypothesis that, in some spheres, government solutions have successfully removed major historically developed BPSLs. State-owned processing industries, state-private regional factories that purchase NTFPs, and government subsidies have contributed to address exploitative marketing chains and unfair market arrangements. Left-oriented social policies contributed to the removal of BPSLs, and improved prospects of sustainable livelihoods in many different fronts, such as poverty reduction, increased standards of living, and increased dignity and self-esteem, decreasing vulnerability that oftentimes leads to overexploitation of natural resources, among others.

4.5.4 Locally Envisioned Solutions

We found a wide range of locally envisioned solutions towards the wise reconciliation of conservation and livelihood improvements, encompassing the following themes: simplified and accessible legislation; policy choices and interventions that appropriately respond to local needs; support for improved market opportunities; a variety of livelihood diversification schemes; adapted and transformed educational systems at all levels; promotion of environmentally, socially and friendly alternatives; and more (Table 4-4). The themes that appeared to be most
relevant and consistent across geopolitical and historical contexts were livelihood diversification; improved infrastructure access; health and educational systems; and the promotion of environmentally friendly alternatives. Tourism was envisioned as part of the solutions in Ecuador and Bolivia, but not in the Brazilian sites. Rescue and promotion of traditional knowledge and practices was a relevant proposed solution in Ecuador. Improved dialogue with government structures, establishment of friendly relations between environmental agents and communities, and collaborative land use planning were relevant envisioned solutions in Acre. Many themes were in some ways interconnected; for example, organic agriculture and aquaculture were elements of livelihood diversification, food autonomy and security, and environmentally friendly alternatives could be connected with improved market opportunities and appropriate extension policies, and integrated into transformed educational systems.

Diversification of livelihood strategies was unanimously seen as a prominent strategy for the successful reconciliation of conservation and improved livelihoods. It was manifested and envisioned through different schemes and included, for example: (1) Improved techniques for animal raising, agriculture intensification/mechanization with the use of leguminous organic fertilizer, honey, fruit production, Brazil nut and other NTFPs in Acre. (2) The combination of *açaí* fruit production, fishing and shrimp catching, *matapi* confection and fishing net confection, family agriculture based on fruticulture and horticulture in Abaetetuba. (3) Brazil nut, agriculture diversification, woodwork, animal raising, fruit production and sewing in Bolivia. (4) Vanilla, cacao, coffee production, and diversified agroforestry production systems, animal raising, horticulture, and wild mushroom production in Ecuador. Aquaculture was an envisioned and desired solution across all research sites. Desire to specialize in one single activity was not observed at all. Livelihood diversification was locally seen as a strategy that reduces the pressure
of deforestation, since income would be provided by varied sources. When asked whether agriculture and animal raising would cause forest conversion, people affirmed that it would not be large-scale, and that they were not willing to lose forest-based livelihood activities. In Acre and Abaetetuba, people expressed the need to learn improved ecological techniques for agriculture without the use of fire, as well as needing municipal and state incentives for the family provision of vegetables and fruits in municipal fairs and schools. Diversification of livelihoods was also seen as a strategy that guaranteed food security and autonomy. People demonstrated a strong preference for producing a wide variety of food for consumption. Also across sites, people envisioned the prospect of supportive policies for the successful implementation of diversified production systems.

Improved access roads represented another relevant envisioned solution across sites, which was related to the quality of life, the right to come and go, increased prices for local production, and the opportunity to access urban hospitals in case of health emergencies. There was a continuum of the need for improved roads among sites: in Acre, this appeared as an urgent and probably the most important demand; in Bolivia, improved roads were important, but they were already benefitting from recently-constructed roads that connected remote communities to small urban centers. In Ecuador and Abaetetuba, improved road access was not expressed as a high priority demand.

At all sites, adapted and accessible health systems represented another envisioned solution locally, as they currently had to go to the cities for medical consultations, spend a lot of time and money, and oftentimes did not have their health issues resolved. They envisioned the existence of itinerant doctors, who would adopt more holistic and preventive types of treatment. They also envisioned the existence of functioning community medical posts. Educational systems also
represented a common dilemma across study contexts. People all desired to provide good education to their children, but middle- and higher-level education was not commonly offered across these forest communities, so adolescents had to leave for the cities in order to continue studying, and the type of education was generally not adapted to local rural realities. In all sites, they dreamed of good quality in situ schools and alternating (itinerant) universities, as well as curricula and portfolios directed to the local forest-rural realities. Priority content would include administration, organization and leadership skills, ecological agricultural systems, integrated forest management, livelihood diversification including environmentally friendly technologies for aquaculture and animal raising, organic production, tourism entrepreneurship, sociology and history, and indigenous culture in the case of Ecuador.

Other envisioned solutions did not appear in all research contexts but also deserve some attention. An indigenous park guard in Ecuador envisioned a simplified and costless mechanism for timber management legalization, whereby a state-hired technician would come to the communities, conduct participatory inventories, collaboratively plan sustainable management decisions, and issue the license in situ, avoiding the several costly and time consuming trips to the cities and the burdensome bureaucracy BPSL. Processing products locally to add value was seen as another conservation-compatible strategy, as well as state-owned and regional beneficiary industries. Expansion of existing solutions included the workings of local cooperatives, state-owned beneficiary industries, the strengthening of local institutions, organic agriculture, and left-oriented social policies.

Overall, we found more commonalities of envisioned solutions across sites than expected. Livelihood diversification and improvement of infrastructural access, health and education were solutions envisioned across all contexts. Other envisioned solutions appeared to be related to
BPSLs operating in specific contexts, such as the desire for improved dialogue and collaborative land use planning in Acre, and promotion of socially and environmentally friendly alternatives in Ecuador.

4.6 Discussion

We found common and divergent barriers to the prospects of sustainable livelihoods across sites. As we hypothesized, Ecuador and Acre displayed the higher number of BPSLs operating locally and we attribute this to the post-rubber policies implementation that prioritized mega-projects and capitalist agendas (cattle frontier and land speculation in Acre; pesticide-base agriculture expansion, multinational oil companies and land speculation in Ecuador). This can be also understood as geopolitical factors shaping local realities, as international interests were not disconnected from the financing of mega projects and market interests such as oil exploitation.

Top-down projects and policies implementation was a common BPSL across sites. If so much research has already provided sufficient evidence of local peoples’ knowledge systems and creative capacities (Berkes, Colding, and Folke 2000, Chambers 1995, Silveira, Petersen, and Sabourin 2002, Pawluk, Sandor, and Tabor 1992), why do they keep being treated as mere recipients of projects designed to improve their own livelihoods? Why are most government research and extension institutions not prepared or equipped to conduct thoughtful and inclusive participatory research and participatory projects design and implementation? Why do these institutions not develop appropriate and environmentally-friendly technologies for small rural producers and extractivists? We argue that there are some deep-rooted reasons behind these problems. We are going to use the case of some Brazilian institutions to reflect on this issue.

EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária) is a government agricultural and livestock research institution, the largest in Brazil and one of the largest in the world. As many other research institutions, it is predominantly guided by elitist based knowledge
production, in which research is conducted almost exclusively by formal scientists in laboratories and field experiments, and then applied in top-down fashions (ANA 2007). But despite the fact that 70% of food in Brazil is produced by family farmers (IBGE 2009), agribusiness is very strong in the country. Commodities such as soy and cattle are prioritized for the export economy (Carneiro et al. 2015), most members of the Brazilian legislative power (senators and deputies) are either big soy and cattle landowners or advocates of the agribusiness sector (bancada ruralista), and the agricultural ministry (from which EMBRAPA is linked) has always prioritized agribusiness agendas (Londres 2011). As a consequence, the overwhelming amount of the federal budget transferred to EMBRAPA is directed to conducting research projects on the agribusiness sector, as opposed to environmentally-friendly technologies that would be appropriate for small producers and extractivists. Moreover, EMBRAPA contains a “technology transfer department” (Departamento de Transferências de Tecnologias), itself a concept which follows the elitist top-down approach that does not acknowledge local realities and knowledge systems of small producers. To complement this scenario, EMBRAPA, as well as many federal and state universities, receives funding from big multinational agribusiness enterprises, such as Monsanto (Embrapa 2012). This case illustrates why small farmers, extractivists, and agro-ecological technologies are not prioritized in the public policy agendas. Another example is EMATER (Instituto de Assistência Técnica e Extensão Rural), an extension organization linked to state governments. The agency is directed to provide technical assistance to rural producers, but in general these are poorly equipped organizations, with low human resources and low budgets, and they follow the same logic of knowledge and technology transfer, which does not account for the local realities, demands and expertise.
Incoherent legislation and burdensome bureaucracy were also common BPSLs across sites that had already been consistently reported by the literature (Cronkleton et al. 2010, Larson et al. 2010, Sunderlin, Angelsen, and Wunder 2004). We argue that the lack of appropriate efforts to address such major constraints is rooted in a lack of political will, and the resulting small budgets directed to small rural producers, along with the elitist mandates of many government institutions. In all these cases, simpler forms of legalization, and fair trade measures would enhance the prospects for sound smallholder management and livelihood improvements.

Repressive and authoritarian enforcement agents were stark in Acre, but not in the other sites. It was intriguing that such repressive and sometimes violent enforcement mechanisms were taking place within the Chico Mendes Extractive Reserve – the cradle of the rubber-tapper social movement, which turned into an internationally known grassroots’ struggle and resulted in a nation-wide land reform that, for the first time, recognized rights to land and resources for previously invisible forest dwellers. Such authoritarian behavior was attributed to federal agencies, such as ICMBio agents and enforcement police. ICMBio is a federal environmental institution directed to the modalities of sustainable use reserves; its agents are recruited for lifelong positions through national competitions (*concurso*), requiring a university degree. Since competition is national, candidates from larger urban centers who have access to better universities are usually the ones who get these positions. However, not many ICMBio officials are willing to live for a long time in remote Amazonian regions such as these, and the decision on allocation of agents can be arbitrary. Some ICMBio agents are thoughtful and competent professionals, who treat residents with respect and consideration, and work collaboratively with them. But unfortunately, this is not the rule: many officials just do not seem to be prepared to work with forest-dwellers, and as we can see, some can be quite disrespectful and inappropriate.
As such, here we reflect more about what we meant in the beginning of the chapter about deep-rooted oppressive systems. We argue that, in the absence of a concentrated effort, authoritarian practices will continue to be a major barrier against the prospects of sustainable livelihoods. Examples of concentrated efforts to address this problem could be a training center in which officials who are directed to work with Extractive Reserves and other modalities of sustainable use reserves receive appropriate training about, for example, horizontal and bottom-up interventions, supportive and collaborative behavior and human rights. Then, the best-prepared individuals would be selected to work in sustainable use reserves. Another possible solution was illuminated by what we observed in the research sites in Ecuador and Bolivia: many of the park guards in these regions were either forest-dwellers from the communities or natives from the regions – we attribute this fact (the cultural proximity between hired park guards and local residents) to much better relationship and dialogue taking place between environmental officials and community residents, even if not perfect.

We found both local and government solutions operating to remove fundamental BPSLs and contribute to the prospects for sustainable livelihoods. Exploitative marketing chains were historically a major BPSL, much reported in the literature (Wunder 2001, Kaimowitz and Sheil 1997, Schmink 2004, Menzies 2007, Pacheco and Paudel 2010). For generations, unfair market arrangements prevented local-forest dwellers from benefiting from their production and escaping from poverty. Additionally, the inherited elements of the rubber economy’s aviamiento (or habilito) system that forced forest dwellers to sell production for ridiculously low prices while buying basic goods for exorbitant prices, in some cases led local people to overexploit resources. The local institutions engaging in improved market arrangements through cooperatives and other means, allied with government effort to establish state or state-private regional processing
industries for forest products have, in regions such as Bolivia and Acre, successfully removed this critical BPSL and increased the income of local residents.

Other prominent local solutions could serve both as cross-region ideas and inspirations, and as inputs for policy and project design, with the understanding that specific contexts require specific locally viable solutions. Examples include tourism and organic production systems in Ecuador. Another relevant finding was the extent to which left-oriented social policies had positively contributed to the improvement of livelihoods. By these means, left-oriented governments in Latin America triggered transformational and unprecedented shifts in social structures, by eradicating poverty and diminishing social imbalances. International political will that supports these agendas to continue will be crucial for the support of social justice and environmental conservation in the Amazon.

The wide variety of thoughtfully envisioned solutions across contexts illustrated the rich potential of including local voices and strategies into the design of sustainable development policies. However, appropriate support is needed. Solutions towards the reconciliation of conservation and wellbeing are better achieved and maintained through bottom-up approaches, with autonomy devolved to local actors and local creativity stimulated at multiple aspects of livelihoods (forest management, social organization, production, commercialization, regulation and enforcement, policy). We learned that policies can be designed to diminish barriers to the prospects of sustainable livelihoods that impede solutions towards a socially fair and environmentally sustainable development. The removal of structural barriers such as exploitative marketing chains, oppressive social structures and internalized oppressions appear to be prominent strategic measures, since other solutions and extension projects have not worked in the past because such barriers were in place. Bottom-up approaches, like participatory research
and supporting local solutions would be essential, as well as strategic large-scale policies designed to promote lasting solutions for the interface of conservation and wellbeing of forest peoples in Amazonian contexts.

In general, isolated households or communities acting alone are too weak to defend their rights from either centralized, bureaucratic power, or external market-oriented threats (Menzies 2007, Paudel, Monterroso, and Cronkleton 2010). Community organizations, cooperatives, networks and other forms of collective action help strengthen the institutional and technical capacity of member organizations and can potentially mitigate various negative forces they face, by defending and increasing community rights and improving market arrangements (Edmunds and Wollenberg 2001, Menzies 2007, Larson et al. 2010, Paudel, Monterroso, and Cronkleton 2010). For example, communities can influence the tenure reform process by collective expression (Paudel, Monterroso, and Cronkleton 2010); they can also address power imbalances and reduce unfair exploitation by middle-tier traders (Menzies 2007). We learned that strategies vary according to different contexts. The findings from this research contribute to our understanding of the dynamics of top-down and bottom-up institutions that contribute to sustainable forest-based production alternatives.
| Table 4-1. Absolute frequencies of retrieved coded sections, related to barriers to the prospects of sustainable livelihoods, by study site. |
|-------------------------------------------------|-------------|-------------|-------------|-------------|-------------|
| **Vulnerability**                               | 2           | 0           | 1           | 1           | 4           |
| **Population density**                          | 1           | 2           | 0           | 0           | 3           |
| **Lack of appropriate POLICIES**                | 1           | 0           | 1           | 0           | 2           |
| Unsustainable legislation                       | 1           | 0           | 0           | 2           | 3           |
| Ineffective legislation                         | 7           | 5           | 2           | 2           | 16          |
| Far and private processing industries           | 0           | 0           | 2           | 0           | 2           |
| Extractive Reserve/Protected area model blocking social policies | 10          | 0           | 4           | 1           | 15          |
| Lack of appropriate technology for forest extractivism | 3           | 1           | 0           | 0           | 4           |
| Limited infrastructure, access and health-education facilities | 23          | 6           | 1           | 4           | 34          |
| Lack of financial resources to implement local solutions | 1           | 0           | 0           | 1           | 2           |
| Credits with too high interests                 | 0           | 0           | 0           | 4           | 4           |
| Lack of policies addressed for rural areas      | 1           | 0           | 1           | 0           | 2           |
| **TOP DOWN/Elitist Social structures**          | 0           | 0           | 0           | 0           | 0           |
| Lack of trust in local people’s solutions       | 4           | 0           | 0           | 1           | 5           |
| Repressive and authoritarian enforcement agents, lack of dialog | 33          | 0           | 0           | 1           | 37          |
| Lack of voice, disempowered political position  | 5           | 0           | 0           | 3           | 8           |
| Inappropriate and unsustainable legislation      | 0           | 0           | 3           | 1           | 4           |
| Top-down policy and projects design and implementation | 10          | 4           | 3           | 6           | 23          |
| Top-down government legislation making          | 2           | 0           | 3           | 1           | 6           |
| **Use RIGHTS**                                  | 0           | 0           | 1           | 0           | 1           |
| White elephant                                 | 1           | 0           | 2           | 0           | 3           |
| Conservation policies limiting local livelihoods | 1           | 0           | 5           | 3           | 9           |
| Limited use rights                             | 28          | 0           | 7           | 1           | 43          |

177
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<th>Exploitative MARKETS</th>
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<td>Lack of market demand for specific products</td>
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<td>2</td>
<td>4</td>
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</tbody>
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| Burdensome BUREAUCRACY                                                              | 10   | 8          | 6       | 10      | 34  |
| Lack of SOCIALLY-ENVIRONMENTALLY friendly alternatives                              | 19   | 3          | 1       | 12      | 35  |
| Organizational/administrative deficiencies                                          | 3    | 3          | 3       | 0       | 9   |
| Inappropriate EDUCATIONAL systems                                                  | 0    | 1          | 1       | 3       | 5   |
| Lack of investment in research                                                      | 1    | 0          | 1       | 0       | 2   |
| Lack of information                                                                 | 1    | 0          | 0       | 0       | 1   |
| Erosion of traditional and indigenous knowledge                                     | 2    | 0          | 0       | 15      | 17  |
| Oil companies                                                                       | 0    | 0          | 0       | 8       | 8   |
| Pesticides                                                                          | 0    | 0          | 0       | 13      | 13  |
| Violence, pirates                                                                   | 1    | 12         | 0       | 0       | 13  |

Note: coded segments related to 40 interviews (10 for each study site).
Table 4-2. Absolute frequencies of retrieved coded sections, referred to local ongoing solutions at each study site.

<table>
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Note: coded segments related to 40 interviews (10 for each study site).
Table 4-3. Absolute frequencies of retrieved coded sections related to government solutions by study site.

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Note: coded segments related to 40 interviews (10 for each study site).
Table 4-4. Absolute frequencies of retrieved coded sections related to local envisioned solutions by study site.

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Note: coded segments related to 40 interviews (10 for each study site).
CHAPTER 5
CONCLUSION

Based on research in four different Amazonian contexts, which included geographical, biophysical, social-cultural and geopolitical variations, we assessed the relative magnitude and forms of forest contributions to Amazonian rural livelihoods. Forests not only represented the most important livelihood strategy in all sites, but they also displayed relevance in alleviating poverty and functioning as regular source of income. Forest based livelihoods across study sites exhibited complex portfolios, diversified production systems, seasonal variation of activities, including subsistence and economic uses, encompassing timber and non-timber forest products at different specialization strategies. We also provided concrete examples where NTFPs play a central role in rural livelihoods. Different patterns of forest use, including levels of sustainability, were observed among different geopolitical contexts; divergent colonization trajectories and government programs explain some of these variations. The diversified production systems also imply that policies should correspond to the multiplicity of economic activities, needs and contexts.

Indeed, beyond subsistence and economic incomes, forests were locally valued in multiple aspects across all sites. Based on our findings on local meaning of forests across transformed Amazonian settings, we assessed that forests are relevant in terms of identity, culture, attachment and conservation interests. Moreover, at all sites, forests were unanimously recognized as critical to people’s health and wellbeing. Therefore, besides safety nets, coping with shocks or alleviating poverty, this evidence suggests that forests actually encompass much broader and deeper roles throughout many rural people’s lives. Local institutions have been transformed, adapted or created after cycles of colonization, violence, epidemic diseases, migration, exploitative economic booms, and government capitalistic-development programs. Their
structures were found to be clearly defined, and their elements included different set of rules, enforcement and sanctions, and even though environmental management systems were not very robust in most sites, ongoing LIs displayed diversified functioning arrangements for the improvement of local livelihoods. Past and contemporary social movements, progressive branches of church-based organizations and the land regularization processes had clearly influenced and shaped the existing LIs throughout Amazonian geopolitical contexts. We also assessed the complex and evolving nature of existing local institutions across Amazonian contemporary populations, through their interconnection with state institutions (hybrid local-government institutions), their multi-functionality evidencing the holistic nature of their workings, and the underlying mechanisms behind them. With this, we learned how the local institutions studied go beyond strategies for managing natural resources.

We found similarities and differences of BPSLs operating across our study areas, and these appear to have been strongly influenced by past historical events and government programs. Top-down projects and policies implementation, ineffective legislation and burdensome bureaucracy were common BPSLs operating across all study regions. Top-down and elitist structures were identified to be behind many of the observed BPSLs (such as top-down projects and policies implementation, and repressive and authoritarian enforcement agents). The local ongoing solutions that were common to all sites were social organization and local cooperatives. People perceived social organization as a way to overcome invisibility, diminish power imbalances, and increase their voice to claim rights from state governments, allowing improvements such as access to education and health services. Social organization also enabled improved internal mechanisms of cooperation, and that included the establishment of market arrangements and local cooperatives. Local cooperatives were locally viewed as critical to
improving life conditions without depleting local resources. Moreover, a number of context-specific local solutions illustrated the creative capacities of forest-dwellers. Government solutions were present at all sites, and more relevant than expected. From the perspectives of local forest dwellers, left-oriented social policies represented functioning and effective solutions that enabled unprecedented livelihood improvements and contributed to conservation. In some of the study sites, state-owned processing industries and support of local cooperatives had removed a major historically established barrier related to exploitative marketing chains, and substantially increased incomes of local residents.

The wide variety of thoughtfully envisioned solutions across contexts illustrated the rich potential of including local voices and strategies into the design of sustainable development policies. However, appropriate support is needed. Solutions towards the reconciliation of conservation and wellbeing are better achieved and maintained through bottom-up approaches, with autonomy devolved to local actors and local creativity stimulated at multiple aspects of livelihoods (forest management, social organization, production, commercialization, regulation and enforcement, policy). We learned that policies can be designed to diminish BPSL that are impeding solutions towards a socially fair and environmentally sustainable development.
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BIOGRAPHICAL SKETCH

Marina Londres grew up in a rural area in the countryside of Rio de Janeiro state in Brazil. She received her bachelor’s degree in Forestry at the University of São Paulo, a master’s degree at the University of Florida (UF) in Forest Resources and Conservation (FRC) with concentration in Tropical Conservation and Development, and a PhD in FRC (UF) where she undertook an interdisciplinary and social approach. She has been active in the Amazon region since 2001, in constant collaboration with various research institutions, community associations, women’s cooperatives, indigenous groups, and grassroots movements.

Since Marina’s undergraduate research, she began pursuing her interest in studying forest ecosystems and the peoples who manage them. With a traditional coastal community in the Atlantic rain forest, she investigated local forest management practices and supported the development of a management plan for palm-heart (Euterpe edulis Mart.). In the northeast Brazilian Amazon, she conducted a socio-environmental survey of Indigenous Peoples of Oiapoque (Amapá State/Brazil) through a project developed by the Anthropology Department of University of São Paulo, the State of Amapá and The Nature Conservancy (TNC).

Upon receiving her bachelor’s degree, she moved to the Amazon region and was hired by the Center for International Forestry Research (CIFOR) in Belém, Pará, and worked under the project Vulnerability and Resilience: Responses of Women and Forest Products on the Scale of Logging Activities in Eastern Amazonia, financed by IDRC (International Development Research Centre - Canada), in close collaboration with FASE Gurupá (Federação de Órgãos para Assistência Social e Educacional). In this project, she collaborated with forest women’s organizations involving the collection, processing and commercialization of non-timber forest products (NTFPs) in eastern Amazonia. She subsequently returned to the Oiapoque (Amapá) indigenous lands to work on a project with the Oiapoque Indigenous Peoples’ Association
(APIO), the Amazon Institute of People and the Environment (Imazon), and TNC. Central activities involved training indigenous environmental agents in forest inventories, coordinating forest inventories, and conducting meetings and workshops with indigenous women in over 20 villages.

Marina then began working as field coordinator for the ecology and management component of a large inter-institutional and interdisciplinary four-year consortium *Bridging the Divide: Enhancing Forest Tenure, Management and Marketing in the Brazilian Amazon* that was funded by the European Union and led by the Brazilian NGO Imazon. She was responsible for generating the ecological information necessary to create guidelines for best management practices in Amazonian floodplain forests. Her master’s thesis at the University of Florida was an unfolding outcome from this project where she focused on Andiroba (*Carapa guianensis*) ecology. During her masters’ fieldwork, she continued participatory forest ecology data collection, expanded the capacity building program and developed a locally based strategy for disseminating and discussing research findings throughout the region. Through her PhD project, Marina decided to broaden the scope of her work, and focused on other aspects of community forest management. Using mixed methods and an interdisciplinary approach, including the fields of economics, social and political sciences, and anthropology, she developed a cross-national project to understand the livelihoods of forest-dependent people across divergent geopolitical contexts.