Thinking the Future: Coffee, Forests and People

Conservation and development in Kodagu

Advanced Master « Forêt Nature Société » - 2011
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Environmental evaluation training course
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EXECUTIVE SUMMARY

Kodagu district, Karnataka state, India, is part of the Western Ghats. This area has exceptional biodiversity as attested by the fact that it was designated as a South Indian biodiversity hotspot, along with Sri Lanka. This indicates both high levels of endemism and high threats from human activities. Basically, Kodagu can be divided in three main areas: the central part of the district, the central coffee belt, is populated, and entirely dedicated to crop cultivation, specifically coffee cultivation; in the fringes, two types of area can be distinguished: forests dedicated to wood harvesting; and protected areas, owned by the state under the control of the forest department, currently managed for conservation but with a history of timber production, particularly with teak plantations. Each of these areas has its own internal dynamics, and specific biodiversity attributes.

As far as crop cultivation is concerned, even if the coffee agroforests maintain high biodiversity compared to other crops, they cannot be compared with the forest ecosystems. The expansion of Coffee-Based Agroforestry System (CAFS) is one of the main causes of the decrease of forest ecosystem area and biodiversity loss. From 1977 to 1997 there was 30% loss of forest cover in Kodagu, mainly replaced by coffee cultivation of which the area has almost doubled. The tree density and diversity inside CAFS have also changed. Indeed the main current trend is the replacement of jungle trees by exotic species, due to demand from the timber sector.

In the forests, two types of human activities are taking place which put pressure on the ecosystem: timber logging, either illegal or carried out by the forest department, and extraction of non timber forest products such as wild game, firewood, lichen, either by forest dwellers through the exercise of forest rights or by poachers for wild game. These activities raise the question of the sustainability of conservation regulations on forests and protected areas.

Moreover, huge cities like Bangalore or Mysore spread strong urbanization away into surrounding areas. The high levels of urbanization in neighbouring Kerala clearly demonstrates the threat urbanization can pose to Kodagu. Currently in Kodagu, agricultural lands are increasingly urbanized under the combined pressures of land demand for tourism and population growth.

In this context of rich biodiversity and increasing threats, several actors are implicated in the crucial issue of environmental conservation and reflect on several questions: is this ongoing urbanization inevitable for Kodagu? Could coffee cultivation become a full sun crop? Can environmental actors propose alternative solutions? How? For which environmental stakes? These questions are also the starting point of the study reported here. They are addressed through the elaboration of reasoned conjectures on the future of Kodagu. A first territorial diagnosis based on concepts and methods of the strategic environmental management analysis provide the basis for the elaboration of scenarios. These scenarios are not predictions but rather possible stories of Kodagu evolution that need to be discussed with concerned stakeholders.
An environmental prospective at the landscape level

The specificity of this study stems from its environmental standpoint, chosen as a normative reference to explore the evolution of the socio-ecological system at the landscape level. This implies (i) identification of the social institutions from the perspective of their environmental impacts on the ecosystems and (ii) a clear formulation of the environmental concern that serves as the reference for analysis. This referential has to be conceived as a landmark to evaluate ecological changes happening in the territory, that could offer a snapshot of the qualitative evolution of the ecosystem as a whole. Six criteria are chosen for this referential: the canopy density, the canopy biodiversity, the integrity of protected areas and reserved forests, the forest connectivity, the large mammal population evolution, the wetland areas.

The study is based on several types of material: field interviews with different stakeholders, from farmers to elected representatives; grey literature from different administrative bodies; ecological data and results obtained from past research programs in the area (CAFNET, POPULAR, BIODIVALLOC). Based on that, a landscape model is drawn which allows (i) to understand the links between different areas in the landscape and how a change in an area can lead to consequences in an other; and (ii) to identify the main drivers of the landscape evolution. Five of them are considered: the coffee sector, the timber sector, the tourism sector, the Forest Right Act implementation, the conservation management. For each of them, several possible evolutions are identified which form the basis for scenario building. A scenario is built up by combining as logically as possible one possible trend for each driver.

Four scenarios have been built, which are described below.

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Scenarios
**A fissured land**

In the 90’s, the entrance of Vietnam in the international coffee market and the increase of Brazil’s production have created a major economic crisis in the coffee market. In addition, the cost of cultivation for Indian coffee increases by 12-15 per cent every year. Thinking into the future, we assume that the high volatility of coffee prices on the market and the continuing increase of labor cost will drive the evolution of the landscape. In a first phase, coffee farmers adapt their practices by diversifying their income, using both the revenue from tourism and the sale of trees. Some others develop Homestays whenever it is possible for them. For the poorest ones, adapting is often impossible and they start to sell their land, creating a mass emigration. The economic crisis forces the government to promote strategies of development. Infrastructure projects are emerging all along the district creating threats for surrounding forested areas. With new job opportunities on the Eastern part of the district, forests dwellers from the East of Kodagou, attracted by economic incentives from the forest service, start to work in cities (to build the roads, railways…) and to leave the Eastern forests. As a result, environmental actors and the forest service put pressure on the government to create a green corridor in order to mitigate the urbanization impact. Kodagou was finally divided into two areas, an Eastern part which is urbanized and industrialized, opened for tourism but with some closed landscape areas, and a protected Western part, conserving its attraction for tourism.

**Let’s cut trees**

The scenario starts with the following questions: What if rights to trees are given in private holdings? Will it trigger a sustained development of the timber sector and the intensification of coffee production? The complex tree ownership rights are modified and allow private owners to sell standing trees to timber merchants. They start removing native trees seeking incomes from timber. They plant and exploit fast-growing marketable exotic species, invest in mechanization and irrigation leading to the intensification of coffee production. This change in practices affects the biodiversity in the agricultural landscape. In the western part of the district, the tree cover in coffee estates is reduced and not necessarily replaced after exploitation. The KFD Wildlife Division starts a strict conservation scheme in the Protected Areas. It reinforces protection and management of wildlife populations (tigers, elephant, panthers, gaur...) in the Nagarabhole National Park and the other Wildlife Sanctuaries. It develops social programs inciting relocation of forest-dependent communities at the fringe of Protected Areas. Compensation schemes are provided with subsidies, facilities, lands and new houses. The landscape-level connectivity between remaining forest patches is affected and thus, threatens both the native wildlife and flora. The sustained demand on wood products forces the KFD to develop new working plans in western Reserved Forests, starting the commercial extraction of timber. In the eastern part, the implementation of the Forest Rights Act allows the development of coffee agroforests for forest-dependent communities that further fragment the remaining protected areas.
Green Landscape Certification

Several attempts to create areas with a specific status of environmental protection have taken place in the past in Kodagu, but they have been rejected by local citizens. Because Kodagu is part of one of the world biodiversity hotspots, the international community devotes much attention to preserve its natural resources. Local environmental NGOs decided to define a new specific status of environmental protection creating a “Green Landscape certification” in the entire district in order to respond to the international demand of biodiversity conservation. This scheme restricts the urbanization development and the implementation of large infrastructure projects, creates a buffer zone around natural forests, increases the Forest Departments capacities, taxes the lowland industries and forbids the use of chemical inputs. As a result, the coffee value chain is modified and allows planters to develop certification schemes for their estates. The Green Landscape Certification increases the protection level in Protected Areas and ensures the protection of a high level of biodiversity in remaining forest patches.

Food for Coffee

This scenario is mainly based on the agricultural alternatives to coffee production. The dynamics of the coffee production system seem strongly linked, to the availability of manpower, as well as the quality of coffee and the international market. These parameters can lead to significant changes. This scenario aims at discussing the evolution of coffee production regarding disease hazard. In the current context of globalization with a free flow of goods and people, the emergence of a disease outbreak steers the collapse of coffee cultivation. In addition, an international crisis of high food demand forces the conversion of agricultural lands for food crops. Agroforests are slowly converted into food crops by removing the trees in the estates. The landscape connectivity decreases and wildlife is concentrated in the western part of the district where the conversion is impossible. The Forest Department takes measures to preserve biodiversity in the remaining patches of natural forests. This results in an increasing pressure on habitats because wildlife exceeds their carrying capacities. The human-wildlife conflicts rises all along the district and the old forested landscape disappears.

Conclusion

This study uses a method that combines a strategic diagnosis of the territory coupled with a prospective approach, both based upon bibliographical work and interviews. In a short period of time, we were able to come up with four contrasted scenarios, with four different pictures of Kodagu 20 years down the line. Discussing the scenarios with the stakeholders showed that progression toward these different futures is plausible and coherent. Our scenarios stress the idea that without a change in one of the five main drivers of the landscape dynamic, the conservation of its highly remarkable ecological characteristic is nothing but certain. Furthermore, discussion outlined possible alternative pictures of the future that will be really interesting to explore by taking into account other drivers such as the energy supply, the social equity and water availability issues.
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Foreword

The collective training period in India brings together the seven students of the Advance Master “Forest, Nature and Society”, option “Management, Nature and Society” of AgroParisTech university (APT). The staff is composed of two researchers of the AgroParisTech training and research team “Environmental Management of Ecosystems and Tropical Forests”, Maya Leroy and Pierre-Marie Aubert, a researcher from CIRAD who worked on CAFNET program in Kodagu, Claude Garcia and one logistic manager with a previous experience on this training field, Jérémy Vendé. The Indian partners are the Kodagu Model Forest Trust (KMFT), the College of Forestry of Ponnampet, CAFNET program and the French Institute of Pondicherry.

This training period is first of all an educational exercise. It was preceded by three weeks of preparatory work in France, focused on Strategic Environmental Management Analysis (SEMA) and on the global value chain (GVC) of the coffee to apply in Kodagu. Three weeks were spent on the field. Then one week was planned to write this executive report once back in France.

Kodagu district has been chosen by the executive staff for three main reasons. First, this type of educational exercise has been done in several other countries, especially in Africa, but never in India (Treyer, Aubert & Leroy, 2009; Leroy and all, 2008; Leroy & Aubert, 2007). Morocco was the last training field and students went there several years; the team wanted to change. Secondly, a cooperation dynamics was created between APT and several Indian institutions (French Institute of Pondicherry, University of Agricultural Sciences of Bangalore, College of Forestry Ponnampet). Lastly, the staff wanted to use the prospective method on the results of different research projects (launched in particular by the CIRAD).
I. INTRODUCTION

Kodagu district (12.15’-12.45’N, 75.25’-76.14’E) is part of the Western Ghats. This area has exceptional biodiversity as attested by its inclusion in the South Indian biodiversity hotspots, along with Sri Lanka (Myers, et al., 2000). This indicates both high levels of endemism and high threats from human activities. The district has biogeographical factors that contribute to the diversity: an altitudinal and rainfall gradient from West to East creates a mosaic of ecosystems. The human activities are mainly oriented towards coffee cultivation using complex agroforestry systems. Traditionally planters have kept coffee under shade to prevent damage to the coffee bushes during the long dry season. The composition of the canopy cover can be quite similar to the one from nearby forest fragments. As a consequence, biodiversity in coffee estates is higher than in most coffee plantations overseas (Ambinakudige & Satish, 2008). Conservation zoning (Nagarhole National Park created in 1955) combined with implementation of strict conservation regulations (Government of India, 1972, 1980, 1986a) have also preserved large parts of Kodagu’s forest from conversion to human activities.

Basically, Kodagu can be divided in two main areas: the central part of the district, the central coffee belt, is populated, and entirely dedicated to crop cultivation, and more specifically coffee cultivation; the fringes are, essentially forests owned by the state under the control of the forest department, currently managed for conservation but with a history of timber production, particularly with teak plantations. Each of these areas has its own internal dynamics, and specific biodiversity attributes.

There are three main types of forest: dry-deciduous forest, moist-deciduous forest and evergreen forest, (Pascal 1988). As far as wildlife is concerned, Kodagu hosts one of the most important wild elephant populations of India (Nath and Sukumar 1998) in addition to other big mammal populations such as tiger, gaur (wild bison), and leopard. A large part of the remaining forest areas are reserve forests, wildlife sanctuaries and national parks. However two types of human activities are taking place in the forests which put pressure on the ecosystem: timber logging, either illegal or carried out by the forest department, and extraction of non timber forest products such as wild game, firewood, lichen, either by forest dwellers through the exercise of forest rights or by poachers for wild game. These activities raise the question of the sustainability of conservation regulations on forests and protected areas. Moreover, the consecutive increase of Asian elephant populations combined with the large scale development of coffee plantations leading to more Human-Elephant Conflicts (HEC), both in government forests and agricultural lands, with elephants causing crop damage and human deaths (Bal et al, 2011).

As far as crop cultivation is concerned, even if the agroforests maintain high biodiversity compared to other crops, they cannot compare with the forest ecosystems. The expansion of Coffee-Based Agroforestry System (CAFS) is one of the main causes of the decrease of forest ecosystem area and biodiversity loss. From 1977 to 1997 there was 30% loss of forest cover in Kodagu, mainly replaced by coffee cultivation of which the area has almost doubled. Initially limited to the low elevation moist deciduous forest, coffee estates have extended to
the west into the evergreen forest area. Coffee plantations are now present even in the border of the protected areas, occupying 33% of the district (Garcia, et al., 2009). However, the loss of forest cover seems now stabilized as no more land remains available for conversion.

![Map Legend: Evergreen Forests, Coffee Plantations, Deciduous Forests](image)

**Figure 1: Evolution of forest and coffee covers from 1977 to 2007 (IFP, 2007).**

During the last two decades, the tree density and diversity inside CAFS have changed. Indeed the main current trend is the replacement of jungle trees by exotic species. The timber sector puts pressure on timber resources in estates and triggers the plantation of marketable species (Cheynier, 2006); strict regulations on tree rights ownership (Government of Karnataka, 1976) also leads planters to adopt new strategies and avoid native species in their plantation (Vendé, 2010).

Moreover, huge cities like Bangalore or Mysore spread strong urbanization away into surrounding areas. The high levels of urbanization in neighboring Kerala certainly give people a clear demonstration of the threat urbanization can pose to Kodagu. Currently, in Kodagu, agricultural lands are increasinly urbanized under the combined pressures of land demand for tourism and population growth.

![House construction in a rice paddy.](image)

**Figure 2: House construction in a rice paddy.**

In this context of high biodiversity and increasing threats, several actors become implicated in the crucial issue of environment conservation.
Is this ongoing urbanization an inevitable future for Kodagu? Could coffee cultivation become a full sun crop? Can environmental actors propose alternative solutions? How? For which environmental stakes? These questions are the starting point of our study. We would like to cast light on them through the elaboration of reasoned guesswork on the future of Kodagu that must be discussed with the stakeholders (who are the first concerned by the territorial evolutions). To do so, we will draw upon a first territorial diagnosis based on concepts and methods of Strategic Analysis of Environmental Management (Mermet, et al., 2005; Mermet, 2011). We will show how this diagnostic provides a basis to elaborate scenarios, possible consequences of the evolution of Kodagu, relying on people’s vision of the future and their projects.

This report will be divided into five main parts. At first we will give a description of the methods used in the field. The second part will focus on the identification of the territorial system and its different components. The third part will present a diagnosis of the main components. Then, four scenarios will be drawn based on trends previously identified. Finally, we will explain the remarks and propositions given by the people who took part in the final restitutions.
II. METHODS

This territorial prospective has been built using the Strategic Environmental Management Analysis framework (Mermet, et al., 2005, Mermet, 2011) which allows us to construct an analysis of the environmental dimension of complex management situations. The direct application of this framework is intended to guide the diagnosis of an environmental field situation with conservation problems to be resolved (Leroy, 2006; Taravella, 2008). The field study focuses on the actors strategies, their power relations, and their effects on Kodagu’s forest ecosystems and biodiversity. There are three lines of work guiding this analyse: (1) Founding the analysis upon a clearly defined environmental concern, (2) Identifying not only the practices at a farmer level but the sectors-based dimension, i.e. the global chain (industry’s technical support, trading organisations, market conditions, incentives, government directives…) which produce the environmental damage, (3) Focusing on the actors supporting the environmental concern.

The specificity of this approach stems from its environmental standpoint, chosen as a normative reference to study the social and economic functioning of the area. This preconception seeks to propose environmental efficiency criteria as a foundation for further analysis and projections into the future. This means identifying the social institutions from the perspective of their environmental impacts on the ecosystems.

We first define our prospective approach and explain how it is original and different from other outlook and forecasting studies. Then, we explain how we articulate strategic analysis and prospective through an interview-based methodology. Finally, we develop the different steps of the methods to arrive at plausible and contrasted scenarios of the future of the territory1.

II.1. Territorial Prospective: goals and objectives

II.1.1. Definition and principles

A territorial prospective could be defined as a two dimensional approach to reflecting on long-term changes that may occur in a given social and ecological system: the first step is the elaboration of conjectures about the future of the territory; the second step is to open a discussion about these conjectures between actors involved in it (Mermet, 2005b, p. 86). On a local territory subjected to quick changes and affected by multi-scale trends, a territorial prospective is a good way to shed light on the inter-connection that might exist between all these levels and identify leverage for the actors impacted by these evolutions. This implies identifying critical uncertainties or tipping points that can affect the whole system, and

1 In this report, the concept of territory has much to do with its francophone signification; by territory, we will thus mean a portion of space which is appropriated by social groups by any means (economics, politics, strategic…) (Di Méo, 1994). Anglophone usages tend to be “harder”, emphasising juridico-political concerns and stressing (often formal) boundedness and institutionalisation (Painter, 2010).
exploring contrasted scenarios. Therefore, questioning the future is not the ultimate goal of this analysis but only a way to open new interrogations and possibilities, through debates and discussions of the scenarios with the stakeholders.

II.1.2. Increasing collective knowledge and adaptive capacity

Territorial prospective is often used as a tool in city planning or territorial development studies. Our approach here is different: thinking the future is not a prediction of what is going to happen, nor a planning exercise to identify the best solutions. It is rather a way to present a broad picture of the different strategies adopted by the stakeholders, displaying critical information on their leverage possibilities on the long term. We expect to have an indirect impact throughout the discussions our scenarios will generate increased collective knowledge, transparency and the adaptive capacity of those involved.

II.1.3. Triggering debates and collective action

Discussing the scenario is a constitutive stage of the territorial prospective exercise. The idea is to involve the different stakeholders carrying environmental and development projects into an open debate. If collective actions for environmental protection are already structured throughout constituted networks, an added value of such a discussion can be to outline new possible alliances or, on the contrary, difficult cooperation between actors.

II.1.4. Telling future dynamics

Our scenario building method distinguishes the present diagnosis and the future picture of the territory, or its synchronic description, from the progression, or its diachronic analysis. The two temporal landmarks – present and future – outline the temporal boundaries of our scenarios. These original pictures result from past and present trends occurring on the territory. Therefore it is necessary to establish a diagnosis, as a basis for the scenarios. It has to be accurate and synthetic to be used as a starting point for the different possible progressions of the system. The idea is to be able to precisely describe the path leading from the present situation to contrasted future pictures of the territory with a 30 year temporal horizon (Mermet & Poux, 2002; Poux, 2005).

To describe both present and future images of the territory, as well as possible progression from one state to another, our methodology relies on several types of data, among which interviews are of a critical importance.
II.2. Understanding the territory: a strategic diagnosis

II.2.1. Adopting an ecological standpoint

Our research standpoint implies a clear formulation of the environmental concern that serves as the reference for analysis. To be relevant, this ecologic referential has to be defined by specific and accurate criteria, upon which is it possible to base a qualitative judgment on the state of the environment. Here, we’ll focus mainly on biodiversity conservation; as a really broad concern, biodiversity conservation cannot serve as such; it has to be refined and applied to each specific and highly heterogeneous ecosystem. This will be done throughout the report.

Finally, this referential has to be conceived as a landmark to evaluate ecological changes happening to the territory. With it, we do not pretend to provide a quantitative monitoring of biodiversity erosion or improvement, but rather to offer a snapshot of the qualitative evolution of the ecosystem as a whole. Moreover, the chosen criteria should give a clear view of the state of the ecosystem in itself, and not just in terms of what services or uses it is able to bring from an economic or social point of view. In our referential, the environment has an existence value in itself.

To draw up this referential, we started from the field, collecting actors’ points of view about the ecosystems’ most noticeable dynamics over the past 20 or 30 years. These discussions were coupled with bibliographical work and ecological data obtained from past research programs in the area (CAFNET, POPULAR, BIODIVALLOC).

II.2.2. Actors’ strategies and environmental management

The ecological referential serves as a starting point to understand the territorial structure: how actors take actions, devise strategies, form alliances between each other… The main idea is to delineate the intentional management from the effective management of the environment. The effective management of the environment encompasses all the activities which have an impact on the ecosystems (notably economic sectors and the global value chains: Mercereau & Vignault, 2008; Palpacuer, 2008). Studying the intentional management is supposed to look at the stakeholders’ actions when planned with the purpose of moving towards a better environment as far as biodiversity is concerned.

II.3. Interviewing to understand present strategies and imagine future changes

II.3.1. Elaborating Interview Guidelines

During the preparatory phase of the project, we had drawn up interview guidelines. The interview is viewed and conducted as much as possible as a natural conversation; the main
objective in preparing such guidelines is to limit the risk of forgetting an important or strategic dimension of the interview.

Starting an interview is anything but easy. Properly introducing ourselves and our research project was fundamental to have access to people’s vision of the future and to avoid biased interviews. The principal challenge is to establish a symmetrical relationship between the interviewer and the interviewee. To achieve this goal, the idea is to introduce ourselves and deliver the information level we have on the subject. One can be tempted to skip this step, especially in a time constrained context, but a long introduction always enhances the information quality we can obtain at the end.

We then organized our interview grid around 4 main topics:

**Work**: A first topic of the survey relates to the activity of the interviewee: what are people in charge of? What are their responsibilities? Starting with the past and present time is helpful to speaking symmetrically about the future, to understand existing and possible future trends.

**Relation**: A second axis seeks to understand with who the respondent is in interaction — be it cooperation or opposition — when carrying out his day to day activities: Which alliances exist, for what purpose?

**Problems**: To go further, we question people on their difficulties; we ask them to recall the action taken to tackle the problems they might face and get their perception on the issues. This gives access to the strategic dimension of the interviewee.

**Future and Legacy**: To conclude the interview, we call upon people’s imagination to elicit their vision of the future. Talking about their children can be a way to access the future. From our experience, playing a “what if game” has been the most successful method to test our scenario during the interviews. We presented our hypothesis, even the implausible ones, and ask people what they thought of it, what alternatives or solutions they could come up with.

**II.3.2. What to expect from the interviews?**

Discussing the future leads to contrasted visions of the territory. We thus gathered different pictures of possible evolutions, based on present and past trends. The collected narratives on the future can be sorted in three categories.

**Trends**: people can first refer to trends or possible evolutions in line with what currently happens to the territory. Trends are seen as an extension or a continuation of the main drivers that steer the system’s evolution.

**Tipping points**: This refers to highly uncertain crucial factors that might clearly have a major impact on the future. Most of the time, these turning points lead to irreversible changes to the system. Tipping points can be external and unexpected events such as a crop disease, or internal like a change in public policies (eg. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights), 2006).

**Project**: Project usually refers to two different notions:
- voluntary actions and plans carried out by stakeholders who have already organized their resources and strategies to achieve their future goal;
- aspirations and desires for the future, but with no practical strategy to make the project happen.

II.3.3. **Producing knowledge from interviews: an inductive approach**

II.3.3.1. **Induction**

We adopt a hypothetico-inductive method for our study; there are at least two reasons for this. First, to investigate the field in detail, we must keep in mind some important actors, events, structuring trends… etc could have been forgotten during the first literature review. Secondly, from a theoretical point of view, we assume that no simple determinisms can explain either current trends nor future possible evolutions, and that actors possess a fundamental margin of liberty as well as good reasons to do what they do and how they do it, that have to be discovered through field investigation/survey (Crozier & Friedberg, 1980 [1977], p. 260).

We look for diverse and heterogeneous points of views that can be confronted and discussed. Moreover, we decide not to classify a priori the stakeholders into systematic groups. The idea is to let the stakeholder define himself and his practices in the social structure as well as his relations with other stakeholders.

II.3.3.2. **Triangulation to consolidate our results**

Two types of information are available for the study: interviews and the printed sources. Accumulation of information from interviews can be a long and arduous process. An optimal ratio of information/labour is met upon reaching saturation, when we do not learn new information through new interviews. The short time we spent for fieldwork (10 days) prevented us from reaching this point. However, all the information presented in this report has been triangulated between interviews and available bibliography, in particular during collective discussions (Olivier De Sardan, 1995, 2003).

II.3.3.3. **Snowball sampling**

At the end of each interview, we ask the interviewee for contacts he might have with other potentially interesting persons. This highlights the network and connections among the interviewees (Olivier De Sardan, 2005 [1995]). Starting with respondents belonging to different networks, this method offers the possibility to explore these different networks individually (Aubert, *et al.*, 2009).

Following this strategy, we interacted with as many actors as we could. We started in a village temple where we attended a religious ceremony. That allowed us to be identified by villagers and helped us to acquire several contacts. In the following days, we enlarged our
scope of investigation, step by step, from one contact to another, using our recent contacts as a reference. We soon get in touch with a broad network of environmental actors. Other networks have then be explored, using different resource persons as a starting point of the survey and taking advantage of our numbers.

II.3.3.4. **Sampling**

We made 67 interviews during our field work (Kodagu district and Bangalore). Interviewees were mostly administrative people (30%) and farmers (23%).

21% of interviewees share multiple activities. This demonstrates the complexities associated with the representation of the social network and the difficulty to get access to individual strategies: each stakeholder jumps from one role to the other.

II.4. **Implementing our methodology: a four step approach**

To implement this methodology, we proceeded in four steps, as shown on the diagram below. All the interviews are made both in English and Kannada by a group of 2 students with assistants/translators.

![Diagram showing the four steps of the research]

**Figure 3: Research steps**
II.4.1. The explorative phase

The first week of the field work is dedicated to an exploratory interview round. Results are shared among the groups every evening during a collective brainstorming session. The idea is first to cross check the information, to limit personal bias or mistranslations; these collective sessions are also a way to formulate interpretations while data is still “fresh” and to construct provisional models that are as close as possible to the empirical material (Bierschenk & Olivier De Sardan, 1997).

During this first period, a systemic representation of the territory is formulated; identifying the major components shaping the territorial dynamics. The component will be analysed in more detail below. Some components have been left out of the analysis. Firstly because the team focused on elements that were considered determinant by us. Also because we do not intend to emphasize everything as we may lack the required expertise to tackle all the topics. This is especially the case for components such as water resources, climate change, demographical changes.

II.4.2. The thematic phase: building up a diagnosis of the territory

During a second round of interviews, we split up into thematic groups. Each group was in charge of formulating a precise diagnosis for each component. Information concerning past evolutions, stakeholders, management systems, threats, trends and possible evolutions for each component were thus gathered and crosschecked with the literature to consolidate our understanding and stabilize our hypothesis. We finally identified the key drivers of changes under each component structuring possible trends of the system.

II.4.3. Scenario creation

Thanks to the diagnosis of the territory, its main components and the identification of their possible evolutions, it becomes possible to create plausible scenarios; stories of possible futures for Kodagu district. The stories are “told” on a “what if” basis. What if this or that happens to this component? How are the other components likely to react? The main task consists of the creation of a story, as plausible as possible, that includes as many elements as possible.

II.4.4. Discussing the scenarios

Following Mermet and al’ approach to the prospective (Mermet, 2005a), these scenarios are finally to be presented to, and discussed by, those involved in the future of the territory. Two presentations have been prepared, one locally, at the College of forestry of Ponnampet, and the other at the Alliance Française in Bangalore. The results of these debates are presented in the last section of the present report.
III. LANDSCAPE MODEL

Figure 4: Representation of Kodagu Territorial system.
III.1. Heuristic Model: Representing the Landscape

The combination of bibliography and exploratory interviews enables us to draw a first conceptual model of the landscape (Fig. 4) that will serve as a heuristic to understand the links between the different components of the district of Kodagu and identify the main drivers of evolution that need to be investigated.

III.1.1. Kodagu district: a biodiversity hotspot

Kodagu district is a part of the Western Ghats Sri Lanka Hotspot. Hotspots are defined as “areas featuring exceptional concentrations of endemic species and experiencing exceptional loss of habitat” (Myers, et al., 2000).

![Figure 5: South Indian and Sri Lanka hotspot](image)

![Table 1 & Table 2: Area and species endemism of the Western Ghats Sri Lanka hotspot (Myers et al., 2000).](image)

The variety of habitats explains the huge diversity of flora and fauna. Kodagu has 1350 species of flowering plants, which represent 8% of India’s flora and 35% of Karnataka’s (Keshav Murthy & Yoganarasimhan, 1990). The bird diversity is also very rich with more than 350 species (Narasimhan, 2004). The district has one of the largest populations of Asian elephants and quite an important number of tigers; it also contains a wide variety of reptiles, amphibians, fishes and insects (Tab. 2).
### III.1.2. Zoning

We can identify three perimeters that partition the district, based on two criteria, land tenure and tree ownership.

1. Agricultural land, with coffee under agroforestry systems (CAFS), rice, ginger, cardamom, pepper, flowers and palm oil as the main crops. These account for 61% of the total district area, more than half of it under CAFS (KMFT, 2010).

2. State managed forests: mainly Reserved Forests (RFs) with patches of Protected Forests (PFs) that include sacred groves (SGs). RFs represent 16% of the district while PFs cover only 2%.

3. Protected Areas (PAs): the Nagarhole National Park (NP) and the three Wildlife Sanctuaries (WSs) of Pushpagiri, Talacauvery and Brahmagiri. Nagarhole NP takes 7% of the district area while WSs cover 9%.

<table>
<thead>
<tr>
<th>Land use pattern</th>
<th>Area (km²)</th>
<th>Total area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low elevation</td>
<td>430</td>
<td>10%</td>
</tr>
<tr>
<td>Medium elevation</td>
<td>897</td>
<td>22%</td>
</tr>
<tr>
<td>High elevation</td>
<td>31</td>
<td>1%</td>
</tr>
<tr>
<td>Wet evergreen forests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moist deciduous forests</td>
<td>188</td>
<td>5%</td>
</tr>
<tr>
<td>Dry deciduous forests</td>
<td>198</td>
<td>5%</td>
</tr>
<tr>
<td>Secondary moist deciduous forests</td>
<td>97</td>
<td>2%</td>
</tr>
<tr>
<td>Coffee plantations</td>
<td>1197</td>
<td>29%</td>
</tr>
<tr>
<td>Tea plantations</td>
<td>4</td>
<td>0%</td>
</tr>
<tr>
<td>Miscellaneous plantations (Teak, rubber, eucalyptus)</td>
<td>239</td>
<td>6%</td>
</tr>
<tr>
<td>Water bodies</td>
<td>19</td>
<td>0%</td>
</tr>
<tr>
<td>Non forested &amp; agricultural areas</td>
<td>806</td>
<td>20%</td>
</tr>
</tbody>
</table>

Table 3: Land use pattern in Kodagu in 1997 (Ramakrishnan & al., 2000).
Figure 6: Land use in Kodagu (from Garcia et. al., 2010).

Figure 7: Tea plantation

Figure 8: Protected area.

Figure 9: Coffee plantation.

Figure 10: Rice Paddies.

The hypothesis underlying the model is that although these 3 areas do not overlap physically, strong links exist between them. This hypothesis implies that the areas cannot be studied in
thinking the future: coffee, forests and people

isolation. To imagine the future of the whole district, one must first understand the links between the compartments in order to understand their evolutions and build scenarios.

III.1.3. Economic activities

Four economic sectors can be distinguished in the Kodagu district:

- **Coffee:** CAFS cover around 1/3 of the district and the coffee production reaches 1/3 of the total Indian production (Coffee Board of India, 2010). Robusta (*Coffea canephora* var *robusta*) is the main variety cultivated. The size of the coffee estates goes from less than 1 acre to several thousands of hectares for the largest corporate estates (Garcia et al. 2009). Management practices are very heterogeneous regarding key components of the production system: chemical inputs, certification, types of shrub in use, etc.

- **Other crops:** rice production, cardamom, pepper, ginger, banana and new activities such as palm oil production bring diversity to the production system. Due to labor shortage and cost, farmers claim such crops are not as profitable as they used to be. This is particularly the case for rice paddies: a lot of them are either left fallow or converted to other uses. Part of the crop is for self-consumption.

- **Timber:** this sector has declined after the changes in Indian forest policies, from Timber production to Conservation and Protection objectives in the 1980’s (Government of India, 1980, 1988). The creation of new sawmills is not allowed in Kodagu and only old ones are still in activity. Nevertheless, Timber is still being harvested in the district, both from state-owned forest and coffee estates and both through formal and informal channels.

- **Tourism:** Kodagu benefits from a “green” reputation that attracts tourists from urban centers like Mysore and Bangalore. Tourists are in search of quiet, green places and a number of resorts or home-stays have been created over the past ten years to answer that growing demand.

III.1.4. Stakeholders

As far as environmental and natural resources management is concerned, several stakeholders can be identified. Among them, the Karnataka Forest Department (KFD), in charge of the implementation of the forest policy, plays a major role. But several organizations and actors also have interests in forest management.

III.1.4.1. Karnataka Forest Department (KFD)

The rationalization of forest exploitation and the appropriation of forest resources by the Government led to the creation of the Forest Department (FD) in 1865 (Laval, 2008). Its duties differ from one state to the other but there are general principles: the KFD enforces national policies, manages the forest resources in government lands and regulates timber management on private land. Its has a hierarchical structure, (Cheynier, 2006):

- Principal Chief Conservator of Forest (PCCF), State level;
- Chief Conservator of Forest (CCF), State level;
- Conservator of Forest (CF), Circle level;
- Divisional Forest Officer (DFO), Forest Sub-division level;
- Range Officer (RO), Range level;
- Forester, Section level;
- Forest Guard or Beat Guard, Beat level;
- Temporary employees called Watchers, Beat level.

The Department has 7 wings with different responsibilities:

- The Territorial Division (TD) is in charge of private holdings, private forests, Reserved Forests (RFs), Protected Forests (PFs) and Village Forests;
- The Wildlife Division (WD): manages National Parks and Wildlife Sanctuaries;
- The Research Division takes responsibility to carry out the research and development activities;
- The Working Plan division: in charge of the revision of the working plans (for RF);
- The Training division: in charge of internal education programs and training activities;
- The Vigilance division: is the law enforcement wing, in charge of the control and vigilance of forest encroachment, poaching smuggling and forest fires;
- The Social Forestry Division: in charge of social aspects, although most of its activities, particularly Joint Forest Management, have been taken over by the Territorial Division.

The KFD intervene in the three compartments defined below:

1. In agricultural lands, the KFD has the control over trees in all unredeemed lands, through its Territorial division. And even in redeemed lands, the KFD has to give licences to cut trees and regulate the whole procedure.

2. The KFD is also the manager of RFs and PFs. Nowadays, even if harvesting activities have almost stopped, there are still teak plantations in these areas to manage and harvest.

3. Finally, the KFD is responsible for PAs control and monitoring. It is done through the Wildlife division.

III.1.4.2. Coffee grower

Coffee growers are major actors of agricultural lands management in Kodagu due to the large areas they control (1/3 of the district). During the last decades, their influence has increased in parallel with the increase of CAFS areas (Fig. 1). The conversion of bane lands into CAFS tends to divide the territory into strict conservation areas (managed forests and protected areas) and productive areas (agricultural lands). However, the fact that those agricultural areas are dedicated to coffee production under shade ensures the conservation of trees in the plantations, and thus ensures an ecological gradient between agricultural areas and forests.
Another particular point about coffee growers: some large owners have multiple activities in addition to their coffee plantation. They are involved in associations and NGOs, and some have links with administrations and elected bodies. This is another way to link associations and organizations that focus on different areas of the territory, and thus to link those different areas.

**III.1.4.3. Forest-dependent communities**

Before the arrival of rice-cultivating communities, Kodagu district was mainly inhabited by “a low population of tribal communities who practiced gathering forest products, hunting and shifting cultivation in the hilly parts of the area. These groups are mainly Yerava and Kuruba.” (Laval, 2008). Their descendants are called forest dwellers in the rest of the document.

Forest dwellers have been making a link between different areas for a long time. First through their living space: some staying in protected areas, others in reserved forests and the remaining living in agricultural lands. Second through their work: their climbing-skills make them necessary workers in coffee-estates to prune trees. In the past, they also used to work with the Forest Department in managed forests (Laval, 2008). Nowadays, some are employed as forest watchers in the protected areas.

Furthermore, since the Join Forest Management Planning (JFPM) in 2006, forest dwellers participate in forest management through the Village Forest Comities. More recently, a new law has been passed which promises to have a major impact on forest dwellers conditions: the “Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act” (Government of India, 2006) (also called Forest Right Act (FRA)). According to this law, forest-dependent communities may benefit from a new control over forest areas where they use to live.

**III.1.4.4. Collective organizations and their link to environmental management**

Several associations hold distinct and divergent interests: associations of landholders, tribal communities, coffee producers and owners, timber merchants, environmentalists… They look at environmental issues through the lens of their particular interest. We distinguish three types of organization: development NGOs, environmental NGOs and planters associations.

We call “Development NGOs” all the organizations that seek to promote the development of forest-dependent communities (tribal and other forest dwellers). They act upon RFs and PAs, where the forest communities exist.

Conservation NGOs pursue objectives and have activities across the entire district in RFs, in PAs and private lands. They play a major role of lobbying, trying to raise awareness on environmental topics, targeting all inhabitants of Kodagu.

**III.1.5. Land tenure and tree ownership rights**

The Kodagu land tenure system is complex. It includes 37 types of land tenures, from which derive several restrictions and constraints for landholders. We present here the most common
land tenure types and tree ownership rights (more detailed description is available in Uthappa, 2004.

- “Jamma” lands were granted by the Rajas at the end of the 19th century. They cannot be sold directly, but a family decision is required. These lands can only be inherited by children from their parents and are split into as many parcels as there are children. Trees in Jamma land are usually government property.

- Sagu lands are lands where full assessment is required to be paid by the owner to the Revenue Department. Sagu lands can be sold easily. Tree rights in Sagu land follow the Karnataka Tree Preservation Act (Government of Karnataka, 1976).

- Bane lands are forests granted for the maintenance of wetland to which it is allotted. Bane land are used for grazing, to supply leaf manure, firewood and timber required for agricultural and domestic purposes. Bane lands are converted today into CAFS. The tree rights in Bane lands are restricted through the Karnataka Tree Preservation Act (1976).

In addition to Jamma, Sagu and Bane, many other type of tenures bring more restrictions and complicate the management of lands. These are Hitlu, Paisari, Uruduve, Umbli lands.

Irrespective of the land tenure two specific tree rights can be distinguished:

- Trees on unredeemed lands belonging to the state of Karnataka. If the owner wants to get the ownership, particularly in the case he wants to harvest it, he must pay a seignorage value (corresponding to a market rate fixed by the KFD) to the Government through the KFD.

- Trees on redeemed lands belong to the landholder. Nevertheless, if the owner wants to cut the trees, he must follow a long procedure (Cheynier, 2006).

In any case, dead wood and firewood can be collected on private lands. Trees can also be pruned for shade management in coffee estates, following the Karnataka Preservation of Tree Rules (Government of Karnataka, 1977). The restrictions are valid only for native Junglewood trees. Some trees, like Rosewood (Dalbergia latifolia), Sandalwood (Santalum album) and Teak (Tectona grandis) are preserved under specific regulations that clearly limit the exploitation in private lands. Only 11 exotic tree species (Casuarina equisetifolia, Cocos nucifera, Erythrina subumbrans, Eucalyptus sp., Gliricidia sepium, Hopea sp., Miliusa wightiana, Prosopis sp., Ficus glomerata, Sesbania sp., Grevillea robusta and Leucaena leucocephala) can be harvested by the landowner without asking the forest department.

**III.1.6 The water resource**

Even though Kodagu’s economic activities rely for an important part on agriculture, water management has hardly ever been mentioned as an important issue by local people. Up to now, no water shortage has been reported in the district, where the Kavery river takes its source. Irrigation of coffee plantations is not systematic and the demand for water is not that high. However, water resource management becomes a challenge downstream, in dryer parts of Karnataka and in the Tamil Nadu state. The water partition between the two states is a long standing feud, and went to the High court.
We have not found much available data on water resources in Kodagu, whether in terms of quantity or quality. The consequences of irrigation and the impact of chemicals inputs (pesticides and fertilizers) are not known enough to be taken into account for this analysis.

**III.1.7. External influences**

Interviews reveal an important trend: rural migration from Kodagu to large cities (Bangalore or Mysore). This is the result of the improvement of the educational level of the younger generation and of the job opportunities offered as a consequence of urban development. Cities also attract non-skilled labour for the construction sector. As a result, plantation owners face two problems: labour shortage and difficulties in handing over their property after retirement.

**III.2. Counterbalancing evolution factors: conflicts and land tenure system**

On the first hand, important trends have been identified that are likely to affect the territorial structure of the Kodagu district, such as the development of economic activities, rural migration, and the implementation of new public policies (the Forest Right Act for example). On the other hand, the district has not evolved as quickly as one would think regarding these important drivers in the past ten years. This situation raises an important question: what is counterbalancing these trends? What is making Kodagu’s landscape not changing too fast?

A first answer to the questions would be the lack of cooperation among actors. Each group tends to serve its own interests without any concern for other groups. This leads to conflicts and is definitely a factor that prevents change. For example, the FD maintains a tense relationships with coffee growers and tribal communities to reduce as much as possible their impact on the territory whether it deals with agroforests or managed forests.

Another explanation concerns the complex land tenure system. This system is the legacy of the district’s own history, which used to be an independent Indian state until 1956 and its inclusion in the Karnataka state. Interviews have shown that this land tenure system is often misunderstood by Kodagu’s inhabitants. They usually mix up the status and are not well aware of their rights. Even administrative bodies are mistaken on this complex topic. Procedures to change from one land tenure to another can be extremely complex and fastidious, and sometimes imply the payment of fees. Furthermore, certain changes are not possible. In addition, our interviewees mention the alleged corruption of government officials which adds another complication which the stakeholders need to deal with, in order to ensure processes are carried out.
IV. DRIVERS

The landscape diagnosis enables us to identify the main drivers of the landscape evolution. These drivers have a major influence on the territory, carry uncertainties and represent a tipping point that drives the evolution of the territory. We have identified five such drivers:

- The coffee sector
- The timber sector
- The tourism sector
- The Forest Right Act implementation
- The conservation management

IV.1. Coffee

Historically, Indian coffee production is located in the southern States of India: Karnataka, Kerala and Tamilnadu. Kodagu contributes to 36.4% of the total Indian production (to compare, the Karnataka production is estimated up to 211815 T, representing 70% of Indian production). As a consequence, the coffee growing conditions in Kodagu district are strongly bound to the international situation and trends on the coffee markets. This is the reason why a fine diagnosis of the coffee value chain can help us to identify the crucial tipping points weighting on the future of the coffee production evolution (Garcia & all., 2009).

IV.1.1. Coffee value chain

The coffee value chain stretches from the coffee growers to the consumers. Coffee plantations are not a homogeneous category, ranging from 1 acre-estates to more than 50 acres. Large companies such as TATA and SCANDA Coffee manage much larger estates. Thus, practices and objectives are different from one plantation to another. One example is chemical inputs: very small growers cannot afford pesticides and fertilizers, managing their estate in an “eco-friendly” way. Large growers can achieve the same result, but the method differs: they can afford to get organic-certified if they feel sufficiently concerned by environmental issues, even if it may decrease their incomes. Meanwhile, the large majority of coffee growers rely on their estate for their livelihood and use chemical inputs to increase productivity.

At first glance, the whole coffee transformation process seems linear, and evenly distributed between local, national and international agents. However, most of the added value of the final product is located outside of India and the demand is driven by the major international buyers.
A broad picture of the production shows that 2/3 of Indian coffee is exported to the international market, and the remaining 1/3 is sold on the national market, protected by a high levels of tax on imported coffee for national consumption, which is subjected to 100% tax; imported coffee for re-exportation is taxed up to 30%, whereas exported Indian coffee is not eligible to any level of taxation.

**Figure 11: Organization of coffee value chain.**

### IV.1.2. Historical perspective

To understand how the coffee value chain is presently organized, it is useful to have a historical perspective.

After 1992 and the liberalization process, the coffee board, a central actor of the commercialization process, stepped out of the market, to focus more on research and development programs, technical support (extension programs) for coffee growers and market intelligence activities. Coffee grower cooperatives\(^2\) started to sell directly on the international market, surfing on a wave of high prices and making a good profit level from their crops.

However, coffee is a highly volatile commodity, and market prices crashed at the end of 1997, and again in 2003.

\(^2\) Former self-organizations dealing directly with the Coffee Board for the sale of the coffee production
Unable to bail out their huge deficit, many cooperatives disappeared in these 2 successive crises. The selling process was organized in such way that growers were paid a fixed price representing 20% of the coffee value at the farm gate, and 80% after their merchandize sale. From then on, mistrust towards any form of grower organization began to grow as well as distrust toward the Coffee Board who was accused with taking a large part of the profits before the liberalization started. Interviews with coffee growers and coffee board agents confirm this reluctance to any kind of collective organization even for first transformation process (curing work).

Producers are doubly careful, and new marketing methods have to be radically different from the past if they want to gain confidence and build up long lasting relationship to secure the supply of the coffee market.

IV.1.3. Coffee Value Chain Description

Drawing a broad picture of the current coffee process allows us to identify new trends and evolutions currently occurring in the coffee value chain and their links with international players’ strategies.

At the present time, the coffee production is directly purchased at the farm gate by so called ‘purchasing agents’ who have replaced the Coffee Board in its collecting work. They mainly buy dry Robusta coffee cherries from small and medium growers, paying an immediate 100% of the price. To help equitable bargains between these local traders and the planters, the coffee board has just started a free SMS information campaign, displaying daily coffee market prices. Most of the time they gain a 100 rupies margin/bag, when they load and transport the merchandize to the curing units (15 units in Kodagu district).

There, coffee cherries are hulled, polished, graded, sorted, bagged, ready to be exported on the international market or sold to national roasting houses. Most of the curing units work with or belong to Indian exporters. However, most of the exporters do not sell directly their coffee on the international market. They are represented by brokers.

Brokers are the middle men who ensure the connection between national Indian exporters and international importers. Their role is to secure the transaction, inspect the loading before shipping, and control the quality. They know the different quality and shipping standards required by the importers, and are used to working to these guidelines.

Currently, 121 000 t are exported that way, via the international market, driven by the large scale roasters (Dreyfus, Nestlé…). With their quality and quantity requirements, they drive the coffee value chain, setting actual standards both for production and consumption, influencing the evolution of consumption preferences on the international markets.

Two main trends are driving up Indian coffee production. The first one is the growth of national coffee consumption: Indian people consume more and better coffee. Some factors may explain this evolution: the emerging Indian middle class with a higher purchasing power and the recent emergence of national/international coffee chains and retail business. We can quote Café Coffee Day, present in 102 cities across India, Barista Coffee Company, opening
new outlets in India, or even Mocha, who opened its first shop in Mumbai in 2001. Foreign coffee brands are also targeting the Indian market, like the American brands Starbucks, Coffee Bean and Tea Leaf, the UK Costa Coffee or the Italian Illy Coffee. At home, coffee consumption is also growing, as the coffee maker market is selling more and more models. However, even if the market shares for good quality coffee are growing fast, most of the Indian coffee is consumed blended with chicoree, in a hot beverage mixed with sugar and milk. Some years ago, different associations started marketing tasting campaigns to educate and incite people to go for estate brand coffee. Briefly, two main issues have to be considered with a regard to the future:

- If more coffee is consumed in India, how is the supply going to satisfy the demand? Is India going to export high quality coffee, and import medium coffee or is the high quality coffee going to be directly consumed, reducing coffee exportations?

- What about the direct sales strategies, mainly represented by estate brands, who tend to by-pass the other intermediary agents of the chain? Are they going to have a substantial market share? What about their environmental stringency?

The second trend is taking place internationally, where quality differentiation strategies are emerging, carried along by major international brands such as Nespresso, MaxHavelar, surfing on new consumption trends from the occidental market. Certification is therefore one of the strategies to qualify the coffee on these emerging niche markets. The originality of these strategies stems from their ability not to invest in production capacities but rather to obtain quantitative and qualitative standards through a criteria based on selection of their suppliers, rewarded with a premium. The AAA program from Nespresso can be taken as an example of this strategy. In this program, certification is seen as a “foot in the door”, like a starting point for a lasting direct buyer-supplier relation. Can we see here a new market model emerging? At the moment in Kodagu, only 5% of the overall production is directly sold to EcomGill, who buys for Nespresso and other international brands oriented toward quality. In that context, certification criteria set up by international certification agencies are raising crucial questions regarding sustainability and conservation. Indeed, the level of environmental requirement is left to few certification agencies’ responsibility like Rainforest Alliance or UTZ. Again, two main issues need to be discussed:

- In a highly competitive context for labels and certification, how do you make sure that strict compliance controls occurs?

- How can an internationally drafted standard be suitable in specific and local contexts? In the case of shade grown coffee of Kodagu for instance, CAFS show a certain level of biodiversity with at least more than 200 different tree species per ha (Garcia, et al, 2007; 2009). Rainforest Alliance criteria requires the maintenance of a minimum of 12 different tree species to get certified. Such a requirement can be constraining for full light coffee plantations in Latin America countries, but it cannot prevent biodiversity erosion in Kodagu CAFS. What can be the role of certification criteria in this context?
The multiplication of certification criteria calls into question the risk of flooding this recent niche market. At the same time, certification can also be seen as a minimum standard requirement in the future, with different quality levels under each label. In that case, niche qualification will be based on quality. From that plausible evolution we can start asking:

- Are existing standards going to be the norm?
- If not, will there be a coexistence of different certification processes?
- Again, are different standards going to merge toward a more comprehensive certification that will take into account both social and environmental considerations?

**IV.1.4. Future trends and possible evolutions**

From that first diagnosis, we have identified the main drivers of the coffee value chain, acting at both national and international levels. To tackle these coming changes, we suppose that local actors are coming up with new strategies that will impact the territory in different ways. To build our scenarios, we have highlighted three contrasted answers to the actual trends, displaying different results in terms of environmental conservation, coffee production processes and welfare repartition.

**IV.1.4.1. Productivism: Intensification without certification**

Intensification of CAFS occurs through massive investments is mechanization and irrigation processes. Labour cost problems can be also addressed that way.

**IV.1.4.2. Certification**

Many growers will go for a standard. Three evolutions are possible. It can either lead to the domination of one main certification such as Rainforest Alliance or Utz that would become the norm among CAFS in Kodagu District. In this case, quality becomes a major criteria for coffee differentiation and reward with premiums. Or, it can either lead to a multiplication of standards. A third possibility concerns the creation of a Geographical Indication for coffee; such a standard aims to gather as many growers as possible and, to do so, often requires low environmental criteria. Lastly, the development of estate-brands is nowadays a growing trend in Kodagu that could grow even faster in the next 20 years (Mercereau & Vignault, 2008).

**IV.1.4.3. Coffee Collapse**

In that case, external threats such as a lasting coffee market crisis, a pest or even food crisis, force traditional coffee growers to switch from coffee to other crops, either food or cash crops.

**IV.2. Timber**

**IV.2.1. Data from Timber sector**

The timber value chain starts from private and government land. Logs extracted are exotic species such as *Grevillea robusta* (Silver oak) and native trees like *Dalbergia latifolia*...
Glyrecidia, Hopea wightina, Prosipis, Rubeer, Sesbania and Subabul trees of the timber). For example it is 54,000 Rs. for one cubic metre of rosewood.

During the period 1995-2006, the quantity of timber regularly harvested was reduced to 40,000 cubic meters (KFD, 2006). Currently, only dead trees, fallen trees or trees from thinning are legally harvested. These can supply the timber and plywood industries.

**IV.2.2. Main actors of the timber sector in Kodagu District**

**IV.2.2.1. The Karnataka Forest Department (KFD)**

The KFD Territorial division deals with tree management in Reserved Forests (RFs) and controls tree felling in private lands. In RFs, they exploit trees according to Working plans. After extraction, logs are transported to a government depot and sold through auction. There are two categories of wood products in a depot: timber and non-timber (branches, bamboo, firewood, etc.). Logs are classified in classes regarding the quality, length and girth. The price is fixed by calculating the CFT in cubic meters (CFT=\(L^*L^*C/16\) with \(L\): length and \(C\): circumference). There are 6 auctions per year: January, March-April, May, June and another in December. No sale occurs during monsoon season.

**IV.2.2.2. Coffee planters**

Trees on coffee plantations are useful for shading the coffee, as stands for pepper vines and for meeting the firewood needs. Planters can get incomes from their trees but they are subject to regulation on land tenure. Regulations regarding the land tenure system, especially the rights over trees (Uthappa, 2004; Cheynier, 2006) are as follows. There is no regulation for certain exotic species that can be cut without permission. Junglewoods are considered to be property of the Government so permission needs to be obtained for felling, selling and transport.

Regarding the land tenures and the two types of tree ownership rights (Uthappa, 2004), different procedures need to be followed.

In ‘redeemed’ land, the owner has the rights on his trees subject to certain conditions except for 11 exotic species\(^3\) (Government of Karnataka, 1976). The most common species found in plantations are *Grevillea robusta* (Silver oak), *Areca catechu* (arecanut), *Cocos nucifera* (coconut), *Lagerstromia lanceolata*, *Mangifera indica* (mango) and *Artocarpus integrifolius* (jack fruit).

For Junglewood trees, planters follow a specific procedure (Cheynier, 2006) In addition, in ‘unredeemed’ land, the owner must pay a seignioriage value, ( a fraction of the market price of the timber). For example it is 54,000 Rs. for one cubic metre of rosewood.

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\(^3\) Those species are: *Grevillea robusta*, *Casuarina equisetifolia*, *Cocos nucifera*, *Erythrina indica*, *Eucalyptus*, *Glyrecidia*, *Hopea wightina*, *Prosipis*, *Rubeer*, *Sesbania* and *Subabul* trees.
IV.2.2.3. Timber merchants

Timber merchants buy the timber from the coffee planter, either themselves or through a broker. Afterwards, depending on the legal status of the logs harvested, they can either bring them to the administrative depot or sell them directly to sawmills.

Some timber merchants are organized in a “Timber Merchant Association” (TMA). This association was created 20 years ago to protect the prices of timber for merchants and coffee owners. Members are mostly timber merchants and also coffee owners and politicians. The association negotiates timber prices with government agencies. They participate in awareness campaigns through meetings and press releases (Vendé, 2010). They have been known to be able to exert their influence in the nomination processes of the Forest Department (Garcia, pers. com.).

Generally, the negotiation between coffee growers and timber merchants are unequal. During the regular procedure, 50% of the timber value goes to the Forest Department and 25% is given to the timber merchants (Cheynier, 2006; Vendé, 2010).

IV.2.2.4. Sawmills

Timber is purchased by local sawmills from the government depot and feeds the plywood and furniture supply chain. Smaller sawmills can only get timber from government depot, essentially Rosewood, Teak or Acacia trees. Larger ones can buy timber directly from private owners. The first and second steps for wood conversion take place in the sawmill. The round wood is transformed into sawn wood, handicraft, furniture or doorframes.

IV.2.3. The wood market in Kodagu district

IV.2.3.1. Exotic species market

In coffee estates and other RFs, the trees most commonly harvested are Grevillea robusta and Dalbergia latifolia (Cheynier, 2006). Logs are cut and sold by timber merchants or directly by private owners to sawmills outside the district (Tamil Nadu, Hunsur, Mysore or Bangalore) feeding the local plywood and handicraft industry. As per the Working Plans, exotic trees from forest plantations in RFs are also removed and brought to the depot.
IV.2.3.2. The Junglewood market

For native species, the system is similar; one exception is that permissions have to be granted throughout the process. Native hardwood species can be more valuable than exotic species and ensure higher incomes for private owners. It takes from three months to one year to get permission and it is fraught with obstacles (Fig. 13).

IV.2.3.3. Firewood

Firewood is collected in coffee estates from pruning. Due to little profits on the firewood market, the majority goes to owners or workers for their daily livelihood needs. There is a lack of data to quantify this resource extracted from the coffee estates.
IV.2.4. An informal timber sector

The timber sector seems well regulated at first sight. But in all our interviews, people explain that they need to deal with smuggling or bribing. One informant says:

“in Kodagu, KFD makes the rights too much harder. In unredeemed land, it has become too difficult for a timber merchant or a private owner to sustain himself. He has to bribe because it is how the system works and everybody is happy”.

The association of complex policies on tree, a constant supply of exotic species seedlings and a lack of Junglewood seedlings work as an incentive for planters to get rid of native timber and replace it with exotic trees. Getting rid of trees is costly, long and complex. Bribes are used to bypass the policies, gain time and save money.

At the fringe of RFs and protected areas, illegal logging seems considerable. Smugglers are cutting valuable species, such as Rosewood, Sandalwood and Teak. There is about 25% of seized illegal logs in the depot. Due to obvious constraints of time and access, we could not do an in-depth analysis of this informal sector.

IV.2.5. Trends and possible evolutions

The timber sector is widely structured through strict policies on tree ownership; the time required and the inherent difficulty to get permission on tree felling, transport and sale constitute important constraints for the farmers. In view of this, some actors are willing to ask the State Government to grant full rights over timber to planters in private lands. In this evolving situation, it is interesting to look at the effect of possible new forest and tree policies on the timber sector. Here we make the assumption that the supply of timber in Kodagu is driven by the nature of the policies on tree ownership.

We identify three possible evolutions for the timber sector. We will try to examine these evolutions by formulating three entries of scenarios:

- What if rights over trees are given in private holdings? What would be the effect on the whole timber market?
- What if policies stay as they are now but the demand for timber increases?
- What if policies stay as they are now with a timber sector structured at a local level with a low demand for timber?

IV.2.5.1. Tree rights and timber market

Here, we assume the rights are given to planters. They cut trees immediately, replacing Junglewoods by fast-growing marketable species such as Silver oak. Corruption decreases. The access to the resource is facilitated and more and more native and exotic species are available for the timber and plywood market. The wood market is stimulated by a strong supply.
IV.2.5.2. No tree rights and market

This is a status quo scenario. Planters don’t get tree ownership rights. They continue to replace native trees by exotic species in CAFS. Monoculture of Silver oak appears in large quantities. Smuggling continues and planters replace native trees by exotic ones.

IV.2.5.3. No tree rights and no market

Coffee growers don’t get tree ownership rights. Selling trees is difficult as it takes time and is costly. Planters can’t afford to pay the seignorage value any longer. Native trees are replaced by fast-growing marketable species. Planters don’t get any real benefits from trees, even from wood coming from the shade management. There is no real market for timber.

IV.3. Tourism

Tourism seems a new trend in Kodagu. As a consequence it is difficult to find documents describing this sector (no scientific publications for instance). All the information below comes from interviews.

IV.3.1. Emergence of tourism in Kodagu

Fifteen years ago, Kodagu wasn’t known as a tourist destination. Tourism really began in Kodagu ten years ago. Electrification, road and phone lines were the preconditions of tourism development. Nowadays, tourism is booming in Kodagu. Three important trends seem to influence tourism development: the influx of tourists, the liberalization of coffee market and the relative weakness of Karnataka State control on the tourism sector.

The tourism market in South India is traditionally oriented towards Kerala and Tamil Nadu reached a saturation point (Ooty is a good example). Tourists now look for new outlets. Ten years ago, Western Ghats were designated as a hotspot of biodiversity. For some actors, it gave touristic interest a boost. Tourists flocked to Kodagu in spite of the lack of tourist accommodation. The first accommodation place was a Mahandra resort in Madikeri. In parallel to that, the huge economical growth of India gives middle class Indians the means to tourism.

The second important trend is liberalization of coffee market. It has two main consequences regarding homestay development. First, it has provided investment opportunities for coffee growers when the prices of coffee became high. Secondly, market fluctuations create uncertainties that can affect planters’ incomes. It incites them to have an alternative activity. For some of the smallest planters, tourism can even become their primary activity. Building a homestay doesn’t require much investment because people already have buildings to accommodate tourists. The labour shortage affected paddy farming and now coffee; it also supports this tendency. As a result children of planters get more educated in non agricultural sectors like commerce for instance. Tourism is an appropriate sector to build a commercial activity in their native region requiring trade, marketing and management skills.
The last important trend is the relative weakness of the tourism department at the State level. It creates a non ambitious tourism policy. The main achievement is the low tax required for homestay because of their classification as non commercial activities\(^4\). The tourism department monitors some governmental controlled areas (Nsargadama, Raja seat, museum, tourism department office). It also takes a census of tourists in every resort and homestay. The State Government wants to promote tourism for SC and ST through incentives programs triggering the emergence of tourism agencies regulated by them. This program doesn’t work at the moment. Only one person from the administration is in charge of tourism in Kodagu. The homestays certification process is also a good example. To receive the certification from the Indian Government, homestay’s managers have to personally invite an officer from Delhi. In addition, tourism promotion is carried out by private actors certified by the government. In Kodagu, the Kodagu Tourism Promotion Association (CTPA) assumes the role of tourism promotion.

\[\text{Figure 14: Organization of the tourism sector.}\]

\(^4\) It concerns homestays with less than 5 rooms.
IV.3.2. Which tourists?

International tourists come to Kodagu from October to February. Most of them are Europeans: German, Spanish, Swiss, French and British. Indian tourists come from April and May to August and September. They come from local cities (Mysore, Bangalore) and from distant ones (Kolkata). The Indian tourism is more frequent on week-ends. They are executive people of the middle to well-off class. However, one limitation to tourism seems to be the lack of tourist entertainments.

Figure 15: Porcupine Castle Resort.

IV.3.3. Which accommodations?

To host tourism, people can provide accommodation in their own house, considered as a homestay. This conversion doesn’t require any authorization. However, this activity must be declared to the State Government. Only 10% of homestays are declared. There is an annual tax, the blank tax. But, they often refuse to pay it until there are power cuts. Power cuts are a main issue for tourist accommodations. We met one resort manager planning to install a windmill to produce his own electricity.

As far as resorts are concerned, they have to convert agricultural land to building land. They have to submit the project to Gram Sahba. A few projects held by outsiders have already been rejected. Once the project is accepted, people have to pay the land value to the revenue department to alienate the land. It is possible only for Sagu land. Then, people have to switch from the unredeemed status to redeemed status to cut trees. Administrative procedures take at least 18 months.

As a consequence, two types of accommodation can be distinguished: those who urbanize (resort) and those who don’t (homestay). First, there is prestige accommodation, resorts, golf and hotels with high standards. They are held by outsiders, chains or local actors. They seem not to be very developed but the resort sector is growing rapidly. Secondly, there are homestays. Most of them are held by coffee planters. They propose outdoor entertainments like fishing, trekking, hiking, doing adventure sports, bird watching. According to CTPA, there are between 2000 and 2500 homestays in Kodagu, with 800 in the Madikeri area, only 168 are certified. According to the Madikeri tourist office, there are more than 400 homestays in Kodagu.

Figure 16: Cottage of the Porcupine Castle Resort.
IV.3.4. **Tourism workers**

High standing accommodations require skilled tourism workers. There is no tourism education in Kodagu, its difficult for them to find skilled people. That is why workers are coming from outside Kodagu (70% for the Bitangala golf staff). In other resorts, the local workers are trained by the manager himself. For these managers, the high cost of skilled personnel due to the imbalance between limited supply and high demand is a risk they don’t consider. Homestays don’t require qualified labor personnel.

IV.3.5. **Promotion of tourism**

Seven years ago, a restaurant owner (and coffee planter) created the Kodagu tourism office in Madikeri. As a restaurant owner, he was often asked for tourism information and began to develop guiding activities for tourists. It is the only structure of tourism promotion in Kodagu. It is also the headquarters of the Kodagu Tourism Promotion Association (CTPA), federating certified homestays in Kodagu. The association helps them to get certified and display the homestays certification on their websites. Finally, the tourism department doesn’t control the development of resorts. That is why CTPA is lobbying for a controlled development of resorts at the Gram Panchayat and Revenue Department levels. CTPA is arguing that resorts destroy landscape by urbanizing countryside, building on top of hills and that they only benefit external investors and external skilled workers. They are also lobbying to avoid the implementation of infrastructure projects and to promote the maintenance of heritage sites in Kodagu.

IV.3.6. **Environmental impact**

For homestay managers and local resort managers, tourism has two main hazards. The first one is the pauperization of tourism, promoted by the government, and related to a big transport infrastructure. It would lead to the arrival of uneducated people, throwing garbage with no respect toward customs and traditions. The second one is the control of Kodagu by outsiders and a tourist industry that pollutes and leads to uncontrolled urbanization.

IV.3.7. **Possible evolutions**

From the previous diagnosis, we highlight trends that may drive the evolution of tourism in the region. It is interesting to notice that tourism development is concomitant with the development of urbanization in the case of mass-tourism. We assume that the types of tourism (green vs. mass) leads to independent impacts in terms of urbanization development. We also assume that the current attraction for tourism may change in the future. We will try to examine these trends in the tourism sector evolution by defining four entries of scenarios:

- What if mass tourism system spread all over the district?
- What if inhabitants got involved in the development of green tourism?
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- What if both types of tourism are overlapping in the territory?

   IV.3.7.1. Mass tourism

A strong urbanization, due to an uncontrolled development of tourist accommodations, mainly resorts. It could be possible if the land prices don’t increase too much or if tourists continue to flock to Kodagu. In 2060, greenery would have disappeared of Kodagu because of tourism and population increasing. If planters abandon coffee because of rural migration, they might sell their land to investors.

   IV.3.7.2. Green tourism

The land price could continue to grow at a rapid rate, discouraging outside investors to come to Kodagu. Or the Government could decide to support more local tourism by blocking resort building. These two evolutions could lead to a non urbanizing tourism, a green tourism based on homestays.

   IV.3.7.3. Mass tourism and Green tourism

The two main types of accommodation could continue to coexist thanks to a continuous tourist boom and negligible governmental intervention.

   IV.3.7.4. No tourism

A disinterest towards Kodagu because of the growing destruction of the environment could lead to a general disinterest for tourism. Urbanization and pollution could spoil the natural environment of Kodagu.

IV.4. The Forest Rights Act

   IV.4.1. Historical origin

Several million rural people in India depend on forests for their subsistence. Tribal communities (known as Adivasis) live in forest fringe areas, developing self-sufficient crops and livestock-based farms. A significant percentage of India’s 471 million livestock are sustained by forest grazing or fodder collected from forests (World Bank, 2006).

India has a long history in forestry conservation regulation. The successive 1865, 1878 and 1927 Indian Forest Acts (Government of India, 1927)\(^6\), provided the legal basis for reservation of forests and ‘settlement’ and notification of forest rights.

The Indian Forest Act of 1878 created “Reserved Forests”, where strict conservation practices were implemented, and ‘Protected forests’ adjacent to settlements, where some use ‘privileges’ like the collection of non timber products (Springate-Baginski, et al., 2009). The

\(^5\) The exact name of the Act is: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act. We will use the term FRA for the rest of the study.

\(^6\) The 1927 version is the most recent. The others are replaced by this one.
Forest Conservation Act (1980) and the Forest Conservation Rules (1981) (Government of India, 1980, 1981) restrict access to Government forests. In addition, utilization and marketing of forest products is strictly controlled. As a result, forest dependent communities faced restrictions and their traditional practices were outlawed (Laval, 2008). Shifting cultivation to other uses of forests such as grazing were abolished. Forest dwellers had their customary forest land use curtailed and thereby have become amongst the poorest of the poor in India (Springate-Baginski, et al., 2009). This non-recognition of tribal rights on forest land is considered as “historical injustice” by many communities (Nagarhole Budakattu Janara Hakkustapana Samithi, 2011).

**IV.4.2. Emergence of the FRA**

In the eighties, the eviction and the exclusion of tribal communities resulted in the collective mobilization of *adivasi* groups (Laval, 2008). The emergence of non-governmental organisations such as the Coorg Organisation for Rural Development (CORD) and the Budakattu Krishikara Sangha (BKS), working for the protection of indigenous groups, development and promotion of equal rights to poor people (focusing principally on tribal communities) also encouraged this mobilization. As a result, *adivasi* started to struggle for their rights over forest land. M. Bosappa an old adivasi leader of Chennangi village remembers:

> “Many tribal leaders of the Coorg and from all India went to Delhi. But the governor in Delhi (normally in Bangalore) put them into jail. Then they went to the prime minister office, but policemen don't let us enter. We finally decided to go in front of the president office (Abdul Kalam ) who decided to give us the rights”.

The FRA was issued in 2006 in order to repair the “historical injustice” done towards forest dependent communities. This act “recognizes the vested forest rights and occupation of forest land by forest dwelling Schedued Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded” (Government of India, 2006). It also provides a legal framework explaining how the forest rights must be given to tribal communities and traditional forest dwellers, including restitution for past illegal evictions or displacements. The rules list the evidence required to claim the rights. Among others, there are principally two types of rights that can be recognized and that are central in the current debate:

- Individual rights corresponding to a certain area of forest land granted to a person, a family, or a household for development needs
- Community rights corresponding to a certain area of forest land granted to the community or the village for community needs.

The Act came through a notification of the Ministry of Tribal Affairs (MTA) which is the nodal ministry for its implementation. Lands concerned by the FRA implementation are mainly PAs (national parks and wildlife sanctuaries) and RFs, under the control of the...
ministry of environment and forests (MoEF). The FRA implementation thus pitches two ministries (MOeF and MTA) against each other, each with different objectives. While one works for the welfare and the development of tribal communities, the others objectives are to ensure the conservation of forest and wildlife.

IVA.4.3. FRA implementation

IVA.4.3.1. Individual rights

The Fig. 18 presents the process for claiming individual rights. In Kodagu, at least 150 families gained such rights in the Thithimathi area and 70 families in the Nagarhole area. The land obtained can be used for self-cultivation or habitation and cannot exceed 10 acres per household. The ownership of the trees remains with the forest department. The land so transferred can neither be alienated nor transferred.

Figure 17: Process of claiming individual rights.

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8 Gram Sabha : means a village assembly which shall consist of adult members of a village and in a case of States having no Panchayats, Padas, Tolas and other traditional village institutions and elected village committees, with full and unrestricted participation of women.

Forest Rights Committee: means a committee constituted by the Gram Sabha (Government of India, 2006. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act. Ministry of Law and Justice. 11.
IV.4.3.2. Community rights

The process for claiming community rights is quite similar to the one for individual rights (Fig. 19).

Community rights include collective management of forest resources; rights over common resources such as water, grazing, collecting and disposing of minor forest products such as honey, roots, lichens or firewood. Timber logging is not permitted as it remains under forest department’s stewardship.

Figure 18: Process of claiming community rights.
Table 4: The forest right act implementation in the state of Karnataka\(^9\).

<table>
<thead>
<tr>
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<th>Karnataka</th>
<th></th>
<th>Kodagu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>claims</td>
<td>approve</td>
<td>pending</td>
</tr>
<tr>
<td>Communities</td>
<td>517</td>
<td>0</td>
<td>517</td>
</tr>
<tr>
<td>Individuals</td>
<td>31,661</td>
<td>1,857</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32,178</td>
<td>1,857</td>
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</table>

At the time of writing, there are no community rights granted in the state of Karnataka (Tab. 5). According to many stakeholders (Adivasi and Forest Department), the process is still unclear and not well defined. It leads to many misunderstandings and strong debates. One member of Forest Rights Committee declared:

“The forest department doesn't want to give communities rights because they don't want to lose their income from by the selling of certain products like dead trees”.

According to one KDF official (RFO), the evidence required to attest the past use of the land by the community is not easy to establish, “this leads to many clashes between actors”.

**IV.4.4. Environmental Impact**

According to the National committee of Forest Rights Act report (Joint Committee on the Forest Rights Act, 2010), many state governments have not yet implemented the FRA in and around PAs due to conservationists and Forest Department resistance. They fear the FRA implementation would lead to habitats fragmentation, having a detrimental impact on wildlife.

To avoid this, two legal devices exist. A first one dates back from the Wildlife Protection Act (1972) and defines a “core or critical tiger habitat” (CTH); this is an area which has to be kept intact for the purpose of tiger conservation. A more recent device has followed the FRA elaboration and defines “Critical Wildlife Habitats” (CWHs). Both devices intend to preserve the continuity of the forest ecosystems for wildlife conservation purposes, but cannot be opposed to the FRA implementation.

CWHs and CTH are to be identified based on objective scientific criteria and only after settling the rights of tribes and other traditional forest dwellers.

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\(^9\) Source: http://www.forestrights.nic.in/Claimreport/
CWHs are declared only with the voluntary consent of the affected people. If “co-existence” is not practicable, the Expert Committee, including the District Tribal Welfare Officer and development NGOs will be consulted to choose one of the following options:

**Option I**: retribution of Rs. 10 lakhs per family

**Option II**: comprehensive rehabilitation by providing land, housing with facilities, and community rights, by the Forest Department.

The implementation of the CTH should also not affect the rights of forest dwellers and tribal communities. So a relocation scheme must be proposed. The relocation is voluntary.

Under the revised Centrally Sponsored Scheme of Project Tiger (2008), two options have been proposed to people:

**Option I**: Retribution of Rs. 10 lakhs per family, without any rehabilitation / relocation process by the Forest Department. It is dedicated to people who are not interested in resettlement and are willing to settle elsewhere.

**Option II**: Carrying out relocation and rehabilitation by the Forest Department with the following per family norms out of Rs. 10 lakhs:

- Agricultural land procurement (2 ha) and development (35% of the total package)
- Settlement of rights (30% of the total package)
- Homestead land and house construction (20% of the total package)
- Incentive (5% of the total package)
- Community facilities such as road access, irrigation, drinking water, sanitation, electricity, telecommunications, community centers, places of worship, cremation grounds (10% of the total package)

This scheme has had a limited success up until now. In the national park of Nagarhole, only 6% of the families have benefited from this scheme. But the Forest Department continues to promote it.

The debate, labeled as “Tigers vs Tribes” (Sheshkaria, 2007) continues in Kodagu and in India, mainly for the recognition of community rights in PAs (as for now, almost all individuals rights have been recognized). At the local level, it involves development NGOs and Forest Department authorities (with the support of some environmental NGOs). The distortion of power between groups (self-organizations vs government authorities) creates intense conflicts where the central questions are crystallized around environmental management of forest. Who is conserving the forest and who is destroying it?

**IV.4.5. Trends and possible evolutions**

At the moment, all the individual rights that have been claimed have been recognized. However the debate on community rights continues and environmental impacts of FRA
implementation can only be assessed if clear distinctions are made between RFs and PAs. Based on the previous diagnosis, we propose three scenarios.

- What if only individual rights are recognized in RFs and PAs but the process is blocked for community rights?
- What if community rights are recognized only in RFs?
- What if relocation schemes at the fringe of PAs for forest dependent communities is a success?
IV.5. Conservation

IV.5.1. Drivers and trends of biodiversity changes

IV.5.1.1. Conversion of forests

The expansion of CAFS in Kodagu is one of the main causes of the decrease of forest ecosystem area and biodiversity loss. Over the last 40 years 30% of the forest and cardamom plantations have been converted into CAFS (Fig. 1), mainly in the wet evergreen forest area. However, the expansion now seems stabilized as no more lands are convertible (Garcia, et al., 2009). Land tenure constraints prevent new encroachment into government forests.

IV.5.1.2. Opening the canopy and replacement of native trees

Coffee in Kodagu was traditionally grown under native trees. Even if coffee plants replaced the undergrowth, the canopy was maintained. The shift from Arabica (Coffea Arabica) to Robusta coffee (Coffea canephora var robusta) has reduced the need for dense shade cover. Thus, many planters have reduced canopy cover in their coffee plantation to increase their production, and native trees are being replaced by fast-growing marketable exotic species such as Grevillea robusta. The tree ownership rights regulation has played a major role in the shifting of species and the decrease of tree density in CAFS. Indeed, the shift from jungle wood to exotic species is currently explained by the fact that exotic trees provide rapid and alternative incomes in case of coffee price fluctuation (Vendé, 2010). However, the number of species of jungle wood in these coffee estates is still higher than most other coffee systems anywhere in the world (Ambinakudige & Satish, 2008).

For the moment, CAFS still preserve a high level of tree diversity; however, CAFS are evolving towards systems with less tree density and diversity compared to most of the sacred groves and protected areas (Ambinakudige & Satish, 2008). Moreover, the replacement of Junglewood trees by exotic species (like Silver oak) is less suitable for wildlife because it provides less suitable habitats and food for animals (Torres, 2010). But CAFS still play an important role in biodiversity and conservation in Kodagu (Nath & Sukumar, 1998; Bal, et al., 2011). They still contribute to landscape-level connectivity between forest patches, and maintain the connection between sacred groves in agricultural landscape and protected areas.

IV.5.1.3. Conversion of terraced rice fields

The terraced rice paddies are probably 300 yrs old (S.Bhaghwat pers. com.). They are used today as subsistence farming rather than marketable crops. Recently, a process of conversion has started. Paddy cultivation is abandoned in favour of CAFS with monoculture of Silver oak, eucalyptus plantations (Eucalyptus sp.), banana (Musa sp.), palm oil plantations (Elaeis sp.) or other farming systems like ginger (Zingiber officinale). This conversion is the result of the low price of rice on the market and the economic boom of other crops. Wetlands like paddy fields are habitats that can be suitable for wildlife (food for many birds for instance) (Jin-Han, et al., 2001). It also provides non negligible food for elephant population (Bal, et
al., 2011). The conversion of the rice paddies will have an impact on the ecology of the region.

IV.5.1.4. Sacred Groves

Sacred groves (SGs) (also known as Devarakadus) are small patches of forest reputed to harbor a god or a spirit. They officially belong to the State Government, under the care of KFD, but local communities lay claims to them. Due to heavy fragmentation and intense human pressure, their structure and composition is very different from the larger Reserved Forests or Protected Areas. Studies show that the diversity of species in the sacred groves is high but the conservation value is less important compared with adjacent WSs (Garcia et al 2003). Half of the Western Ghats endemic species have disappeared in SGs and have been replaced by ubiquitous species (Garcia, et al., 2006). As per official data, there were 1214 sacred groves in 2001, covering 2520 ha (Garcia, et al., 2006). The number and the surface of SGs is decreasing but lack of data prevents any attempt at precise quantification. Some sacred groves are threatened by encroachment from nearby coffee plantations.

Even if the total area covered by SGs is quite small, these forests attract the interest of managers, scientists, politicians and religious leaders. They can certainly act as stepping stones for forest species in an agroforestry landscape, increasing connectivity between forests and forest patches. They can also provide nesting sites for wildlife species and protect threatened trees, birds and a distinctive macrofungal flora (Bhagwat, et al., 2005).

IV.5.1.5. The Reserved Forests (RFs)

All RFs are managed under the National Forest Policy of India and the Forest Conservation Act (Government of India, 1980, 1988). RFs constitute 16% of the district forest area (KFD, 2001). They are the exclusive property of the government and are managed under Working Plans. These plans deal with general objects of management:

1) To maintain environmental stability and ecological balance by adopting measures to protect, preserve and enrich the existing natural forests with variety of flora and fauna;

2) To apply a system of management which will ensure the maximum degree of protection to soil and maintain the forest cover in good condition;

3) To maintain or improve natural and manmade forest structure and growth in non-degraded areas to ensure long term sustainability of forest production;

4) To rehabilitate and increase the economic value and utility of the degraded forests;

5) Consistent with the above objectives, to ensure sustainable use of forests to meet the needs of the people, especially the rural and tribal people living in the vicinity of forests;

6) To encourage tree planting in private lands and to meet the local demand for forest produce from these areas;

7) To create a massive awareness movement and to ensure people’s participation and involvement in protection and development of forests.
These Working plans are written by the KFD Working Plan division and applicable for a 10 year period. Working plans are made up of 8 thematic points, named “working circles”, notably: protection, improvement, teak plantations management and bamboo overlapping working circles. Each RF possesses its own working plans where each circle is more or less addressed, depending on the forest.

Since 1990, all Indian states are required to adopt joint forest management programs. The aim is to forge a partnership between the forestry department and local communities based on common management objectives. In Karnataka, the JFM has been implemented in an adapted form called the Joint Planning Forest Management (JFPM). Its implementation includes the formation of Village Forest Committees (VFCs) (KFD, 2002). The role of VFCs and their activities are connected to forest management, and thus have an impact on biodiversity. With the participation of KFD, each VFC creates a micro-plan for 5 years of management of the nearby RF. Micro-plans are dedicated to activities such as plantations, fire prevention, thinning work and non timber forest products (NTFPs) development.

The implementation of the JFPM was presented by the KFD as a way to respond to the national and international demand for biodiversity conservation, but also to bypass the problems of field’s staff shortage. Thus, these VFCs represent the smallest entities of forest management at the level of one RF. At the beginning of the process, a fixed amount of money (from external donors) was given for 5 years to each VFC for self development and initiation of the priority activities. Then, depending on the situation, some VFCs received more funds through different projects and continue their activities. Others were not in a position to get new funds and now have practically no action.
IV.5.1.6. Wildlife Sanctuaries (WS)

The first of Kodagu’s WS was created in 1955: the Nagarhole Wildlife Sanctuary, located in the South-East of Kodagu. It then became the Rajiv Gandhi National Park and is still known as the Nagarhole National Park. Today, there are three WSs in the Kodagu, covering a total area of 389 sq. km where endemic flora and some endangered animal species (elephants, tigers…) are preserved through strict conservation. General features for each WS are presented in Tab. 5.

Table 5: General features of the three Wildlife Sanctuaries.

<table>
<thead>
<tr>
<th>Wildlife Sanctuary</th>
<th>Date of Creation</th>
<th>Area</th>
<th>Altitude Min-Max</th>
<th>Temperature Min-Max</th>
<th>Mean Annual Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talakaveri (TWS)</td>
<td>1994</td>
<td>105 km²</td>
<td>63-1659m</td>
<td>15⁰-35⁰C</td>
<td>2000mm</td>
</tr>
<tr>
<td>Pushpagiri (PWS)</td>
<td>1994</td>
<td>102 km²</td>
<td>60-1712m</td>
<td>10⁰-38⁰C</td>
<td>2000mm</td>
</tr>
<tr>
<td>Brahmagiri (BWS)</td>
<td>1974</td>
<td>181 km²</td>
<td>60-1527m</td>
<td>10⁰-35⁰C</td>
<td>4000mm</td>
</tr>
</tbody>
</table>

Each WSs is divided into three different zones:
- one or several core zones, where entry is forbidden except for FD officers;
- a tourism zone, where touristic activities are allowed such as hiking, trecking,…
- a buffer zone, where inhabitants (mainly forest communities and dwellers) are allowed to use minor forest products (grazing, collection of NTFPs,…).

In addition, each WSs is surrounded by an “Eco-sensitive area” spreading over a belt of 5 to 10 km along its boundaries (Government of India, 1986a, b). Within this zone, building houses and industries are limited to reduce the risks of forest encroachment and human-wildlife conflicts.
Wildlife Sanctuaries are managed by the Wildlife Division of the Karnataka Forest Department. In the Kodagu division, there is a Wildlife PCCF in Bangalore who is the direct chief of the Wildlife DCF of Kodagu in Madikeri. The Wildlife DCF makes guidelines for the management of the WS and has four RFO under its authority (two in Brahmagiri, one in Pushpagiri and another one in Talacauvery). Each RFO employs between 8 and 14 workers who are mainly in charge of monitoring and controlling illegal activities (timber harvesting, hunting...) and managing human-wildlife conflicts with local communities (maintenance of trenches and solar fences). All field damages, injuries or human deaths are registered; RFOs are in charge of the distribution of financial compensations set by the State.

IV.5.1.7. National Park (NP)

The Nagarhole National Park (NP) covers an area of 643 sq. km in Karnataka. It covers two districts: Hunsur and Kodagu. Its Western part is located in Kodagu.

In 1972, the MoEF implemented the Wildlife Protection Act and Tiger Project in order to safeguard the habitats of species such as elephants and tigers. Under these governmental plans, the Nagarohole WS became a National Park in 1988. Teak plantations, established before the creation of the National Park, cover around 40% of the surface. These plantations are very susceptible to forest fires.

The NP is managed by the RFO of Hunsur Wildlife Division. He also has a team of watchers in order to prevent illegal activities and to mitigate the human elephant conflict. Forest dwellers rights are very restricted. They are only allowed to use a small part of the forest amenities, under the LAMPS (Large-Scale Adivasi Multi-Purpose Societies). LAMPS has been created under the impulsion of the Indian Tribal Development program in 1976 (Lélé & Rao, 1996). They are cooperatives that collect, distribute and sell forest products such as soap nuts, Lichens, Honey.
**IV.5.2. Lessons learnt**

Human pressure has increased in Kodagu after World War II (Guilmoto and Elouard, 2000). The specificity of Kodagu attracts many conservative interests. Among others, two projects for biodiversity conservation have been proposed recently with the support of local and international NGOs. These projects have failed. We propose here to present these two projects and analyze the reasons for their failure, as an example of strategic positions and conflict of interests for biodiversity conservation.

![Figure 21: Previous failed conservation attempts.](image_url)

**IV.5.2.1. The Greater Talacauvery project**

In 2002, with the support of local environmental NGOs (CWS and KMFT), the project of a large Wildlife Sanctuary, covering the 3 actual WSs and 2 RFs of the Western part was launched (Fig. 22). It seems that the project failed because of political pressures. One informant explained that influential inhabitants of Kodagu put pressure on the NGOs that had proposed the project. They used the Medias and created large awareness campaigns with the message: “Environmental NGOs want only elephants and tigers in Kodagu, no more people”. The mobilization of a section of Kodagu population forced the failure of the project\(^\text{10}\).

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\(^{10}\) This version of the story still has to be cross-checked by other sources and material but we did not have time to do that during the field period.
IV.5.2.2. The Natural World Heritage project

In 2010, UNESCO, with the support of ATREE (an Indian environmental NGO), proposed to recognize Kodagu as a Natural World Heritage Site that would include the Pushpagiri and Talacauvery WSs among other areas out of Kodagu (Fig. 22). A delegation from the UNESCO came in November 2010, but with no effective results. Again, different informants told that the delegation was blocked and finally expelled from the district, leading to the abandonment of the project. Politicians and people from Kodagu are said to be strongly opposed, arguing that UNESCO has no legitimate authority in this territory.\(^1\)

IV.5.2.3. Threats to biodiversity?

The main threat to conservation that people identified during our investigations was the development of infrastructure such as railways and highways. Cutting down corridors and harvesting trees to develop infrastructures damages biodiversity and divides the landscape. If urbanization is combined with industrialization environmental impacts may be even worse. There are also other kinds of threats depending on the area concerned. They are summarized in the following table:

Table 6: List of possible threats for biodiversity in different areas.

<table>
<thead>
<tr>
<th>Main threats</th>
<th>Agricultural lands</th>
<th>RFs</th>
<th>WSs</th>
<th>NP</th>
<th>SGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity line + cutting of trees around it</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Highways and railways + cutting of trees around them</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Tourism and urban pressure</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Plantation of exotic trees</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increase of livestock</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Increase of fuelwood collection</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social pressure due to the potential total implementation of the FRA</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IV.5.2.4. Possible alternatives

For many of our contacts, improving education is a way to change the current situation. They see the improvement of environmental quality as a consequence of an educational program.

Several environmental NGOs work in the Kodagu district. Among others, the Coorg Wildlife Society (CWS) is one of the largest. A striking point about these organisations is that their

\(^{11}\) Idem note 10.
members are quite often the same over the different NGOs; these environmental NGOs are trustees of each other, as demonstrated by their close relationships. An important number of these members are also coffee growers.

One of their main current preoccupations is to prevent the implantation of large infrastructure projects in the region such as dams, highways, railways and high voltage electrical lines. Generally, they are opposed to large projects coming from external investors (external from Kodagu). They have succeeded in the past and have stopped several road projects in the Ghats. But they do not only protest; they also have projects. Among others, the creation of an Eco sensitive Zone for the whole of Kodagu has been proposed.

What is an Eco sensitive Zone?

Ecologically Sensitive Areas (ESAs) have been identified and notified by the Indian MoEF since 1989. Notifications declaring areas as ESAs come from the Environment (Protection) Act of 1986 (Section 3 and 5) (Government of India, 1986a).

There are primary and auxiliary criteria for designing ecological sensitivity. These criteria are divided into three categories: species-based, ecosystem-based and geomorphological features-based.

- species-based: endemism, rarity, presence of endangered species and centre of evolution of domesticated species as primary criteria and centre of lesser-known food plants as auxiliary criteria
- ecosystem-based: specialized habitats, special breeding areas, areas with intrinsically low resilience, sacred groves and frontier forests as primary criteria and wetlands and grasslands as auxiliary criteria.
- geomorphological features-based: origins of rivers as primary criteria and upper catchment areas, moderately steep slopes and high-rainfall areas as auxiliary criteria
The ESAs restrict industrial or development activities in order to conserve ecosystem diversity and landscape connectivity. The ESAs can also be used to conserve agro-biodiversity or areas where agricultural lands form a contiguous stretch.

**How?**

A Western Ghats Ecology Expert Panel was asked by the Ministry to propose actions to preserve the ecologically-sensitive Ghats region. The goal was also to determine ecologically-sensitive zones in the region. The panel interacted with various NGOs’ representatives. Creating an eco-sensitive zone in Kodagu requires the support of the local population which can be obtained through information or awareness campaigns. Indeed, NGOs fear that local population hinders the project because of misunderstanding, referring to what happened to other projects in the past. The validation of this kind of project is normally done by the MoEF. The government of Karnataka alone is not able to terminate the project.

**Why?**

The key issues for local NGOs are:

- **Urbanisation:** Restriction of the extension (of existing) town/city limits without the approval of a monitoring body, restriction on conversion of wet lands and coffee plantations to non-agricultural purposes and restriction on heights of buildings and on number of storeys.

- **Tourism:** Constitution of a tourism regulatory body. Limiting the number of licenses for construction of any new tourist resort or expansion of existing facilities and a total ban on new tourist resorts within 10 Km of Protected Areas.

- **Encroachments:** Formation of a core committee to look into encroachments. Proper boundary demarcation of forest areas, river banks and sacred groves. The suppression of encroachments and trespassing into these areas.

- **Land stability:** Regulation in building permission and road construction would be denied on hill sides with steep slopes. No fresh licenses shall be granted for mining or quarrying.

- **Forest Cover:** Creation of an Eco-TA unit for Kodagu, which would assume key tasks like Prevention of poaching and illegal logging, as well as raising nurseries for saplings of indigenous tree species.

- **Pollution and Water Contamination:** Only non-polluting industries are allowed. All Industries and Towns would have proper sewage treatment facilities. Proper garbage disposal and waste management facilities would be set up in towns.

- **Livelihood and financial security:** Setting up agro/plantation based industries in Kodagu, such as coffee and pepper processing plants, fruit canning units, etc. Implementing schemes related to animal husbandry, bee keeping, floriculture, etc with sizeable
subsidies for the local farmers. Providing assistance for GI certification of Kodagu products (coffee and honey for example).

It seems that a real cooperation between actors in charge of conservation is needed for such a project to succeed. The CWS and the KMFT are working on it and are trying to implicate people in resisting infrastructure projects.

IV.5.3. Trends and possible evolutions

Biodiversity management and conservation involve a great diversity of actors, of interests, and of strategies. Taking into account these various actors and the general context, we will explore the consequences of four possible trends on this territory:

- What if a project of a large “Protected Landscape Area”, similar to an Eco-sensitive zone, were to be created, and is eventually approved for the entire Kodagu district?
- What if conservation stakes focus only in the western part of the district, creating a large corridor of biodiversity?
- What if the protection level decreases in PAs due to the extension of human activities and the development of infrastructures?
- What if biodiversity conservation management stays as it is today without any stronger regulations?
The dynamic articulation of the sectorial diagnosis constitutes a crucial step in building the final scenarios. These scenarios describe the possible evolutions of the system that we have identified and characterized. A scenario is built up by combining as logically as possible one possible trend for each component of the territorial model: one trend for the coffee sector, one for the timber sector, one for the FRA implementation, one for the tourism sector and one for the conservation issues. We did this four times and thus built four scenarios. The idea for each scenario comes either from different persons we interviewed or from our comprehension of the territory. In particular, the last scenario to be presented here has not been designed according to interviews and can be considered as extreme. Its aim was to provoke reactions when presented to people.

All these scenarios are made in order to tell a story outlining the possible futures of Kodagu over a period of time of 20 to 30 years. They were presented in the two lectures we gave (one in Ponampet and the other one in Bangalore). The main purpose was to trigger debates between the people we invited, who were mostly people we interviewed.

V.1. 1. Scenario 1: “A fissured land”

V.1.1. 1.1. Why this scenario?

During our study, the coffee growers often mentioned two important issues that worried them about the future. First they spoke about a market coffee crisis that occurred in the 90s. This event was caused by the arrival of Vietnam in the international market (International Coffee Organisation, 2004). This country tripled its exports between 1995 and 1999. In addition, at that particular period, the coffee production in Brazil increased. That caused “five years consecutive (1998-2003) where total coffee production has exceeded demand” (International Coffee Organisation, 2004) and prices fell.

This event caused problems in different coffee producer countries. Indeed, the ICO explained in 2004 that it had:

- economic impacts: farms had been abandoned, loss of jobs (in African countries mainly),
- social impacts: rural migration,… (Africa, Asia, South America),
- environmental impacts: cutting down shade trees to get fast cash income from timber (Ecuador, El Salvador, India).

The high volatility of coffee prices on the market leads us to assume that such an event might occur again in the future.

In addition, most of the coffee growers explain that their major problem is the labour cost; it represents almost 65% of the cost of coffee cultivation and is still growing (Govindan, 2010).
According to the president of the Coffee Exporters Association, “the cost of cultivation for Indian coffee increases 12-15 per cent every year due to high wages and fuel prices. But, this is not the case in Vietnam and other south-east Asian nations” (Business Standard, 2010).

The combination of these two facts explains why it is plausible to imagine this scenario. What could happen in Kodagu if a coffee market crisis occurs and the cost of labor continues to increase?

\[ V.1.2. \quad 1.2. \textbf{Impacts on the territory} \]

Lets make the hypothesis of a long term coffee price decrease and a continuing increase of labor cost.

\textit{First step: income diversification}

The reduction of incomes and the necessity to pay workers forces large coffee growers to look for different possibilities. For example, some of them get certified to ensure a stable income. Some large coffee growers decide to harvest and replant their exotic trees. Others decide to diversify their activities slowly by planting palm oil (a current trend in Kodagu) as a food crop or to develop biofuel production. Others develop homestays whenever it is possible. As coffee prices remain low and labour cost high, these three diversifying possibilities are more and more important on the territory.

Small and medium farmers have difficulties to get enough money to live and pay their workers. For them, cutting, selling and replanting exotic trees is almost the only solution to earn income. Furthermore, these practices are supported by the Forest Department which has a policy of providing farmers with exotic species seedlings. However, some of them can’t sustain their livelihood through CAFS (especially paying their workers). Having no rights on the Jungle trees, they can’t sell their trees. Hence they begin to sell their land. Emigration starts when their children decide to leave the district to get an education and then a job in a big city.

At this moment, numerous farmers assume that their difficulties can be solved by getting the rights on their trees because they would thereby be able to cut, sell them and earn money. They decide to fight in order to get the tree ownership rights.

\textit{Second step: Development of infrastructure project}

As an answer of these difficulties and in order to develop the district and to provide job opportunities, the State Government promotes the development of infrastructures. It is supported by people facing financial difficulties. Highways, railways and electrical plants are built. Investors coming from other districts or other states begin to invest in Kodagu to implant industries. Workers and forest dependent communities get new job opportunities out of forests and coffee estates. As a consequence, the labor shortage increases and it becomes more and more difficult for coffee growers to find workers; only large owners manage to
keep their workers by paying them more than before. Some investors decide to buy the abandoned lands or former paddy fields to build tourism infrastructure such as big resorts for middle class Indians. Homestays remain in coffee estates that can afford to do that. Skilled people from other districts arrive in Kodagu.

In some areas, the landscape is closed because of the conversion of paddy fields into more profitable plantations: coconuts, palm trees…

Even if coffee growers still remain in Kodagu, thanks to a certification or a diversification of their activities, the Eastern part of the district becomes urbanized and industrialised around the brand new infrastructures. Environmental pressures are now exerted in the Western part. With the new job opportunities in the Eastern part of the region, forests dwellers from the East of Kodagu, supported by economic incentives from the forest service, start to work in cities (to build the roads, railways…) and to leave the Eastern forests.

Locals and new arrivals supported by politicians put pressure on the Karnataka state to get the tree rights. Finally the State gives up and grants them.

**Third step: The creation of a Green corridor**

To combat urbanization and the pressure on the remaining protected areas, environmentalist NGOs get involved with the forest service in order to reinforce the already existing protection status (Wildlife Sanctuary and Reserved Forest localized in the Western Ghats). Some buffer zones are created surrounding the protected areas, with 5 to 10 km of wooded lands, in order to mitigate the urbanization impact, and eventual encroachment into forest areas. Local forest dwellers continue to live there.

**V.1.3. 1.3. Environmental consequences**

Kodagu is finally divided into two areas, an Eastern part which is urbanized and industrialized, open to tourism but with some closed landscape areas and a protected Western part conserving its attraction for tourism.

Wildlife habitats are gradually destroyed by encroachment and urbanization; conflicts between human beings and wildlife, especially elephants, increases. Some species, which used to live in coffee estates or in paddy land, disappear slowly whereas others remain only in protected areas. Forest connectivity decreases, as well as canopy density and biodiversity. However, the integrity of Protected Areas and Reserved Forests is maintained.

In the long term (and if the coffee crisis continues) coffee can be slowly abandoned and replaced by other cultures (tobacco, tea...).
Figure 23: Kodagu in 30 years under the "fissured land" scenario.
V.2. Scenario 2: “Let’s cut trees“

V.2.1. Why this scenario?

One of the most striking questions which emerges from interviews deals with the land tenure system and tree ownership rights. According to the current land tenure system in Kodagu, the private owners cannot dispose of all the rights over their trees (see above).

The scenario starts with the following question: What if rights on trees are given in private holdings in Kodagu district? How could the system react if rights on the trees are given, triggering a sustained development of the timber sector and intensification of coffee production in coffee estates?

Hypothesis

These new rights allow private owners to sell standing trees to timber merchants who don’t have to face complex regulations to obtain permission. They don’t need to comply with the government. This leads to less corruption. Then the timber harvesting increases along with more and more native and exotic species. This stimulates the offer in the timber and plywood supply chain. Transformation units are coming-up allowing added value along the transformation chain in the local and the export market. A better exportation chain is driven by constant timber demand. Finally the timber sector development leads to substantial incomes and to a profitable market for timber sellers. Timber merchants and coffee growers acquire new investment capacities.

The KFD Wildlife Division start a strict conservation schemes in PAs. They reinforce protection and management of wildlife populations (tigers, elephant, panthers, gours...) in the Nagarhole NP and the other WSs. They also implement social programs to incite forest-dependent communities to relocate at the fringe of these PAs. Compensation schemes for these communities are provided with subsidies, facilities, lands and new houses at the periphery of these areas.

In the western part of the district, RFs are managed by the KFD Territorial Division under new Working plans. These working plans are guidelines for good forest management and exploitation, on a 10 years basis, and approved by the Supreme Court. The working plans include directives for tree planting programs, farm forestry, seedlings distribution, biodiversity conservation and also timber exploitation. Concerning socio-economic issues, local communities are not involved in the protection and management of these western RFs.

In the eastern part of the territory, timber exploitation is under community forest management schemes, with the tribal communities’ participation. Both individual and community rights of FRA are granted to tribes and forest dwellers, who are also working in coffee plantations to earn additional income. Forest-dependent communities are fully integrated at different levels into the coffee and timber production sectors. Usually, they benefit financially from these two activities, after negotiating the limits of their area of activity with the different actors.
Regarding tourism development, we make the hypothesis that both homestays and resort based tourism will spread all over the Kodagu district. Under PAs, wildlife spots for tourism are developed, strictly controlled by the Wildlife Division. The coffee plantation is seen as a strong cultural identity attracting tourists in the coffee estates.

\section*{V.2.2. Impacts on the territory}
In CAFS, coffee growers use their new investment capacities for mechanization and irrigation. It leads to an intensification of coffee production. People exploit their trees and plant fast-growing marketable species. The tree cover is reduced and not quickly replaced after exploitation. The main species selected could be Silver oak, Eucalyptus, Coconut, Erythrina or Rubber. The structure and the composition of CAFS throughout the region is very different. We can imagine a double evolution with:

- Large estates entirely mechanized with an adapted architecture of exotic species;
- Medium and small estates with a mix of few remaining Junglewoods and exotic species with short rotation.

The new working plans of western RFs change the management and the ecological state of the forest area. In addition, three changes to tree ownership in CAFS coupled with a sustained demand for timber enhances timber production in Reserve Forests. Commercial extraction of timber from the forests can start again. For instance, teak management working circles allows to plant and to harvest teak wood following felling. The KFD can follow new management objectives and activities: plantations of exotics and native species are envisaged to supply the local plywood demand and the international precious wood demand. Rubber, pulpwood, teak & bamboo are also planted for firewood or for the commercial market.

On the eastern part, forest-dependent communities use their individual and community rights to plant coffee in their recently granted lands. It increases the proportion of CAFS in the area of RFs.

\section*{V.2.3. Environmental consequences}
In coffee estates, the tree cover decreases immediately due to timber harvesting. Planters reduce the canopy cover and native trees are replaced by fast-growing marketable exotic species such as Silver oak, Eucalyptus, Coconut, Erythrina, Rubber …

- There is a further loss of biodiversity of native canopy cover in terms of tree species and associated species (Garcia, \textit{et al.}, 2009).
- The intensification of coffee cultivation drives a slow conversion of wetlands into CAFS. As a result, wetland surfaces decrease.
- The coffee belt, covering more than a half of the remaining area, forms a natural corridor between the moist deciduous forests on the eastern part and the wet evergreen forests of
western areas. The landscape-level connectivity between remaining forest patches is affected.

The management of western RFs induces timber extraction activities. All these activities lead to a reduction of canopy cover.

- The new stimulation of the sector leads to a further loss of biodiversity.
- Exploitation activities induce habitat fragmentation in RFs. This also affects the landscape connectivity between PAs and the remaining RF patches.

On the eastern part, the implementation of the Forest Rights Act divides the remaining RFs, as individual and community rights are recognized. The establishment of coffee plantations in these areas leads to a decrease of landscape connectivity and to a further loss of biodiversity. Macro faun population size is reduced. Ecological corridors are fragmented by new land uses, increasing Human-Wildlife conflicts.

WSs and the NP play an important role in biodiversity conservation. They provide an extended habitat for large animals like elephants or tigers and a variety of rare endemic species. The Wildlife Division ensures strict protection of the biological diversity and promotes the increase of forest and vegetal covers. Macro faun population size increases rapidly within the limits of carrying capacities for both WSs and NP.

Figure 24: Environmental consequences of "Let's cut trees" scenario.
V.3. Scenario 3: “Green Landscape certification”

V.3.1. Why this scenario?

Several attempts to create areas with a specific status of environmental protection have taken place in the past, within the Kodagu district, but they have been rejected by the local elected bodies and the local population.

As Kodagu is part of the Western Ghats, one of the worlds biodiversity hotspots, the international community pays much attention to this district to preserve its natural resources. This is one of the reasons why UNESCO made an attempt to create a World Heritage Forest in the Pushpagiri and Talacauvery WSs.

In addition, local environmental NGOs fight to preserve the integrity of Kodagu against upcoming development projects. Their influence is strong enough to be seriously taken into account (they have already stopped large infrastructure projects: the building of a larger dam in Karnataka that would have flows the Brahmagiri WS and the development of highways that would have threatened the integrity of western forests). They have failed to define an evergreen belt 10 years ago. However, under the threat of new large projects that would divide the landscape - highways, railways, an electrical line – these NGOs will certainly make new attempts to protect and conserve what they consider to be their natural heritage. Their objective is two fold: first to protect the specific Kodagu environment, meaning the NP, the WSs and CAFS; secondly to avoid too much intrusion from external investors.

Kodagu is also the area where the Kavery River starts and flows through southern India. Water resource management is already a big challenge in Southern India – there have been legal battles between Karnataka and Tamil Nadu – becoming more and more important with the increase of irrigation in agriculture and the need for water in growing cities. Protecting the Kavery river’s catchment area is another argument to suggest that new attempts to create a specific legislation in the district will be made in the future. However, one must be aware that water management is not a priority in Kodagu and that its inhabitants do not believe it to be an important issue.

Under these conditions, a new attempt to define a specific status of environmental protection in Kodagu seems highly probable. The area concerned could be part of the district, the whole district or even an area larger than just the Kodagu. The initiative could come from local NGOs as well as national or international ones. The constraints in the area depend upon the first two parameters.

In this scenario, we make the hypothesis that local environmental NGOs will present a new project for the entire district: designating Kodagu a “Green Landscape certification”. The objective is both to maintain the particular Kodagu landscape and to preserve the Kavery catchment area. In order to do so, the new status:

- Constrains urbanization: maximum size for new private buildings, more severe constraints to construct on agricultural lands like paddy fields.
- Prevents the implementation of new large infrastructure projects. Instead, existing roads are renewed to improve transportation needs.
- Creates/maintains a buffer zone around the NP and the WSs: no industry and no new tourist resorts within 10 km.
- Increases the KFD capacities by raising the number of forest guards, creating a backup cell for legal aspects, with better salaries and an anti-corruption campaign.
- Compensates Kodagu communities for hydrological services, through the taxation of lowland industries.
- Forbids the use of chemical inputs such as the most toxic fertilizers and pesticides for agriculture.

The creation of this area with this jurisdiction is the starting point for the following scenario.

Figure 25: Green landscape certification in Kodagu.
V.3.2. Impacts on the territory

Changes in the coffee value chain: Geographic indication and estate-brands

Bangalore’s inhabitants look for quiet green places for holidays and weekends and therefore tourism expands in Kodagu. The Green Landscape certification restricts the creation of new resorts and large infrastructures. It limits the development of mass tourism and tourists shift toward home-stays mainly located in coffee estates. Kodagu becomes a place for “green tourism”. Favouring this kind of tourism, current roads are renewed.

Medium and large coffee owners get sufficient investment capacities whereas smaller ones couldn’t take advantage of this opportunity. Those who invest can get new incomes in addition to coffee sales (and other products like pepper) that can be reinvested.

The Green Landscape certification complicates coffee intensification. Tree removal and irrigation development is forbidden (or at least limited) as it contributes to modify Kodagu’s landscape and Kavery’s watershed. Seeking for alternatives, coffee growers take advantage of the new status of the district, its “green image” to create a geographical indicator for coffee: “Coffee produced and transformed in Kodagu”. Within this strategy, medium and large growers invest in transformation units to switch from dry cherry production to parchment production adding value to coffee beans. Some coffee growers also invest in the
entire value chain in order to create their estate-brand and sell their products directly to the consumers. Furthermore, the flow of tourists in their home-stays is an opportunity to promote their brand and be in contact with large cities consumers.

On the other hand, as coffee growers are reluctant to group into cooperatives, small owners have difficulties to invest in expensive transformation equipments. They prefer to sell their production directly to larger growers who control a part of the value chain. They also have the choice to keep selling dry cherries to local purchasing agents but at lower prices as this value chain implies more intermediaries and a lower coffee quality.

In this scenario, two coffee sectors appear:

- One that takes advantage of new incomes and of a green image to produce better quality coffee with premiums associated with the Geographic Indicator. It concerns a majority of estates but maybe not the majority of growers. The small growers are the most numerous but are not included in this new value chain.
- Another one with small owners that do not change their practices and stay as before.

The Geographic Indicator can easily include other products than coffee: honey, jam... for which producers can also get premiums. Once again, the Green Landscape certification is a way to advertise the products and get visibility on the market.

Use of the Green Landscape Certification as an argument to protect the forest.

Influential members of local environmental NGOs that fought for the Kodagu’s landscape preservation are mainly medium and large growers. This is the reason why they are also implicated in another battle: the devolution of tree rights. The fact that they succeeded in the first one, in creating a Green Landscape Certification, makes it more difficult for them to succeed in the second one. The KFD uses the new district image as a powerful argument: it is necessary to conserve a high density of trees and a high number of species in Kodagu’s agroforests to preserve the landscape. Consequently the KFD refuses to give the rights on trees to coffee planters.

Under these conditions, if they cannot get the rights on trees, small growers that cannot shift their production toward parchment are the most affected ones. At least, other growers increase their incomes through parchment production and premiums with the GI or by selling their products directly to the customers. It implies more social tension.

The Green Landscape Certification increases the protection level in PAs. Projects that would fragment these areas are thus more constrained. This is the case for the implementation of the Forest Right Act: tribes and forest dwellers have more difficulties to get individual or community rights. However, it doesn’t occur in RFs where the majority of forest-dependent communities live. Once again, it increases social tensions.
V.3.3. Environmental consequences

This scenario is relatively conservative. The purpose of the Green Landscape certification is to preserve Kodagu’s landscape. The Biodiversity conservation hasn’t improved so far (Fig. 28).

Agricultural land

The Geographic Indicator doesn’t constrain the practices in coffee estates but only limits their intensification. These areas look similar to the way they are today while the density and diversity of trees in CAFS decreases. Junglewoods are replaced by Silver oaks.

Similar changes take place in paddy fields: there is no reason to believe that the evolution will radically change even if urbanization is constrained. These lands can shift toward other kinds of agriculture and slowly close the landscape.

Forests

The western forests remain intact and benefit from more protection because KFD capacities are reinforced. Ecological connections between these areas benefit wildlife development.

In the eastern part of Kodagu, many tribes and forest dwellers live in RFs. Consequently, these forests suffer from the implementation of the Forest Right Act. Forest lands are slowly converted into agriculture and villages.

In the National park, the situation is different because the protection status makes it difficult to implement the FRA. However, there is no reason to believe that Teak plantations will be removed. The biodiversity does not increase as could be the case for Junglewoods. It seems that large mammal populations cannot increase because resources and carrying capacities offered by the forests are limited.

Kavery river

The Kavery watershed doesn’t suffer from a loss of agroforests and the conversion of paddy fields. The water resource is relatively preserved. In addition, lowland industries’ taxation allows the development of instrumental stations that improve water quality monitoring. It is finally concomitant to the prohibition of toxic chemical inputs in CAFS that affect the water quality.
Figure 27: Environmental consequences of the "Green landscape certification" scenario.
V.4. Scenario 4: “Food for coffee”

V.4.1. Why this scenario?

This scenario is mainly based on the agricultural alternatives to coffee production. The dynamics of the coffee production system seem strongly linked, among others, to the availability of manpower, the health of coffee and the international market. These parameters can lead to significant changes. This scenario aims at discussing the evolution of coffee production regarding disease hazards. How can coffee plantations be replaced by food crops if there is a high international food demand? What could be the environmental consequences of such a switch?

V.4.1.1. Disease hazard

The first hypothesis is related to disease hazards. In the mid-1880s, coffee production (mainly Arabica) was at its peak in India. A disease outbreak occurred: orange rust and borer attacked white stems of coffee plants. Coffee production collapsed and, as a result, many plantations were abandoned. The acreage itself was reduced by half (Decroix & Chrétien, 2007). *Coffea arabica* was replaced by *Coffea robusta*.

10 years ago, Africa's leading exporter of coffee, Uganda, faced the Coffee Wilt Disease (CWD). CWD, also known as tracheomycosis or vascular wilt disease, which is caused by a fungus: *Fusarium xylandoides*. It occurred in many Africans countries like Cameroon or the Congo. According to the Uganda Coffee Development Authority (UCDA), CWD mainly affects robusta and, since 1993, it has destroyed over 12 million plants. The entire plant is affected. The only way used to manage the disease is to burn the uprooted plants.

In the current context of globalization with a free flow of goods and people, this fungus could be introduced into India. As coffee species and lines are homogeneous in Kodagu, they are highly vulnerable to a disease. The continuous fields of coffee allow an easy diffusion of the disease along coffee estates. The diseases outbreak could easily spread throughout Kodagu.

V.4.1.2. Food demand

The second hypothesis used for the construction of this scenario is an international context of high food demand. According to the Food and Agricultural Organization (FAO), the demand for food is expected to continue to grow, as a result of both population growth and rise of incomes. The conversion of land to produce biofuel crops, crops damages due to climate change and financial speculation are all important factors of the international rise in food prices. In 2007, the UN observed an 80% increase in the price of dairy products, and a 42% increase in the price of cereals.

In the past three years, violent protests against the rise of food prices have broken out in several countries (Haiti, Egypt, Burkina Faso, Mauritania, Tunisia). Many countries have experienced hunger riots. They may occur again in the years to come. It is the responsibility of governments to implement policies in favor of food crops to supply the population and to avoid such events.
So, in this scenario, we propose the combination of a coffee disease outbreak in Kodagu and an international context of high food demand with hunger protests in India.

**V.4.2. Impact on the territory**

**V.4.2.1. Starting point**

This scenario begins in a context similar to the current dynamics in coffee production. Coffee prices are high but there is an increasing labor shortage compensated by these prices. People continue to replace jungle trees by exotic trees in coffee estates. A few native trees remain in estates. Thanks to the informal market, planters can easily fell trees in plantations.

As a result of the FRA implementation, individual land rights are given to forest dwellers who use their land for coffee cultivation. The number of coffee estates increases in PAs and RFs.

**V.4.2.2. Disease outbreak**

A disease is introduced in the south east of Kodagu. It rapidly spreads to the entire district because of the vulnerability and the proximity of estates. This disease causes the deaths of coffee plants in a short time. No solution is found to confront this epidemic. Any expected solution would not become efficient before five years; the time needed for coffee to be productive. Coffee planters live with pepper and tree logging incomes. They can’t wait five years with these low incomes. Furthermore, pepper plants need trees to grow. So they have to choose between growing pepper and cutting trees. There is a critical point when they cut too many trees to grow pepper. At the same time, tree harvest and coffee deaths transform the green landscape into a brown one. Facing this desolate landscape, tourists are no longer interested in Kodagu. As a consequence, incomes of coffee growers collapse. The smallest planters cannot survive these difficulties and leave Kodagu for big cities.

*Figure 28: Chronological impact on landscape evolutions of "Food for coffee" scenario.*
4.2.3. Agricultural switch

The State Government gives incentives to pull out coffee in order to encourage the shift from coffee to food crops because there is a huge need for food in India to avoid hunger riots. There is also high demand in the global market. The government gives permission to cut the remaining native trees for the food crop intensification. Big planters take advantage of this policy to invest in agriculture conversion from coffee to intensive food crops (Fig. 30). Forest dwellers who planted coffee are also concerned and decide to switch to food crops, even in Nagarole National Park, without withdrawing many trees. Infrastructures (Fig. 29) are built to open up the region. There is no more opposition to these projects because of the weakness of coffee growers strongly hit by the coffee pest.

In the landscape diagram underneath, paddy fields are mechanized in the wetlands, on the intermediary zone, people plant corn, soya, beans, and vegetables; on the slopes they prefer growing bananas and a lot of palm oil.

To intensify crops and to avoid the spread of coffee disease to other plants, farmers use irrigation and a lot of pesticides and fertilizers resulting in a water shortage and water pollution.

![Figure 29: Scheme of the landscape conversion of the "Food for coffee" scenario.](image)

V.4.3. Environmental impact

This scenario has huge environmental consequences (Fig. 31). Agroforests are replaced by food crops, biodiversity has changed and decreased. In RFs and PAs concerned by individual land right grants, there is also damage to biodiversity due to the establishment of new food crops.
The KFD enforces strict conservation rules on the PAs and RFs not affected by the FRA implementation. They are the only remaining preserved areas for forest and wildlife. As a consequence, biodiversity remains high mainly in the western part and in the eastern part of the Nagarhole NP. Wildlife is concentrated in these areas and is increasingly expelled from agricultural lands by electric fences. This results in increasing pressure on habitats because wildlife exceeds their carrying capacities. Elephant overpopulation threatens these areas. Their migration routes are now broken by fencing and infrastructure projects. This results in increasing human-wildlife conflicts.

Figure 30: Environmental impact of the "Food for coffee" scenario.
VI. DISCUSSING THE SCENARIOS

Discussing our scenario was in itself a part of the prospective methods. Indeed, the aim of this territorial prospective was to trigger debates among people, to initiate strategic positioning, to highlight tipping points.

VI.1. First presentation: an open forum for a tribal community?

The first debate was held at the College of Forestry of Ponnampet; it was mainly led by the tribal community representatives. It is also important to notice that a large number of our guests apologized for a late cancellation. They had been called to an urgent meeting in Madikeri, to protest against new infrastructure projects from the government. Tribal community representatives were superior in number and the other guests did not dare to argue or propose other visions of the future.

They underlined their role as inner protectors of the forest, as a strong guarantee against the assaults of tourism, urbanization, commercial crops, infrastructure projects, etc. At the same time they firmly stood against any conservation projects relocating the forest dwellers at the fringe of the forest since they consider themselves to be the only people who can properly maintain and conserve the forests.

Going through their declarations, we could therefore build up a 5th scenario, in which all forest rights will be given to them, making them the first forest managers. This situation was even described in detail:

- Environmental education for children and awareness to forest protection
- Demography decreases and alleviates pressure on the environment
- No commercial crops allowed, only food crops

However, we failed to go further regarding the link between government forest areas and the rest of the territory. It was impossible to connect our different territorial compartments under this new scenario. It has been difficult to know what could be their interactions and impacts on the remaining territory - especially coffee plantations. We also fail to understand how tribes could sustain a decent livelihood without impacting the nearby forest. Tribal representatives make the assumption that the traditional “tribal way of life” is intrinsically a holder of conservative value. If rights are granted, they will manage and conserve the forests. But how to sustain a certain livelihood without seeking development? And if so, how could development conserve biodiversity? These questions were central in the debate but the answers were not precise enough to allow a proper analysis.
Tribal representatives were also short of answers when biodiversity conservation and tree ownership rights were discussed. They underlined the fact that they were crucially missing native Junglewood seedlings to regenerate the smuggled ones.

In conclusion to this debate, we think it is interesting to consider this 5th scenario, but there is a need to go further into the links between the forest part belonging to the tribe and the other areas dedicated to coffee, agriculture and urbanization. This lack of connections underlines the inexistence of alliances between tribes and other groups in Kodagu and the will to make their voice be heard. From an environmental point of view, it could lead to a more efficient landscape conservation that has to be explored further.

VI.2. Second presentation:

The second presentation took place at the French Alliance in Bangalore. The Prof. BK Chandrashekar, former Minister of Education and Dr. P.G. Changappa, former Vice Chancellor of the University of Agricultural Sciences of Bangalore, were attending the presentation along with Prof. C.G. Kushalappa from the College of Forestry of Ponnampet, Dr. M. Leroy and Dr. C. Garcia. Apart from the panelists, students from the French High School of Pondicherry and their teachers, on their way back to Pondicherry, also attended the presentation. They were studying biodiversity conservation in agroforest ecosystems in Kodagu district. Researchers (from the Institute for Wood Science and Technology), interviewees and involved people in conservation initiatives from Kodagu or other districts were present and widely discussed the scenarios. The remarks were plentiful; we got new material to add to our scenarios, the debates were varied, measured and to the point.

VI.2.1. An answer to the tribal community scenario

The 5th scenario previously discussed with the tribal representatives has been submitted to the audience and exposed to remarks and comments. The Forest Rights Act has been identified as inevitable in its implementation but “extremely contentious”. Pr BK Chandrashekar denounced a “lot of romanticizing” on the tribal commitment to protect forest. He stressed the existence of an agreement between the National Adivasi Council and the GoI on compensation programs to relocate people in areas outside PAs but “not so far from where they were” with much more facilities. Based on the assumption that a community management of the forests is very unlikely, another scenario, identified as a “pro conservation scenario” has been suggested. It distinguishes three major areas:

- a green corridor/evergreen belt on the Western part of the region
- a central area managed by coffee growers as a strong group working together
- some small areas in the forest reserved for tribes and forest dwellers with a high density development, educational and welfare programs
Drawing up this scenario, people tried to show how forests areas and agricultural lands were not integrated and can be thought about separately. But they went one step further in developing the trends in CAFS. This scenario insists on the fact that tribes forest management is not so reliable, raising the possibility that some brokers or timber merchants can encourage them to remove trees with tempting financial incentives.

VI.2.2. Opening the field for our scenarios

It is interesting to note that the fourth scenario entitled “Food for coffee”, in which coffee is no longer an option for Kodagu, raised a lot of comments and reactions. Questions were mainly about the environmental impacts of shifting from coffee to intensive commercial crops. Even Dr C.G. Kushalappa identified this scenario as the worst case scenario and tried to explain how implausible it is regarding the important crop diversification occurring in Kodagu. Is this scenario just not plausible? So many reactions show that such a shift means the loss of the Kodagu cultural identity, something unthinkable for those whose identity is rooted in coffee plantations.

The fissured land scenario has been seen as the most obvious natural continuation of present trends. However, a large consensus was built upon a limitation of tourism development. Most of the people made it very clear that resorts development is not sustainable and threatens the entire quality of life in Kodagu as do any large infrastructure projects like projects to build a main highway passing through the district.

None of our scenarios present a real improvement of the environmental situation. In the best case, ecosystems stayed as they are today. In the worst case, they were completely destroyed. This observation raised a lot of questions concerning the way to achieve a perfect conservation scenario. How can we articulate all these scenarios, not exclusively, to get the perfect match? This could only be resolved by a two fold answer. First, under the current hypothesis, no perfect scenario could be reached, and a choice had to be made between conservation and development. But, the root causes of this checkmate stemmed from the existing gap between the different stakeholders. So, to get out of the checkmate it is necessary to adopt a strategic perspective. Indeed, we can identify two types of stakeholders maintaining biodiversity in Kodagu: the ones who do not have the means to convert forests into CAFS and the well off, who do not need the resource they can extract from the land. But the huge majority will only act in favour of conservation if it is in their best interest. The question now is, how to propose tools to make conservation be in the best interests of the whole society? A shift is apparently not possible until real alliances between coffee growers, tribes and forest dwellers, and the KFD is consolidated. Dr Kushalappa strategically presented the KMFT as one of the organizations that can promote new alliances between stakeholders. Payment for environmental services, geographical indications and certifications have also been mentioned as necessary tools to preserve the environment and it was suggested that the government should come up with a clear policy for Kodagu providing incentives for the amenities the district is bringing to Karnataka state and downstream areas.

A shift from “green revolution to evergreen revolution” has also been mentioned as a possible and even desirable future for Kodagu. In some other Indian states, convincing examples have been developed generating consequent incomes for farmers that have shifted to multi
cropping farming systems (seed, flowers, dairy, poultry, fishery, sheep, saniculture…).
Agribusiness based on women can be a new transformation trend for a future scenario which is well worth studying.
VII. CONCLUSION

Formulating a territorial prospective, after the Cafnet project and other research programs, was a way to go one step further in the understanding of the socio-ecologic system in the Kodagu region. To take up this challenge, we had good connections, partners, and abundant scientific literature at our disposal, as well as a highly motivated staff and team of students, but very little time.

Our results are based on proven methods that combine an environmental strategic diagnosis of the territory coupled with a prospective approach, both based upon bibliographical work and interviews. In the short period of time, we were able to come up with four contrasted scenarios, as four different pictures of Kodagu 20 years down the line. Discussing the scenarios with the stakeholders showed that progression toward these different futures was plausible and coherent. Furthermore, it outlined possible alternative pictures of the future that would be really interesting to explore and investigate under a similar approach, involving a larger panel of stakeholders. Indeed, the real added value of this exercise stems from the interactions and debates that could also produce insights in a second session.

Among the new themes that could be interesting to explore, we can outline the energy supply, social equity, climate change and water availability issues.

The energy issue has not been taken into account in our scenarios. The first reason was that wood energy is plentiful in CAFS and there are no incentives to find new alternatives. However, on a broader scale, the energy supply and the regions dependence on it should be addressed in another territorial prospective. Indeed, power shortages are a limiting factor on Kodagus development, and could raise usages conflicts as the demand will grow. The electricity supply is also an issue, which energy mix to go for? What will be the share of renewable energy? What about the environmental impact of the chosen technologies – large hydroelectricity dam, gas pipeline, windmills?

A sound set of prospective scenarios should also include a study on poverty. This is something that we did not address in our research but which had been underlined as essential in the restitution. Therefore, it will be useful to understand what kind of poverty is affecting disadvantaged people for instance. But poverty issues are closely linked to labour shortage and labour cost issues. This subject has been ever-present in all our interviews, and was a major issue for all the coffee growers. Indeed, Prof. BK Chandrashekar underlined that migrant labourers are coming in large numbers for each picking season, but for a number of known (legislation, wages) and unknown reasons, there is a shortage of labour in western areas and driers areas. Climate change is also to be considered more closely, as a new report on Karnataka GHG emission has been recently issued (Chandrashekar, 2009, 2010). Total emissions of the State are 80 millions of TeCO2. What proportion does agroforest degradation represent in the overall emissions? What actions can be undertaken to mitigate against GHG? Some people suggest a broader PES scheme under the government to reward amenities from the special agroforests ecosystem.
One more interesting point to study would be water availability and quality. Indeed, our scenarios have not dealt with the water needs of coffee growing due to a lack of time and resources. However, it seems essential to address this issue, as tourism and irrigation are increasing in the region without any regulations to pump the water from the Kavery River – (the only mandatory authorization is the one to connect the pumping system to the electricity network, but most of the water pumps run on petrol). Along with water availability, water quality seems to be a question regarding the few regulations on pesticides uses in coffee plantations. The Coffee Board has developed a reach out campaign to raise awareness about the use of chemical and pesticides but no systematic controls are in place. It may also be interesting to have a look at recycling sectors and initiatives, since most of the certification standards ask for reprocessing of the chemicals sprayed in the plantations along with a reasonable use of pesticides.
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