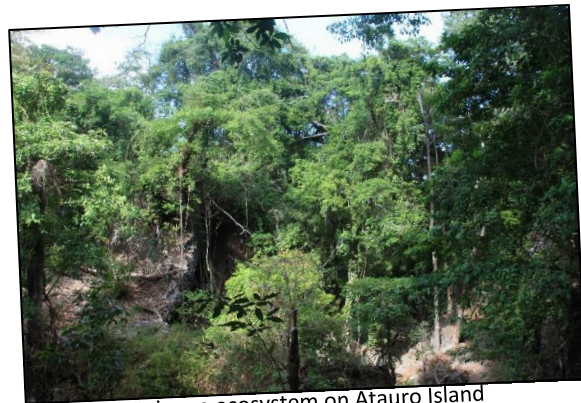Lund University Master of Science in
International Development and Management
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Exploring the management of biodiversity in Timor-Leste

A transdisciplinary approach

Marine ecosystems are a source of livelihood for some coastal communities

Mountainous ecosystem on Atauro Island

Colony of valuable pollinators in a forest

Free-ranging livestock: one of the threats to biodiversity

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Supervisor: Elsa COIMBRA

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This thesis would certainly not have been possible without the infinite patience and fascinating insights brought by my supervisor, Elsa Coimbra and I cannot thank her enough for this. I also thank the participants of the study who provided me with their time and documents. Following the concept of action research, this thesis will be sent back to them after the initial submission and I also thank them in advance for their edits and additional views. I sincerely hope that some useful insights could be drawn from this modest piece of work. I also need to thank the Kröger family for their continuous support during the data collection process and its preparation. Last but certainly not least, my heartfelt thanks go to my entire family and my dear friends whose smile and warmth accompanied me throughout this process.

I. Introduction and rationale for the research

The Democratic Republic of Timor-Leste[1] is a small country of roughly 15,000km², which the Swedish reader can visualize as the combined size of the counties, Skåne and Blekinge. Timor-Leste is located on the Eastern part of the island of Timor, between Indonesia and Australia, and populated by about 1,200,000 people[2] (DNE[3], 2014). After nearly 500 years of Portuguese colonization and 24 years of bloody struggle under the Indonesian occupation, the nation finally re-gained independence in 2002 after the 1999 referendum (GoTL, 2014). I arrived in the Land of the Rising Sun (Timor Lorosae), as it is also called, shortly after a turning point in the country's history: the end of 13 years of peacekeeping operations under the 1999-2002 United Nations Transitional Administration in East Timor (UNTAET) and the United Nations Integrated Mission in Timor-Leste (UNMIT), which left on December 31st 2012.

After the independence, the newest nation in Asia was not only faced with the colossal task of rebuilding the entire country –from infrastructure to institutions and governance– but also with finding ways to promote peace-building and support the population on their way out of income poverty, among other forms of vulnerabilities. Upon the departure of UNMIT, Timor-Leste had already achieved tremendous changes, but to this day, still faces significant challenges to achieve the country's vision of becoming a middle income country by 2030, as outlined in the Government of Timor-Leste's (GoTL) Strategic Development Plan (SDP) 2011-2030 (GoTL, 2010).

As the country gradually became more stable, both the GoTL and international organisations have been increasingly shifting parts of their portfolio from peace-building and state-building to economic development and environmental sustainability (including disaster risk management). The growing focus on the environment can be explained by the recognition of its intrinsic links with the lives of Timorese people. It can be viewed as a source of livelihood, particularly through agriculture, and as a source of vulnerabilities through natural disasters and the impacts of climate change.

The local government was quick to recognize the importance of the environment for the development of the country. This can be illustrated by its accession to three major international environmental agreements within five years of independence: the UN Convention to Combat Desertification (2003), the UN Framework Convention on Climate Change (2006) and the Convention on Biological Diversity (2007). These were then followed by the Kyoto and Montreal Protocols as well as the Vienna Convention (2009).

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[1] Formerly known as "East Timor"

[2] Projection for 2014: The latest population survey is the 2010 Census estimating the then population at 1,066,582 (Direcção Nacional de Estatística (DNE), 2011)

[3] General Directorate of Statistics (in English)

While the accession to those treaties, so early in the nation's history, is an achievement in itself, it also meant that Timor-Leste had to work towards the formulation of national objectives and their implementation to satisfy the reporting obligations. This was a challenge for a nation whose institutional, human and technical capacity had been strained by years of struggle and occupation. The first, and so far the only, National Action Plans deriving from those agreements are the 2010 National Adaptation Programme of Action on Climate Change (NAPA) and the 2011-2020 National Biodiversity Strategy and Action Plan (NBSAP). Those were the first set of objectives for environmental work and were later reiterated by the SDP. The target implementers of the strategies, besides the Government, ranged from international and local NGOs to international organisations and donors, as many of those active in the country are involved in activities having an impact on climate change adaptation, mitigation and biodiversity and/or the conservation of ecosystems of the country.

I am convinced both of the importance for researchers to bring useful and relevant data to support a country's national development objectives and fascinated by the links between human development and environmental sustainability. Thus, I naturally turned to NAPA and NBSAP for research topics in response to its explicit invitations for more research on various aspects of the biodiversity of the country (GoTL, 2011).

A quick overview of the literature available online on Timor-Leste's environment and biodiversity confirmed the lack of empirical quantitative data on biodiversity (see Chapter II). Research on qualitative aspects of biodiversity management informed by the social sciences appeared even scarcer. Faced with the lack of basic background literature and the desire to prepare a relevant and useful thesis, I decided to apply some basic concepts of action research to the study (see Chapter VI).). I thus undertook an informal pre-study to formulate the research problem by surveying the kind of questions that were the most pressing in *and* from the field. Therefore, armed with a little more than NBSAP in my hand, I approached the few Timorese and international professionals working on biodiversity I could reach soon after my arrival in TL.

I made it clear that although I understood that the need was for more quantitative data (e.g. number of species), given my limited knowledge and financial means and the difficulty to access most of the country on my own, I hoped to contribute to the so-far neglected qualitative research close to Dili, the capital. In those discussions, I confirmed that the implementation NBSAP was difficult because of the lack of data. Illustrating the difficulty to implement NBSAP because the knowledge necessary to apply the recommendations is scarce, one professional told me to "look at NBSAP, pick any page and you'll see that there are plenty of research topics to choose from". It also became obvious that as in most countries, the different actors managing biodiversity (.e.g. through conservation) in the country had very different opinions on the subject, and different views on their and other actors' impact on it. Some

regretted that some actors had a poor knowledge of what others were doing and thereby had activities with seemingly opposite objectives or had missed opportunities for collaboration. Some professionals expressed their frustration at the overall "confusion" with "who does what" and other aspects of the fields of biodiversity (particularly for the conservation and sustainable use of resources) and regretted the lack of awareness and coordination on those issues.

As my observations and informal discussions continued, I realized that despite all their different oand sometimesr even opposite views on the subject, all theose diverse professionals were united by one common question: "How can the management of biodiversity in Timor-Leste be enhanced?" It is towards this question that this thesis will endeavour to contribute.

As the research question was formulated explicitly within the attempt to coincide with the interest of a variety of biodiversity management actors of biodiversity management and particularly GoTL, a framework calling for the convergence of different knowledges was necessary to attempt to answer it. This is why a transdisciplinary approach is used in this research, that is to say;, a model that is able to comprehend and coordinate the cross-fertilisation of knowledge between different disciplines which that are united by a common pragmatic purpose (Nicolescu, 1996; Max-Neef, 2005; Hirsch Hadorn, et al., 2008) (see Chapter III). Again, in this paper's case, the common purpose is the improvement of sustainable management and use of biological diversity in Timor-Leste. The "actors", who hold the knowledge, include the "persons and institutions in public agencies, the private sector and civil society who are involved in one way or another in the problem field", in our case the management of biodiversity (Pohl and Hirsch Hadorn, 2007 cited in Hirsch Hadorn, et al., 2008:427). However, due to time and financial limitation the research question will only be answered according to those actors in the government, international organisations, bilateral organisations and local NGOs located in Dili.

Following the transdisciplinary approach, a research problem can be answered first by acknowledging the diversity and complexity of knowledge in the field. Then, an analysis of those findings will provide insight on how the results to achieve the common purpose can be obtained (Hirsch Hadorn & Pohl, 2007; Hirsch Hadorn, et al., 2008). Those three sections will form the structure of the paper's discussion, with its final section answering our main research question: "How can the management of biodiversity in Timor-Leste be enhanced?" To reach this, the paper will focus on the following sub-questions:

- How diverse are the actors of biodiversity management in Timor-Leste?
    - o This includes the identification of actors and of the nature of their involvement in the field, as well as their perception of biodiversity management and its future direction.
- What are some of the underlying factors explaining the actors' perception of the management of biodiversity?

The paper starts with the definition of key terms and a literature review of biodiversity management in Timor-Leste (Chapter II), followed by the methodology (Chapter III), then the theoretical framework (Chapter IV). Transdisciplinarity is presented before moving to each of the three main sections of the discussion: Acknowledging diversity (Chapter V), Underlying factors affecting diversity and complexity (Chapter VI) and Harnessing diversity for the management of biodiversity (Chapter VII).

II. Biodiversity in Timor-Leste
a. Definition of terms

Biological diversity or biodiversity can be defined in a number of ways. As all policies and most projects on biodiversity or more generally natural resource management in Timor-Leste mention the Convention on Biological Diversity (on which NBSAP is based), this paper will adopt the definition of the CBD:

"Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (United Nations, 1992:3).

This paper will focus on the management of biological diversity as defined above, or in other words, on the management of both living organisms (species) and ecosystems. Ecosystem refers to a "a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit" (UN, 1992:3). "Conservation" is also a recurrent term in this paper. In-situ conservation refers to "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties". On the other hand, Ex-situ conservation refers to "the conservation of components of biological diversity outside their natural habitats" (ibid).

The purpose of this section was to clarify this paper's use of the words "biodiversity", "ecosystems" and "conservation". It should be noted that although the CBD's definition of biodiversity and other terms are mentioned in many documents, the question of whether the definition and the understanding of the terms by different actors match, will be discussed further as part of the findings of Chapter VI.

By extension, the management of biodiversity refers to the management of species and ecosystems and includes activities which falling under or affecting the three main objectives of the CBD, namely:

"the conservation of biological diversity, the sustainable use of its components[4] and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (UN, 1992:3).

b. Types of actors in the field of biodiversity management

In the pre-study and the early phase of the thesis, it became clear that the identification of actors was not an easy thing. A senior staff from a Timorese NGO even mentioned that "having a general idea of who does what" would be useful. Furthermore, no document found listed the different organisations working with environmental sustainability; let alone biodiversity conservation, for example. Between the research period and the most recent mention of the institutional infrastructure dealing with environmental sustainability in the Government, even the name of Ministries and their departments had changed - reflecting the dynamic changes in governance which characterize Timor-Leste. Therefore, following concepts of action research described in the methodology, it was decided that identifying the actors would become part of the study through the interviews and informal conversations (see Chapter III (b) discussion on the selection process and the continuous identification) .

The introduction defines actors as people or institutions in the public and private sector, or civil society involved with biodiversity conservation. In line with the definition of the "management of biodiversity", the identification of some key actors targeted those who work in one of the three main objectives' area of the CBD. Through the interviews, a "snapshot" of a range of actors were identified, including in the local, regional and national Government; national/international NGOs; international organisations; bilateral organisations; citizens' goups (e.g. organised farmers), private sector, academia. The actors and their scope of work are discussed further in Chapter V.

c. Review of literature on biodiversity in Timor-Leste

Literature on Timor-Leste is scarce, particularly up to date one, and the availability of the existing information (which is often not online) makes it particularly difficult for the Government, international and national organisations and researchers alike to have an overall picture on what has been published on the country. Over the 6 months I have spent in Timor-Leste, I have collected as many articles and reports as I could closely or vaguely related to biodiversity management in Timor-Leste from a wide variety of people who cannot be thanked enough. The documents written in Portuguese, English, Tetun, French and Spanish range from the 19th Century to present were collected. The vast majority of the

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[4] "Sustainable use" means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. (UN, 1992:3)

articles collected focus primarily on history, conflict, governance, linguistics and anthropology with a minority focusing on natural sciences, physical sciences, natural resource management, environmental studies, agriculture, food security and governance.

This section illustrates the state of the literature on biodiversity and its management with a selection of various key studies on the topic .Through this review, it is hoped that the reader can both understand the scope of the available research on Timor-Leste but also understand useful background information on different aspects of biodiversity in the country. This is particularly important to understand the background of management as well as the kind of information available to decision-makers.

i. Scope of data available to decision-makers

To understand how to enhance the management of biodiversity, it is crucial to understand the scope of research that has been done on it, as this is often a factor put forward as limiting expansion of the field.

Identifying biodiversity

The National Library in Lisbon, Portugal, holds more than 40 of the earliest accounts of Timorese biodiversity and ecosystems, ranging from 1881 to 1961 and on various fields such as botany, climate and soils (BNL, 1980). This was followed by a large research gap in the troubled years of Indonesian occupation, after which a new wave of research had emerged.

Some researcher's objectives was either to directly inform and and make recommendations to policy makers about the use of biodiversity. This includes Lança & Parreira (2004) who identify the main fodder plants for ruminant nutrition existing and used on the island and suggest their potential for more sustainable agriculture

Other studies not only provide baseline data but also include recommendations on the conservation of species, particularly for advocacy of setting up protected areas in the last decade. Those are important as species identification and inventory is still at an early stage and very little research has been published. For example, sixteen important bird areas were identified and presented as key sites for conservation by (Trainor, et al., 2007) based on a small dozen of various ornithological surveys between 1944 and 2004. Such work was the base for later advocacy, including through the production of pamphlets (see Santana, et al., n.d.). Another example includes a study on the Orchids of Timor and the identification one specie as "critically endangered" and another two "endangered" (Silveira, et al., 2008). After identifying the location of those most species orchids as inside the protected areas defined by UNTAET, the author calls for better implementation of protected areas regulations. The need for protecting marine areas was also highlighted in last year's landmark rapid survey of marine biodiversity (Conservation International, 2013)

Baseline data, however, is not always up to date. Thompson (2011), for example, explains that the geological maps used at the time of writing are in fact based on Portuguese maps from the 1960s which were digitized. Although the geology is unlikely to have changed in the last 50 years, technology has and the study does not mention whether any work was done to verify the accuracy of the mapping.

Quantifying the impact of humans on biodiversity

Several studies attempt to assess the impact of human activity (particularly in terms of land use) on species and ecosystems. Some studies also look at the impact of environmental degradation on humans (see ii.). Those studies provide an important rationale to frame policies and identify specific entry points for projects and cooperation.

The example of studies on deforestation

Bouma & Kobryn (2004) puts deforestation in the historical context of the struggle for independence and explain explains the continuous deforestation rates between 1989 and 1999 as a result of the combined effect of transmigration, Indonesian policies and competition for land, woodland, etc. However, the concrete impact of forest disturbance on bird, mammal, reptile and ant populations in Timor-Leste was only examined more recently in an extensive study by Trainor (2010). The study concluded that Timor-Leste's double cover of "intact forest" compared to the West of the island was the primary reason for the 20-45% difference in bird concentration. By first making the point that Timorese data shows the correlation between forest cover and species concentration, Trainor makes the point that deforestation is having a disastrous impact on local ecosystems. It was also argued that that native land mammals and reptiles suffered greatly from human-impact, including through hunting, habitat loss and introduction of non-native species as 82% of land mammals and 22% of reptiles were "probably introduced" (ibid:248).

Documenting the value of Timorese biodiversity besides nutrition

While the value of ecosystem services for the water cycle, disaster risk management, etc. are well documented across the globe, their benefits in Timor are usually described using foreign scientific literature and no study documenting the provision of ecosystem services by particular species in local ecosystems (and therefore, under local conditions) could not be accessed5.

However, the case for the value of biodiversity in Timor-Leste is made by literature on the medicinal uses of plants found in Timor (including natural insecticides). The literature focuses on the

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[5] Please kindly note that it does not suggest that this data does not exist.

identification of plants used traditionally in different parts of Timor-Leste. Collins (2005), for example, identifies a total of 116 medicinal plant and highlights the diversity of the plants used by different ethnic groups. For example, over 70% of the Fataluku medicinal plants were different from those used by the Laklei or the Idate people. Similar studies are being undertaken by projects on agro-biodiversity such as Senayake's participatory survey (2013). It should also be noted that several studies outline the importance of Timorese forests, in particular, to Timorese culture (McWilliam, 2001; McWilliam, 2003).

ii. Linkages between biodiversity conservation and development

The impact of biodiversity and the ecosystem services it provide on development is well documented across the world and studies exploring the different links between the two have been growing (Roe, et al., 2013; Turner, et al., 2013). This section emphasizes that the link between biodiversity conservation and the livelihoods of rural and urban Timorese is strong and provided as rationale for several national laws and policies (RDTL, 2012; GoTL, 2010; GoTL, 2011).

National policies acknowledge that environmental sustainability, including the conservation of biological diversity, is crucial for the current and future development of the country. While this observation is probably true of most countries, Timor-Leste is not only located in Wallacea, one of the most biologically rich areas on Earth of international significance for conservation priorities (called "biodiversity hotspots") (Myers et al., 2000; GoTL, 2011), but also presents several features that strengthen the relative importance of the environment on development. Firstly, the biologically diverse marine and terrestrial ecosystems of the country are the direct source of livelihood of most Timorese with about 80% of the population depending on agriculture for survival, including 98% using firewood for cooking (World Bank, 2010). This makes them very much dependent on the quality of the services ecosystems are able to provide which in turn depend on their state of conservation. Indeed, being dependent on agriculture for survival also means to be dependent on weather, climate, seed availability, invasive species, natural disasters, water availability, etc. Secondly, the ability of ecosystems to regulate water flows and erosion, for example, are also key considerations when evaluating the risk a given area will be facing natural disaster. With a mountainous topography, Timor-Leste is indeed particularly prone to landslides and floods, particularly in deforested areas (UNDP, 2014). This has a particular impact on the most vulnerable segments of the population in rural areas as natural disasters affect infrastructure, crops, housing, water supply, etc. Finally, climate change is predicted to have a particularly strong impact in Timor-Leste, particularly in terms of agriculture and disasters (ibid). Considering the impact the environment can have on the development of the country, rapid action is crucial. This priority is also recognized in the Government's Strategic Development Plan (2011-2030).

iii. Management of biodiversity in Timor-Leste

In preparation for the restoration of independence, academics and NGOs had already underlined the importance of the institutional framework for environmental issues in the country, highlighting that it should "be closely matched" to the exisiting challenges and that it should be mainsteamed in all aspects of society (Sandlund, et al., 2001). A few years later, Trainor et al. (2007) provides an overview of the "conservation infrastructure" in Timor-Leste as of 2007. It highlights the importance of UNTAET regulation for the preservation of biodiversity in early years after independence. The authors particularly praised regulations on logging (UNTAET 2000/17), Timor-Leste's accession to the UNCCD and CBD, the identification of 15 "protected wild areas" (2000/19) and some endangered species or fragile ecosystems. However, the authors do not question the implementation of those regulations. In fact, as of 2007, they admit that "institutional mechanisms, roles and responsibilities for conservation, natural resource and environmental management" were "still in the process of establishment and development" (ibid:28). this provided the rationale for the structural and strategic changes in environmental governance after 2010. This included the elaboration of the National Biodiversity Strategy and Action Plan (NBSAP) in 2010 and followed by the Basic Environmental Law, which came into force in 2012 and overtook the UNTAET rules (see RDTL, 2012).

Palmer and de Carvalho (2008) explain that local customary law (such as "Tara Bandu") have played an important role in natural resource management in pre-Indonesian times. In the midst of difficulties in implementing national regulations which are planned and decided upon by an "elite", the authors explain that the practices are being revived by communities frustrated to have been marginalized in the national debates on the management of natural resources, including biodiversity. Cullen (2013) provides further examples of marginalization of communities, even in co-management of local resources, such as between the government and communities living in the country's first national park (Nino Konis Santana National Park). His findings indicate that the protected area caused a significant change in the communities' livelihoods, including lower food security and the lack of fuelwood as no alternative livelihood options were introduced. The lack of participatory decision process in biodiversity management is also discussed later in this paper.

III.   Methodology

a. Action Research

In Timor-Leste, I interned for 6 months at the United Nations Development Programme and became subsequently involved in different phases of projects and long-term strategic planning. Through my work and observations, I realized some of the difficulties that the Government and its development partners face to promote effective planning, monitoring and evaluation of projects and policies in Timor-Leste due to the lack of data (and hence few SMART[6] indicators) or research to support the "definition" of development challenges. New research is therefore very much valued. Despite this, I observed the frustration of some Timorese professionals at some research done which do not have much practical use for people "on the ground" or when researchers sometimes never sends their results back to interested parties. Hence, to be more likely to develop a useful and practical document for interested stakeholders or at the very least, a meaningful contribution to the small but growing pool of research on Timor-Leste, I had decided early into the study to use the concepts of action research as guiding methodological principles in this thesis. This is also a recommended approach for the problem identification of transdisciplinary research (Hirsch Hadorn & Pohl, 2007).

Within the limitations of time and feasibility of the study, I use concepts of action research by involving the "subjects" of the thesis throughout. They were included in the formulation of the research problem and discussions on the ways the thesis can be useful to them and offered the opportunity to comment on the draft, thereby "involving stakeholders in the research process" but not going as far as "solving the problem" (Mikkelsen, 2005:132-133). This study thus combines action research and applied research, in the sense that it helps to provide input for policy/decision-maker (ibid:131) but not to "solve policy-specific problems". Indeed, there are lot of people in the government and other organisations more knowledgeable than me to "solve" problems. Few, however, have the time and resources to do studies to inform them (e.g. on the current situation/'baseline"). Though I am certainly not "indispensable" not "better" as Kapoor (2004:642) puts it, I have tried to put my time for practical use.

Local working customs, political reasons and the timeframe of the thesis would have made it difficult to convince and arrange most actors to take the time to come around the table to find ways to manage biodiversity as a group. This limited the scope of action research in this thesis by limiting some of its tools, such as group discussions/workshop. After publication, the study will be "returned" by email to

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[6] SMART stands for Specific, Measurable, Achievable, Relevant and Time-bound

all the participants in the study, including to those who could not attend the interviews. I will work to facilitate the translation of a detailed executive summary in Tetun so as not to marginalize or exclude those interested parties who do not speak English[7].

b. Investigation

i. Selection of participants

A total of 16 respondents were interviewed through in-depth semi-structured interview and 7 more were approached but either cancelled the interview due to the GoTL's budgetary discussions (3 cases), or did not respond (2 cases), refused (1 case) or were abroad (1 case). As advised by Mikkelsen's (2005:89), the participants who were selected were all "key individuals" in their organisation. They included senior staff of the Government (4 participants), international organisations/NGOs (6 participants), Timorese NGOs (2 participants), Academia (1 participant) or bilateral organisations (3 participants).

Identifying actors (as defined in the introduction) was not an easy task considering the lack of data on actors in the field. Hence, they were identified as the interviews went along, based on the phone numbers collected. Naturally, one other criteria for the selection of participants was their accessibility. Emails being unreliable and hard of access in most of the city, much of the contacts were made by phone and sometimes through recommendations, including by some other participants. This is a limitation of the study, I could only reach those for whom I could obtain a valid phone number early enough in the research process. Nevertheless, the participants still covered a wide variety of the some of the most important actors in biodiversity conservation and management in the country. Due to the requests for privacy expressed by some of the participants, the list of organisations and individuals involved in this study will be kept strictly confidential.

ii. Pre-study

This informal study was done very early in the research process. The informants included 1 professionals from a Timorese NGO, 2 from international NGO organisations and 1 field project officer leading government work on marine conservation in a rural area. The pre-study took the shape of

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[7] Most of the research on the country is in English or Portuguese, languages that the majority of the population, including many government and NGO staff and university students, do not master at an academic level. It should be noted that Portuguese is an official language, together with Tetun, which is more widely spoken. English and Indonesian are working languages as mentioned in the Constitution

informal semi-structured interviews around the NBSAP and the main areas of the field needing research focus. They were also the opportunity to understand the local context and system better and obtain additional secondary data which were also mainly used to understand the local context.

iii. Semi-structured Interviews

Questions were open-ended and discussion was steered to obtain the most details from respondents. Finally, participants were asked for additional sources of information that is not published online, such as their reports and data. This has helped me to gather secondary data that I would not otherwise have access to, as for example, many organisations do not have internet.

The interviews intended to be specific on the interviewee's own projects or organisation/department – studied beforehand by the author – so that the conversation could be steered faster towards more substantial points. The interviews had three main parts:
> (a) Introduction to participants' organisation, programme, strategy and partners (linked to ii. below). This question also helped to set the base for deeper discussions.
> (b) Participants' understanding of the key challenges the country's conservation or biodiversity is facing and the factors behind them (linked to their specific programmatic areas)
> (c) Participants' views on ways to improve the system.

iv. Mapping the relationships between different stakeholders

As mentioned in (i), the identification of actors also took place during the interviews. This also integrated a discussion of the relationship between the different actors. For this exercise in the introductory part of the interview, white paper was provided for participants to write or make diagrams freely. Instructions for the exercise are inspired from Venn-diagrams (Mikkelsen: 2005:92; Newing, 2011:172), typically used to map power and relationships. To simplify the exercise under the time constraint of the interviews, participants were invited to map the relation (e.g. financial, decision-making, influence, etc.) of their different partners freely instead of imposing the use of circles. Only 2 participants refused to participate in this element and other dictated. The main limitation of this activity was the inability to read some of the sketches but this was helped by the recording.

v. Methodological obstacles

As Creswell (2012:171) discusses, the first challenge was accessing the organisations. My position as a student is both a blessing – by being respected as graduate students are valued in Timorese society

seen as independent and not linked to UNDP where I interned- and a curse as I am not someone important, nor am I an emergency. Hence, even at the preliminary stages of the research and despite all participants' apparent appreciation and enthusiasm for the research, meetings would regularly get cancelled at the last minute, participants would come late or not at all without notice, etc. This is very common in the Timorese context, but it is extremely time-consuming and affects the research. The second main challenge is the lack of secondary data published or easily available on this topic (and many others) in the country. This has made the initial "background" sessions take a very long time to compile and could only be done while in Timor-Leste. Hence, the majority of the data was collected through interviewees and include articles in English, French, Portuguese and Tetun.

IV. Transdisciplinarity: A Guiding and Crosscutting Principle

As discussed in the introduction, this research was formulated after talking with actors, in the pre-study, who wished to strengthen the management of biodiversity in the country but were overwhelmed in their quest for answers by the lack of knowledge about the different actors, their perceptions, their rationale, and more importantly, how to bring as many actors as possible together. Hence, the exploration of the research problem [8] requires plunging into the diversity of actors involved in biodiversity conservation directly or indirectly, knowingly or unknowingly. Furthermore, all actors involved in the study have also explicitly expressed their desire to that this paper should not be limited to an analysis of the complexity of biodiversity conservation management in the country, but should also provide practical insights on how to improve it. Transdisciplinarity provides the tools to tackle the different aspect of this research problem.

Earlier transdisciplinary thinkers recognised that over the last century, there had been a dramatic increase in the number of new disciplines and specialisations while the world had also become increasingly complex (Nicolescu, 1996). They questioned how comprehension over the "disciplinary barrier" can occur between the tens or hundreds of disciplines involved on a same issue and how policy/decision-makers can dialogue with them (idid).

Nicolescu (1996:26f.) summarizes how several other modes of interactions and linkages between disciplines support decision-making by enriching knowledge. Pluridisciplinarity – the study of one object from one discipline by several other disciplines - such as a painting analyzed using chemistry - has for main objective to enrich the initial discipline (e.g. by determining which ingredients were used

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[8] "How can the management of biodiversity in Timor-Leste be enhanced?"

in the paint). On the other hand, by focusing on the transfer of methods between disciplines, interdisciplinarity aims to broaden the degree of application of some disciplines (e.g. medical applications of physics) or even creating new ones such as International Development Studies9, for example. Yet, as with pluridisciplinarity, the overall aim of interdisciplinarity stays within disciplinary research (ibid).

Acknowledging the complexity of the world, trandisciplinarity's overall aim, however, tries to go beyond only enriching disciplinary knowledge. It attempts to link what is "between disciplines, through different disciplines, and beyond all disciplines" and with the aim to "understand the present world" by uniting knowledge (Nicolescu, 1996:27). It can be also be understood that the convergence of knowledge is central to transdisciplinary research in order to bring insights or solutions to the common purpose or ideal of the diverse stakeholders. In short, the transdisciplinarity research focuses on (a) "grasping the complexity of problems", (b) "taking into account the diversity of life-world and scientific perceptions of problems", (c) "linking abstract and case-specific knowledge" and (d) "developing knowledge and practices that promote what is perceived to be the common good" (Hirsch Hadorn & Pohl, 2007).

Hirsch Hadorn & Pohl (2007:20) 10 explain that transdisciplinarity becomes useful when "knowledge about a societally relevant problem field is uncertain", when the "the concrete nature of problems is disputed" and when there is a "great deal at stake for those concerned by problems and involved in dealing with them". When considering using this theoretical framework, which was considered after the pre-study, it was important to test whether the problem satisfied those criteria, to ensure that transdisciplinarity could be useful to provide answers. As will be discussed in later chapters, through the interviews it became clear that biodiversity conservation in Timor-Leste satisfies all criteria.

This may not be surprising to the informed reader, as although this study focuses on Timor-Leste's local context, high levels of complexity seem omnipresent around the globe when dealing with problems in the fields of biodiversity conservation or more generally, of environmental sustainability. In fact, according to Klein (2004:519) "environmental problems exemplify complexity" because "they comprise of several sub-problems that fall in the domains of different disciplines and sectors", each of which being affected by the diverse "preferences and values" held by each stakeholders. This is why this study attempts to engage with a wide variety of stakeholders through the three steps of the transdisciplinary research process. As will be discussed later, this inclusive approach occasionally

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[9] As taught in the Master Degree (LUMID) that the present paper is part of. Source: (Eklund, 2012)
[10] Hirsch Hadorn & Pohl are lead academics in the methodology of transdisciplinarity research

destabilised respondents if their perspective was that "they had nothing to do with biodiversity", who despite their initial reticence, provided interesting insights.

a. The transdisciplinary research process

The Transdisciplinary research process consists of three specific phases: "(1) Problem identification and structuring, (2) Problem analysis and (3) Bringing results to fruition" (Hirsch Hadorn & Pohl, 2007:20). This makes Transdisciplinarity well-suited to answer this research question by (1) acknowledging the diversity of actors and views on biodiversity conservation; (2) understanding the its implications and underlying factors and (3) exploring ways to make this knowledge converge (make it converge?) or how to utilise this diversity to strengthen biodiversity conservation.

i. Problem identification and structuring

In this phase, the researcher and actors work jointly on "identifying and understanding the nature of specific problems" (Hirsch Hadorn et al., 2008:35). The identification of the problem is thus participatory and therefore elements of action research were integrated in the study (see methodology) as suggested by Hirsch Hadorn et al. (ibid:13) for whom it is "crucial for the societal relevance of problem oriented research". In this study, this phase was divided into two. The pre-study, focusing on the identification of a broad problem and the in-depth interviews continuing the identification of the problem and its differents facets as well as "the need for change, desired goals and better ways of acting; and to technical, social, legal, cultural and other possible means of transforming existing practices" (ibid:35).

ii. Problem Analysis

The analysis attempts to examine underlying and explanatory factors of the problem as it was identified and structured in (a). This can be done through sub-questions that "are dealt with and answered in relation to one another" (Hirsch Hadorn et al., 2008:429). Hirsh Hadorn et al. (ibid) suggest that this process should be done through interaction between the actors. As this was not possible for this thesis due to time and other constraints, all interviews encouraged respondents to explain why they perceived different challenges of biodiversity conservation in the country. This section will thus be a brief overview of those underlying factors.

iii. Bringing results to fruition

This phase "relies on the synthesis of knowledge and the translation of that knowledge" by taking into account how different actors work towards the "common good" (ibid:36). Hirsch Hadorn et al. provide summarize this phase well (ibid:428):

"Because of the uncertain empirical knowledge, contested purposes and habits relating to existing practices, it is important that practitioners learn about the strengths and weaknesses of problem-solving strategies and develop competences for implementing and monitoring progress in order to be able to adapt strategies and purposes. This influences problem-solving strategies: from the implementation of definitive (technological) solutions, to social learning about problem-solving strategies including the design of technologies and institutional structures as well as changing attitudes."

V.   Acknowledging diversity

This section discusses the main findings of the discussion with the different actors on their perception and understanding of different aspects of biodiversity management in Timor-Leste.

This chapter is divided into two sections: the diversity of actors and the diversity of perceptions. The two sections are inextricably linked but are presented separately to convey two different sets of findings of this chapter: (a) a non-exhaustive snapshot of different actors and activities working with biodiversity and their relationship and (b) the exploration of the range of perspectives on some key aspects of biodiversity management.

a. Diversity of actors

Participants in the study were all invited to list their partners on biodiversity-related activities. The result of this action research-oriented activity was to create a "snapshot" of the kinds of organisations, departments or groups who work on biodiversity. Because of the limited time available for this study, a comprehensive listing of all agencies and their exact focus area was not possible[11]. Hence, the list presented in Annex 1 is non-exhaustive both in terms of actors and of their activities as the data is limited to the perspective of the participants' in the study[12]. The actors were classified by type and their activities.

The exercise provided a general overview of type of actors and their focus. From the study's 16 interviewees, 45 number of organisations or groups were identified though many of which were mentioned by several participants. Of those groups/organisation, 3 belonged to Academia, 4 were bilateral organisations, 2 were broad and non-organised groups of citizens[13], 1 was a foreign government, 14 were different departments, directorates of Ministries, 9 were international NGOs (INGOs) and 6 were multilateral organisations and 8 were local NGOs.

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[11] Please note that for time constraints too, the accuracy of every item in Appendix 1 could not be verified. Nevertheless, it is hoped that limiting the identification of organisations or groups the participants *work* with (rather than listing the ones they know of) would limit inaccuracies.

[12] Actors presented but who were not linked to the work of the respondent were ignored.

[13] It should be noted that teachers, community leaders and farmers/fishermen are listed as part of the actors, because they implement and/or are affected by project or policies, they are not organised and formal groups

The large number of actors is an interesting finding as confusion about the kind of actors active in the field – especially outside the respondent's "speciality" - has been recurrent in many interviews and informal observations with other stakeholders. This sets the tone for the rest of the Chapter which deals with the complexity of the relationships and the diversity of the perceptions of those actors.

i. Links between the actors

Another aspect of the identification exercise was to allow respondents to explain the relationship with their partners. The different kinds of relationships identified are summarized below. This will be important to bear in mind when considering the possible implementation of the findings of Chapter VII.

Exchange of funds or services

This is one of the most common relations between the actors: donors and recipient of funds (e.g. grants) or buyer/vendor paid services, including knowledge (e.g. consultancy, advisory services, services to implement a project).

Exchange of knowledge

In this case, we refer to the exchange of knowledge in terms of exchange of information, ideas or data on a free non-contractual basis or in other words (i.e. no consultancy or paid-provision of services). There are two kinds of exchange of knowledge in this category: occasional and regular exchanges.

Occasional exchange of knowledge involves informal or formal meetings to discuss a specific topic, such as a project proposal, the launch of a report or a new policy. Many organisations, particularly larger ones (or the Government) which can afford to a conference room, organise those meetings as part of a consultation process. Though an interesting ideas, some participants regretted either the lack of instructiveness of such sessions or the feeling that their voices was not heard. While it is not possible to generalise this finding, my own participation in similar workshops tend to corroborate participants' views.

Regular exchange of knowledge is done mainly through project steering committees. Some projects include different organisations in their steering committee and the participants involved expressed their satisfaction with this arrangement[14]. Another example of regular meetings are bi-annual to quarterly meetings of the "Conservation Agriculture Network". The network, set up by FAO, includes national and international NGOs such as Mercy Corps, World Vision, Permatil, CRS, etc. This platform was created to exchange information about the techniques, including between organisations that may not be doing those activities currently but are only interested to learn. The activities will include visit to

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[14] Because of the order of the interviews, it was too late for me to question the members of the steering groups on their experience.

demonstration plots, etc. So far, this is the only example of a regular platform for exchange of information recorded.

Collaboration on research

Reports and scientific research are sometimes the product of joint collaboration between two actors. Examples were recorded in the fields of conservation agriculture and agrobiodiversity.

Joint work

A few joint projects – i.e. projects co-designed and/or co-implemented - were recorded and mainly involved joint work with the actor and the Government and also involved international NGOs and multilateral organisations.

ii. Quality of knowledge about other actors

There are three aspects to knowing about other actors: knowing who is in the field and knowing what they do, as well as knowing oneself. As aforementioned, some respondents, including in the pre-study, mentioned their frustration with the difficulty to grasp "who" in the field. If this step is difficult, exchange of information as outlined above becomes more difficult for simple practical reasons such as knowing whom to invite.

One interesting aspect of the discussions with respondents, however, was that we noted different accounts of the activities or objectives of other actors. One NGO in particular was named by several respondents and the activities discussed (and criticized) did not match the organisation current work. This informs us of the possible discrepancy between what actors think others do and what others actually do. It also became clear that another aspect of the actors' perception of each other was trust, particularly between the government and other actors. While this is difficult to avoid and the reasons go beyond this paper, actors should first acknowledge this issue to find ways to work together for their common objectives.

Another finding was that participants in the study may not systematically have an accurate knowledge of their organisation or the "actor" they represent. This was illustrated by a respondent who mentioned they regularly received data from UNDP though I knew that this particular data had not been produced by UNDP nor sent to the said actor. The variability of knowledge about who is in the field, in an important point to take into consideration to answer our main question.

The quality of knowledge about others actors can also be assessed with the awareness of the research done by others. A finding from the literature review in Chapter II (c) is that despite the very limited pool of research on the country, some studies do not explicitly reference earlier ones. For example, Senayake's survey of agro-biodiversity, including medicinal plants (2013), ignores Collins' comprehensive documentation of tens of medicinal plants used by different ethnic groups (2005) which

claims to be the first comprehensive survey of the sort. While it does not necessarily mean that those studies were not read or are unknown to the authors, it could also echo some participants' views that access to past research is very difficult. This holds particularly true for research made by individuals outside international organisations as those often – though not always- have the capacity to launch, distribute and promote the paper. Those research are usually either available on paid-online databases, on university websites (for Master and PhD theses) or are simple not available online. However, those studies are in Timor and the lack of platforms to share data explains why some actors are not aware of publications on the country.

iii. Implications for the research question

Those findings indicate that without specific mechanisms, coordination between actors, including coordination of knowledge is challenging. Nonetheless, successful attempts to create such platforms, such as the Conservation Agriculture Network show that such platforms can work in the Timorese context.

b. Diversity of perceptions

This section examines the variety of perspectives on several key aspects of biodiversity management in the country. This is particularly important as when discussing strategies to achieve a common goal, one must take into account that others may understand terms and concepts differently.

i. "Biodiversity"

This paper defines biodiversity following the CBD's definition. Depending on the adequacy of the question (with regards to the position of interviewee), all respondents were either asked to define biodiversity and/or to discuss the challenges facing biodiversity, or the aspects of biodiversity they work with. The first conclusion is that many actors understand biodiversity differently and that the CBD definition is not a uniform answer to the question.

The first finding is the understanding that "ecosystems" are part of biodiversity. In fact, the majority of respondents did not mention ecosystems as being part of biodiversity and focused on species in their discussion. This was particularly clear with respondents working with agriculture (but not on agrobiodiversity or conservation agriculture). For them, the link of their work with their definition of biodiversity was unclear. When compared with the CBD definition, however, agriculture deals not only with species (crops, insects, birds, etc.), but also modifies ecosystems through the agricultural practices. Some agricultural practices, such as conservation agriculture have for primary purpose the conservation and strengthening of agricultural land by using an ecosystem-approach. Another type of activity not

automatically associated with the management of biodiversity is watershed management. Further questions on what kind of activities they understood to be part of biodiversity revealed that some actors considered "biodiversity work" to be more about protected areas and the protection of endangered species, for example. Some actors were confused if they dealt with areas that they do not consider to be scarce such as fisheries or forests.

Some definitions, such as the definition of what is "endemic" to Timor-Leste also vary with participants. For example, some consider that some crops were introduced more than hundreds of years ago and are therefore not "local". Others, on the other hand, explain that those crops have been here for so long that they are endemic. Sometimes, not knowing how long a specie has been in Timor makes the definition of endemic confusing.

The various ways to understand biodiversity is important to understand that actors involved in the management of biodiversity (species and ecosystems) may not feel linked to it and may not join some collaborative processes.

ii.   NBSAP

NBSAP is also a contested item with rather opposite views. Supporters of NBSAP, often in the government, praise its inclusiveness and the strategic priorities listed. In fact, one international professional who was not involved in the process, called it "one of the best NBSAPs I have ever worked with". On the other hand, other actors criticized NBSAP particularly because it was so general and not specific. One respondent familiar with NBSAPs in other countries said that NBSAPs tend to be just "shopping lists" for countries to approach donors and regretted that Timor-Leste's NBSAP "had not even reached that stage". He also explained that having a strong NBSAP, where national goals and priorities and clear, makes it easier for project proposals to be supported and funded. All parties, on the other hand, agree that NBSAP lacks implementation mechanisms. The sharp contrast between those views but the agreement on implementation mechanisms suggest that implementation should be a core aspect of the revision of NBSAP planned this year.

iii.   Challenges facing the *management* of biodiversity

When asked the identical question of the challenges facing the management of biodiversity in Timor-Leste, a variety of different answers were provided reflecting the diversity of stakeholders.

Some stakeholders put forward the physical and web infrastructure needed to connect the local and national centres as one key element of improving coordination among members. Others stressed the importance to tackle free-ranging animals. The threat to management of biodiversity from free-ranging animals, were, however, different for different actors. One actor in the agriculture sector stressed that

free ranging livestock are a threat to agriculture or agroforestry projects. However, a government official raised concerns that free-ranging monkeys near the Parliament are a threat to parliamentarians and by extension policy-makers. This does not only illustrate how one question ca be understood differently but also explains different opinions on the way forward for managing biodiversity. For example, the agriculture specialist would suggest fences or finding ways that richer households – who hold more livestock and power – can be accountable for their animals. On the other hand, one of the national biodiversity policies for 2014 is the construction of a zoo to conceal the monkeys but also as a platform to store captured animals which were about to be sold for consumption in Dili (including monkeys, possums, rare birds, etc.).

Some actors reflected on the difference between the details of some policies – which they praise – and the ability to implement them. Two major implementation challenges, both relating to human capacity, include the number of staff and relevant budget to supervise and monitor protected areas. Another main challenge was the question of the knowledge needed to implement monitoring (such as the ability to differentiate between one endangered specie of pigeon and one not endangered).

iv. Implications of the findings for the research question

Due to a lack of time, this section only focused on some of the key aspects of biodiversity management which were affected by sharp contrast of perception. Without considering how "good" or "bad" this difference is, the transdisciplinary approach suggest that each of them should be valued as they represent a different aspect of reality (Hirsch Hadorn, et al., 2008).

VI. Underlying factors explaining diversity and complexity

While the difference of experiences and disciplines in itself in an important factor to explain the differences in opinion discussed in the previous chapter, transdisciplinarity acknowledges that other factors can influence the relationship between actors and ultimately, the accomplishment of the ultimate "common goal". This section briefly identifies the main underlying concept that affects the relationships between the diversity of actors in Timo, based on the interviews: power.

Power is a crosscutting element in many discussions. The field of political ecology is particularly well suited for understanding the power dynamics affecting the environment (Robbins, 2012). Although this study initially intended to go into greater depth in the dynamics of power through the conceptual framework of political ecology, this was not possible due to the fact that political ecology is more an "approach" to study an issue rather than a theory or a methodology, and as such, it requires a more time to and data to draw meaningful discussions. A an in-depth understanding of the underlying factors affecting the relationship between the different actors could not be reached with the limited data

obtained, this discussion will not go beyond the implications of power for the research question. This is one of the limitations of the study.

Throughout the interview, power was mainly discussed in terms of financial power (through financing projects and defining the allocation and disbursement of the national budget) and political power (through votes for the budget, corruption and the power to influence decisions). Indeed, the majority of actors, including at the Government were clear that with low predictability of the budget for specific departments every year and a non-transparent decision-making process on the allocation of resources, further prospects for enhancing biodiversity management may be undermined. Even in cases when the budget has been allocated, power dynamics influence the disbursement of the budget and memories of salaries unpaid – as happened in other Ministries – are still present. The implementation of policies has also been put into question, particularly with suspicions of corruption regarding illegal hunting and the Environmental Impact Assessments. Though the question of whether those allegations are correct or not, political ecology nevertheless reminds us that ignoring the power dynamics behind the management of biodiversity can be counter-productive.

VII. Harnessing diversity for the management of biodiversity

The previous sections have shown the reader that the field of biodiversity management in Timor-Leste is not only complex and diverse but is also affected by power and institutional dynamics affecting trust to engage with the actors' common objective of sustainable and effective management of biodiversity, its species, and its ecosystems.

The transdisciplinary framework indicates that the diversity of the different actors, or different realities, are complementary to perfect our understanding of the world or in our case, of the different facets and challenges to enhance the management of biodiversity in Timor-Leste.

Rather than providing a "step by step" answer, this paper makes the case for actors to take conscience of the richness of this diversity – as rich as Timorese biodiversity itself perhaps. This paper calls for the organisation of a learning platform. Given the diversity of actors and purposes, having one large platform for "all" actors is not feasible. Smaller working groups instead, may be more feasible and provide more opportunity for interaction.

The current involvement of different actors in the policy-making and designing process is mostly through advice and comments on the public consultations. Occasionally, workshops are organised to present the proposal and collect oral comments. Yet, even in some workshops, comments tend to be

individual, uni-disciplinary. Almost every actor interviewed expressed their hopes for the engagement with the forthcoming NBSAP review process, the Protected Area Law and the Biodiversity Law. The suggestion of a platform or working group helping to design policies together was welcomed by practitioners who would be doing so anyway, though individually. While the need individual advice on specific issues remains, further insights can be gained from a joint collaboration. Those theme-specific platforms can also help to channel all the existing capacity, data and perspective to generate holistic problem analysis and comprehensive management solutions. Besides the ad hoc "Legal Working Group", other areas that are in demand from actors themselves for new ideas generated by new collaboration, or in other words a more transdisciplinary approach to planning (for examples from South Africa, please refer to Reyers et. al 2009), "Agriculture and Food Security", "Land Use and Planning" , etc. Other ideas for working group are clearly labelled in the strategic and specific goals of the Government's Strategic Development Plan 2011-2030.

Let's illustrate this idea with potential areas of "dialogue" for an agriculture and food security group. Agriculture, on which more than 80% depend for their livelihood, also has the potential to benefit from this approach. One of the main goals of agriculture in Timor-Leste being to feed the population, food security could be the "common goal" of this group. The interviews showed that seemingly opposite but simultaneous policies such as conservation agriculture and agrobiodiversity on one hand and the mass import of foreign seeds, tractors and pesticides on the other hand can instead be complementary. For example, part of the high vulnerability of Timorese people to natural disaster can be reduced if ecosystems are able to recover their capacity to uptake and regulate water, which conservation agriculture promotes. At the same time, conservation agriculture is more painstaking in coastal areas with much harder soil, where tractors could be used just once for the first planting. Agroforestry also helps to increase food security by diversifying livelihoods and the reducing the crops' risk of failure. This could inform the protected areas management and its record of poor food security for people living inside the areas. On the other hand, those living inside park can continue to share their valuable knowledge on medicinal plants and natural insecticide, benefitting the rest of the country. Of course, the support and understanding of the transport, health, justice and other government department would be necessary. Moreover, bringing government statisticians to the table may bring ideas to ensure that the next census, unlike the previous one, clarifies the importance of fisheries for food security of otherwise "agricultural" communities. Yet, the poor agricultural practices affect the quality of the fish at the coast, needing discussions at least between the fisheries, water management quality and agriculture specialists. Last but not least, many actors are confidence that Tara Bandu and traditional customary laws has an increasingly important role to play in food security. Those are just some of the examples of how current and future agricultural policies can benefit from a transdisciplinary approach to planning by acknowledging the diversity of stakeholder as a source of innovation which is not achievable through individual consultations.

VIII. Conclusion

This paper walked the reader from the overall background of biodiversity challenges and management in Timor-Leste to later demonstrate how different the different actors can be. By considering the diversity of stakeholders and the relationship between them, biodiversity management can be enhanced through an open space of dialogue, made for sharing and teaching. This would in turn facilitate the trust re-establishment of trust be despite power dynamics and thus promote new ideas and research on how to stimulate a more effective and sustainable management of biodiversity, including the conversation of its species, the sustainable use of its components and the sharing of its benefits for the benefit of the people of Timor-Leste.

IX. Bibliography

Biblioteca Nacional de Lisboa, 1980. *Timor do seculo XVI ao seculo XX.* Lisboa: Biblioteca Nacional de Lisboa.

Bouma, G. A. & Kobryn, H. T., 2004. Change in vegetation cover in East Timor 1989-1999. *Natural Resources Forum,* Volume 28, pp. 1-12.

Cinatti, R., 1950. *Esboço Histórico do Sândalo no Timor Português.* Lisboa, Portugal: Ministério das colónias, junta das investigações colonais.

Cinatti, R., n.d. Vocabulário indígena de algumas plantas timorenses. *Revista da Junta das Mïssões Geográficas e de Investigações do Ultramar,* 2(3), pp. 359-366.

Civil Society Consultative Commission on Development, 2002. *East Timor 2020 – Our Nation, Our Future,* Dili, Timor-Leste: Government of Timor-Leste.

Collins, S., 2005. *The ethnobotany of East Timor,* Ottawa, Canada: Ottawa University, Ottawa-Carleton Institute of Biology.

Conservation International, 2013. *A Rapid Marine Biological Assessment of Timor-Leste, RAP Bulletin of Biological Assessment 66.* Arlington, U.S.A.: Conservation International.

Creswell, J., 2012. *Qualitative Inquiry & Research Design, Choosing among five approaches.* Thousand Oak: Sage.

Direcção Nacional de Estatística (DNE), 2011. *Highlights of the 2010 Census (Englsh).* [Online] Available at: http://www.statistics.gov.tl/highlights-of-the-2010-census-main-results-in-timor-leste/ [Accessed 17 February 2014].

Direcção Nacional de Estatística (DNE), n.d. *2014 Population Projection.* [Online] Available at: www.statistics.gov.tl [Accessed 2nd May 2014].

Eklund, L., 2012. *LUMID at a glance.* [Online] Available at: http://www.lumid.lu.se/about-lumid [Accessed 5 May 2014].

Friedberg, C., 1971. Aperçu de la classification botanique bunaq. *Bulletin de la Société Botanique de France,* Volume 118, pp. 255-262.

Government of Timor-Leste, 2010. *Strategic Development Plan (SDP) 2011-2030.* Dili: Government of Timor-Leste.

Government of Timor-Leste, 2011. *National Biodiversity Strategy and Action Plan.* Dili, Timor-Leste: Government of Timor-Leste.

Hirsch Hadorn, G. et al., 2008. *Handbook of Transdisciplinary Research.* s.l.:Springer Science.

Hirsch Hadorn, G. & Pohl, C., 2007. *Principles for Designing Transdisciplinary Research.* Munich, Germany: Swiss Academies of Arts and Sciences.

Kapoor, I., 2004. Hyper-self-reflexive development? Spivak on representing the Third world 'Other'. *Third World Quarterly,* 25(4), pp. 627-647.

Klein, J. T., 2004. Prospects for transdisciplinarity. *Futures,* Volume 36, pp. 515-526.

Lança, A. J. d. C. & Parreira, A. M. R., 2004. As pastagens e as foragens em Timor-Leste. *Pastagens e Forragens,* Volume 24/25, pp. 69-84.

Max-Neef, M. A., 2005. Commentary: Foundations of transdisciplinarity. *Ecological Economics,* Volume 53, pp. 5-16.

McWilliam, A., 2001. *Haumeni, not many: renewed plunder and mismanagement in the Timorese Sandalwood: Resource Management in Asia-Pacific Working Paper No. 29,* Canberra, Australia: Resource Management in Asia-Pacific Program, Division of Pacific and Asian History,Research School for Pacific and Asian Studies, The Australian National University.

McWilliam, A., 2001. Prospects for the sacred grove. *The Asia Pacific Journal of Anthropology,* 2(2), pp. 89-113.

McWilliam, A., 2003. New Beginnings in East Timorese Forest Management. *Journal of Southeast Asian Studies,* 34(2), pp. 307-327.

Mikkelsen, B., 2005. *Methods for Development Work and Research. A New gudie for practicioners.* 2nd ed. Londong: Sage.

Ministry of Economy & Development, 2012. *Sustainable Development in Timor-Leste: National Report to the United Nations Conference on Sustainable Development (UNCSD) On the run up to Rio+20,* Dili, Timor-Leste: Ministry of Economy & Development.

Myers, N. et al., 2000. Biodiversity hotspots for conservation priorities. *Nature,* Volume 403, pp. 853-858.

Newing, H., 2011. *Conducting Research in Conservation - A social science perspective.* Oxon, United Kingdom: Routledge.

Nicolescu, B., 1996. *La Transdisciplinarité: Manifeste.* Monaco: Editions du Rocher.

Palmer, L. & de Carvalho, D. d. A., 2008. Nation building and resource management: The politics of 'nature' in Timor-Leste. *Geoforum,* Volume 39, pp. 1321-1332.

Republica Democratica de Timor-Leste (RDTL), 2012. DECRETO-LEI N.º 26 /2012 de 4 de Julho: Lei de Bases do Ambiente. *Jornal da Republica,* Série I(24).

Reyers, B., Roux, R., Cowling, A. & Ginsburg, J., 2009. Conservation planning as a transdisciplinary process. *Conservation Biology,* 24(4), pp. 957-965.

Robbins, P., 2012. *Political Ecology: A Critical Introduction.* 2nd ed. Oxford: Wiley & Sons.

Roe, D., Elliott, J., Sandbrook, C. & Walpole, M., 2013. Linking biodiversity conservation and Poverty alleviation: What, why and where?. In: D. Roe, J. Elliott, C. Sandbrook & M. Walpole, eds. *Biodiversity Conservation and Poverty Alleviation: Exploring the evidence for a Link.* Oxford: John Wiley & Sons, pp. 3-18.

Sandlund, O. T. et al., 2001. *Assessing Environmental Needs and Priorities in East Timor: Issues and Priorities,* Dili: UNOPS and NINA-NIKU.

Santana, F. et al., n.d. *A lost world in Timor-Leste: Mount Mundo Perdido: A profile of its biodiversity and conservation,* Dili: Darwin Initiative (UK), Government of TImor-Leste, BirdLife International, Charles Darwin University.

Senayake, C., 2013. *Agro-biodiversity Participatory Survey Report: Managing agro-biodiversity for sustainable livelihoods in Timor-Leste: (ABD Survey Draft report Ver. 09 August),* Germany: Ambero Consulting.

Silveira, P. et al., 2008. The orchids of Timor: checklist and conservation status. *Botanical Journal of the Linnean Society,* Volume 157, pp. 197-215.

Thompson, S. J., 2011. *Geology and Soils in Timor-Leste,* Dili, Timor-Leste: Seeds of Life.

Trainor, C. R., 2010. *Timor's fauna: the influence of scale, history and land-use on faunal patterning (PhD Thesis).* Darwin, NT, Australia: Charles Darwin University.

Trainor, C. R. et al., 2007. *Important Bird areas in Timor-Leste: key sites for conservation.* Cambridge, UK: BirdLife International.

Turner, W. T. et al., 2013. The Potential, Realised and Essential Ecosystem services benefits of biodiversity conservation. In: D. Roe, J. Elliott, C. Sandbrook & M. Walpole, eds. *Biodiversity Conservation and Poverty Alleviation: Exploring the evidence for a Link .* Oxford: John Wiley & Sons, pp. 22-35.

UNDP, 2014. *Initial National Communication on Climate Change (in publication process),* Dili, Timor-Leste: UNDP Timor-Leste.

United Nations, 1992. *Convention on Biological Diversity.* s.l.:s.n.

World Bank, 2010. *Key issues in rural energy policy,* Washington, U.S.A.: World Bank.

X. Annex 1

#	Name	Type	Linkages with each CBD objective		
			Conservation	**Sustainable use**	**Sharing of benefits**
1	School teachers	Academia		Environmental Education	
2	Universidade da Paz	Academia		Research (agronomy, agriculture)	
3	Universidade Nacional de Timor-Leste	Academia	Research (Agronomy, agriculture)	Research (Agronomy, agriculture)	Research (Agronomy, agriculture)
4	GIZ	Bilateral organisation	Agrobiodiversity, Policy	Agrobiodiversity, Policy	Policy
5	Japan International Cooperation Agency	Bilateral organisation	Marine Protected Areas, Maps	Watershed Management, Maps	
6	Spanish International Development Agency	Bilateral organisation	Donor (fisheries)		
7	USAID	Bilateral organisation		Donor (conservation agriculture)	
8	Community leaders	Citizen			Local natural resource management
9	Farmers, Fishermen (artisanal/subsistence)	Citizen	Marine species, terrestrial species	Coastal and coral reefs, forests, and other terrestrial ecosystems	
10	Finland Embassy	Foreign government	Donor to civil society	Donor to civil society	
11	District level government	Government	Implementing MAF work in the districts		
12	Extension workers	Government	Implementing MAF work in the districts		
13	GEF Focal point	Government	Manage GEF funds (including recommending projects)		
14	MAF (crop)	Government		Crop regulations	
	MAF (fisheries)	Government	Governance of marine and coastal ecosystems and fisheries and related activities		

15	MAF (Forestry)	Government	Governance of forest ecosystems, protected areas and related activities		
16	MAF (research)	Government		Research on crops	
17	MAF quarantine	Government	Quarantine regulations		
18	MCIE-SEMA (GIS)	Government	Geographic information on biodiversity or relevant to biodiversity		
19	MCIE-SEMA (protection and recuperation of biodiversity)	Government	in charge of the implementation and reporting of the CBD		
20	Ministry of Foreign Affairs	Government	Multilateral Environmental Agreements		
21	Ministry of Health	Government		Exchange of information on environmental health (chemicals in sea water, etc.)	
22	Ministry of Justice	Government	Land/property		
23	Ministry of Public Works	Government		Environmental screening and impact assessment of construction works	
24	CARE	INGO	Agroforestry	Sustainable livelihoods	
25	Conservation International	INGO	Policy and legislation advice	Sustainable livelihoods, policy and legislation advice	
26	CRS	INGO		Conservation agriculture	
27	Mercy Corps	INGO		Conservation agriculture	
28	Oxfam	INGO		Sustainable livelihoods	
29	Seeds of Life	INGO	Research on crops		
30	USC-Canada	INGO		Conservation agriculture	
31	World Vision	INGO		Conservation agriculture	
32	Worldfish	INGO	Fisheries		
33	ASEAN Secretariat of Biodiversity	Multilateral organisation	Policy	Policy	Policy
34	EU	Multilateral organisation			Donor to civil society

35	FAO	Multilateral organisation		Conservation agriculture	
36	UNCBD	Multilateral organisation			Governance of biodiversity
37	UNDP	Multilateral organisation	policy, biodiversity projects, NBSAP		
38	UNEP Regional Office Bangkok	Multilateral organisation	Support to government, donor	Support to government, donor	Support to government
39	ACDI/VOCA	NGO	Wild crabs		
40	Groups of catholic sisters	NGO			Medicinal plants
41	Haburas	NGO		Agriculture, Energy, Tara Bandy	
42	HAK	NGO		Advocacy	
43	Hasatil	NGO		Agriculture	
44	Lao Hamutuk	NGO	policy and legislation advice	policy and legislation advice	
45	Permatil	NGO		Perculture, policy advice	

Note on the table:

A bracket ( ) after a Ministry's name indicates the name of a directorate or other department.