A Law and Economics Analysis of Policy Instruments to Prevent Deforestation and Forest Degradation in the Tropics

Een rechtseconomische analyse van beleidsinstrumenten ter voorkoming van ontbossing in de tropen

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DEDICATION

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Table of Contents

List of Figures

List of Tables

List of Abbreviations

ACT	Amazon Cooperation Treaty
ADM	Archer Daniels Midland
ASEAN	Association of Southeast Asian Nations
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CFCs	chlorofluorocarbons
CGF	Consumer Goods Forum
CIFOR	Centre for International Forestry Research
CITES	Convention on the International Trade in Endangered Species
CPF	Collaborative Partnership on Forests
CPOPC	Council of Palm Oil Producer Countries
CSA	Canadian Standards Association
EKC	Environmental Kuznets Curve
EUTR	European Union Timber Regulation
FAO	Food and Agricultural Organization
FLEGT	Forest Law Enforcement, Governance and Trade
FSC	Forest Stewardship Council
GATT	General Agreement on Tariffs and Trade
GCF	Governor's Climate and Forests Task Force
GEF	Global Environmental Facility
GHG	greenhouse gas
HCS	High Carbon Stock
HCV	High Conservation Value
HFCs	hydrofluorocarbons
IDH	Sustainable Trade Initiative
ILO	International Labour Organization
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change

IPOP	Indonesian Palm Oil Pledge
ISCC	International Sustainability and Carbon Certification
ISPO	Indonesia Sustainable Palm Oil
ITTA	International Tropical Timber Agreement
ITTO	International Tropical Timber Organization
IUCN	International Union for Conservation of Nature
IUFRO	International Union of Forest Research Organizations
KPK	Indonesian Corruption Eradication Commission
MRV	Monitoring, Reporting and Verification
MSPO	Malaysian Sustainable Palm Oil
NGO	Non-governmental organization
NLBI	Non-legally Binding Instruments on All Types of Forests
OECD	Organization for Economic Co-operation and Development
PEFC	Pan-European Forest Certification
PES	Payments for Ecosystem Services
POIG	Palm Oil Innovation Group
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RSB	Roundtable on Sustainable Biomaterials
RSPO	Roundtable on Responsible Palm Oil
RTRS	Roundtable on Responsible Soy
SADC	Southern African Development Community
SAN	Sustainable Agriculture Network
SBSTA	Subsidiary Body for Scientific and Technological Advice
SDGs	Sustainable Development Goals
SFI	Sustainable Forestry Initiative
SFM	Sustainable Forest Management
SIZA	Sustainable Initiative of South Africa
SPOM	Sustainable Palm Oil Manifesto
SVLK	Indonesia's domestic timber legality system

TBT	Technical Barriers to Trade Agreement
TFT	The Forest Trust
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCED	Conference on Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
VPAs	Voluntary Partnership Agreements
WRI	World Resource Institute
WTO	World Trade Organization
WWF	World Wildlife Fund

Chapter 1: Introduction

1 Problem statement

Tropical forests are a crucial ecosystem to human's survival. It generates oxygen, regulates global carbon cycles and climate, and provides homes to the lives on earth. Tropical forests also provide more than 5000 kinds of traded commercial commodities around the world, encompassing pharmaceutical products, food, fuel, timber, cosmetics and clothing, etc. (SCBD, 2009). These forests are thus vital to the economic welfare and development of our society. However, these forests nowadays are threatened by deforestation and forest degradation across all tropical regions.

Global deforestation and forest degradation continue across tropical regions at alarming rates, which imply significant repercussions for ecosystem processes, carbon balances, long-term sustainability and human well-being (Austin, González-Roglich, Schaffer-Smith, Schwantes, & Swenson, 2017). Deforestation is the removal/clearcutting of forest for agricultural use, mining or infrastructure development, etc. It results in a decrease in forest cover in a given area. Forest degradation on the other hand does not involve a decrease in forest area but a decrease in forest quality and its conditions. The causes of forest degradation can be selective timber harvesting, subsistence use, pest or fires, etc. A degraded forest is more likely lead to further deforestation. For a more detailed discussion, see Chapter 2, Sub-section 2.2. Throughout this thesis, most of the time forest degradation is not stated explicitly but is implied when mentioning deforestation. Between 2000 and 2012, there were approximately 230,000 kha of forest loss globally (M. C. Hansen et al., 2013) and more specifically, tropical deforestation is projected to accelerate due to growing demands for food, fuel, and fibre, etc. (Tilman, Balzer, Hill, & Befort, 2011).

Although tropical deforestation and forest degradation occur at local and regional levels, their negative environmental impacts are influential at the global level, such as climate change, biodiversity loss and disruption of ecosystem services (Foley et al., 2005). Hence the problem of tropical deforestation became a subject in global environmental governance in the 1990s (UNCED, 1992a, 1992b). Nevertheless, after over two decades of global efforts, tropical deforestation persists. This research thus analyses policies designated to govern drivers of tropical deforestation and contributes to potential solutions with law and economic theoretical inputs. This introductory chapter first sketches out the extent of the problem of tropical deforestation and the necessity of policy research on this selected topic. It then presents the specific research questions in Section 2. Section 3 further explains the methodology and concepts applied for this dissertation. Last, Sections 4 and 5 present the limits and structure of this study respectively.

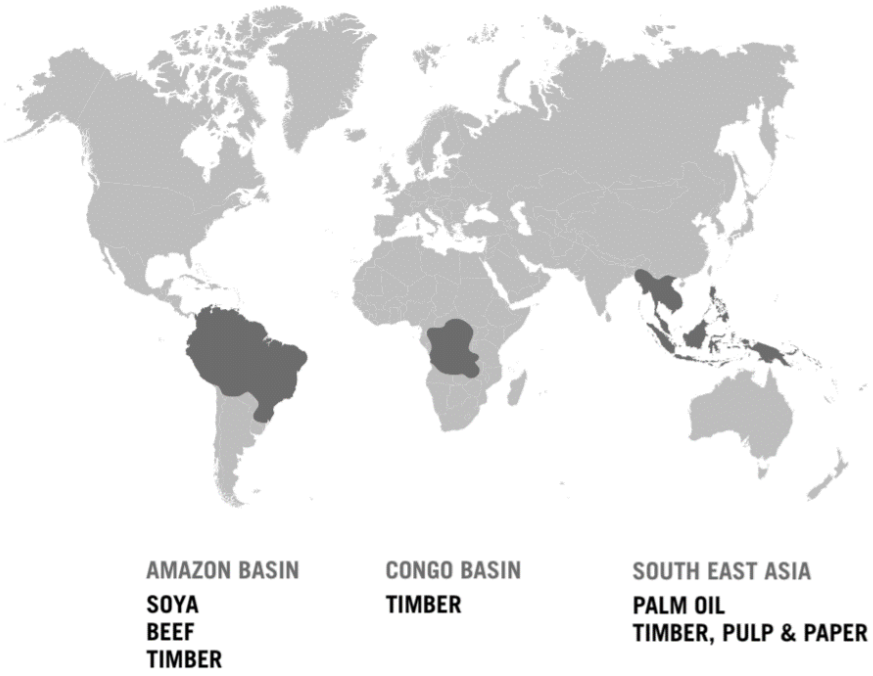
The tropical forest region encompasses around 7% of the global land between latitude 23.5° north and 23.5° south of the equator but contains more than 50% of the terrestrial biodiversity on earth (Dupuy, Maître, & Amsallem, 1999). See Figure 1 for the main tropical forest areas and their primary deforestation drivers. Moreover, tropical forests constitute the second largest terrestrial carbon sink on the planet (after the boreal forest)[1] which accumulates a large stock of carbon (over one trillion tons of CO_2)[2] in the biomass (Nabuurs et al., 2007). Thus even a relative small alteration to the tropical forest carbon shares could result in severe consequences for the global carbon cycle. The Brazilian Amazon alone stores approximately 10% of the global terrestrial carbon (Tian et al., 1998) and the world's forest as a whole absorbs up to 30% of the total anthropogenic carbon emissions annually (Bellassen & Luyssaert, 2014). This characteristic of forests acting both as carbon source and carbon sink[3] is where the greenhouse gas (GHG) mitigation potential of the forestry sector is derived from. The reduction of emissions can be achieved via land management as well as an enhancement of GHG removal from the atmosphere.

[1] Boreal forest, also known as Taiga, is "forests of pine, spruce, fir, and larch stretching from the east coast of Canada westward to Alaska and continuing from Siberia westward across the entire extent of Russia to the European Plain" (IPCC, 2001, p.367).

[2] The current total flow of greenhouse gas emissions of about 40 billion tonnes annually (52 Gt CO2-eq/yr by 2010) (IPCC, 2014b).

[3] Carbon sink refers to "[a]ny process or mechanism which removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas from the atmosphere. A given pool (reservoir) can be a sink for atmospheric carbon if, during a given time interval, more carbon is flowing into it than is flowing out." On the contrary, a carbon pool becomes a carbon source when there is more carbon flowing out of it into the atmosphere then flowing into the carbon pool (IPCC, 2000, p.21).

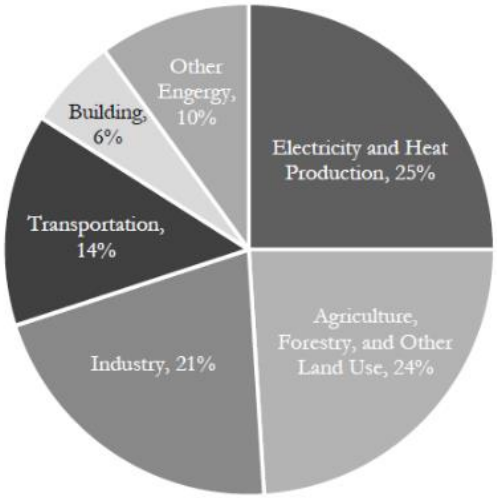
Figure 1: Key forest risk commodities from tropical forest regions



Source: (Rautner, Leggett, & Davis, 2013)

Man-induced forest degradation and deforestation contribute 6 to 17% of the total anthropogenic GHG emissions in the atmosphere (Baccini et al., 2012; Harris et al., 2012). Together with agriculture and other land use, this number goes up to 24% (in 2010)(IPCC, 2014a), which makes it the second largest GHG emitting economic sector after energy production, as can be seen in Figure 2, more specifically, the Amazon Basin, the Congo Basin and South East Asia. In fact, Brazil and Indonesia together accounted for 60% of the rainforest loss over the period between 2000 and 2005 (Matthew C. Hansen et al., 2008). The losses of tropical forests mainly result from the production and trade of the following commodities: soy, beef, timber, palm oil and pulp and paper (Rautner et al., 2013). In theory, prioritizing global forest protection, particularly in the tropics where nearly all net deforestation is taking place, is considered as a cost-effective way to solve global warming (Eliasch, 2008; McKinsey & Company, 2009; Stern, 2006). Furthermore, it is also considered as a more comprehensive long-term solution for securing the economic viability of forest goods, along with providing vital ecosystem services worldwide, conserving biodiversity, protecting forest-sustained livelihoods.

Figure 2: Global Greenhouse Gas Emissions by Economic Sectors



Source: (IPCC, 2014a)

The research on forest policy science (rather than merely focused on the long-term forest productivity and utilization) is fairly recent. It was not until about two decades ago, that foresters and policy scientists respectively have become more involved in forest policy theories and forest issues (Arts, 2012). Even more recently, the importance of forests in mitigating GHG, conserving biodiversity and support community livelihoods, combined with growing pressure by civil society and consumer markets, has stimulated public and private sectors to adopt targets to reduce tropical deforestation. Unlike other environmental regimes, there exists no universal forest agreement. The global forest governance consists of fragmented components, including international soft-law agreements, binding agreements focusing on other environmental issues, policy measures taken by individual countries and actions taken by private sector initiatives. Moreover, while commercial agriculture is estimated to cause 71% of deforestation worldwide (Lawson, 2014), the internationally focused concept of sustainable forest management in fact does not directly address the deforestation and forest degradation causes in the agricultural sector. Vice versa, many policies aiming at governing deforestation related commodities are not always included in the discussion of international tropical forest governance.

Due to the fact that forests and agriculture are inextricably connected (C. Meyer & Miller, 2015), I see a need to broaden and link the focus of global forest governance with other commodity productions that drive deforestation in the tropics, such as palm oil, soy, cattle ranching, cocoa and so on. The international environmental non-profit groups have been campaigning against tropical

deforestation in the past decades, mainly targeting the private sectors, more specifically the well-known multinational corporations (Paddock, 2016). In response, the companies have started to take action mostly in the form of sustainable certification and until more recently voluntary commitments to zero deforestation supply chains. However, despite numerous policy efforts from the intergovernmental organizations, national governments and private companies, tropical deforestation and forest degradation continue and are still prevalent in supply chains.

This research thus examines policy interventions taken to tackle tropical deforestation at international, national and subnational levels, both by the public and private sectors. With the aim of studying these various policy instruments so as to better understand the complex formations, linkages and interactions among them, the theories of instrument choice and multilevel governance are applied to the research. In particular, the research adopts the concept of 'instrument mix' introduced by Gunningham, Grabosky, & Sinclair (1998). The core idea of instrument mix is that the combination of complementary regulatory instruments is usually more effective than the use of a single instrument. For the reason that most actors and instruments have varied strengths and weaknesses in different situations, and a mix allows them to augment each other by taking the advantages of strengths while compensating weaknesses. A combination of instruments can be tailored to achieve particular environmental goals and it can also balance coercive and non-coercive policy approaches. The main challenge is thus to assess how regulatory instruments and governing initiatives interact and how to coordinate and/or orchestrate their interactions in order to create a productive and compatible instrument mix concerning certain environmental issues. It is with this concept that the following research questions are developed.

2 Research question

This research does not aim at designing a quantitative model of regulatory system with assessment criteria but provides a framework that suggests valuable policy generalizations and knowledge for the induced deforestation of tropical forest-risk commodity. With this in mind, I hope to contribute to environmental law and economics and policy debates through the study of policy mixes for preventing tropical deforestation. The study thus aims to answer the following research question:

> "How can mixes of policy instruments be designed to effectively govern the challenges of deforestation and forest degradation in the tropics?"

The question is further broken down into two parts: first to identify current policy weaknesses and misalignments with instruments in use and second to suggest a potential instrument mix solution. In addition, this study also attempts to gather

scattered information on global tropical forest governance across levels and sectors.

3 Methodology

The methodology of this study mainly comprises qualitative desk research on environmental policy, environmental law and economics literature analysis and positive analysis of a case study, aiming at providing valuable insights for normative policy prescriptions. In doing so, this section first explains the meta discourse theoretical background for the study. Subsequently, it introduces the field of environmental law and economics and policy instrument choice theory. Lastly, the selected case study is briefly described.

3.1 Theoretical background

This thesis concerns the research fields of environment, economics and governance, and regulations. More specifically, it falls into the overlapping areas of discourses on ecological modernization, sustainable development, civic environmentalism, new institutional economics, forests, global governance and smart regulation. This sub-section first provides a general discourse background in which the methodology applied in this research is located. The next two sub-sections then present the main approaches applied throughout this book.

Building on the discourse of limited growth, ecological modernization and sustainable development has been eminently influential and popular in the past three decades as efficiency-oriented approaches to the environment. These two discourses assume a positive-sum game between the environment and the economy (Berger, Flynn, Hines, & Johns, 2001). In other words, they argue that economic growth and development can be achieved simultaneously with environmental protection (i.e. environmental degradation is solvable) (Bäckstrand & Lövbrand, 2006). Ecological modernization advocates the use of stringent environmental policy as beneficial to improve economic efficiency and technological innovation (Gouldson & Murphy, 1997). In addition, sustainable development calls for economic re-direction (John S. Dryzek, 2013, p.141), inter- and intra- generational equality and satisfaction of needs, broader global emphasis on distribution (taking developing countries into account) and more inclusive on social issues (UN, 1987).

Ecological modernization and sustainable development are also strongly associated with the conceptual shift from "government to governance". They facilitate a strengthened role for the private sector, voluntary regulation, and the use of market mechanisms, and they promote coordination between public and private actions in order to achieve flexible and cost-optimal policy solutions for environmental degradation (Arts, Appelstrand, Kleinschmit, Pülzl, & Visseren-Hamakers, 2010). They aim to bring transformations and restructure production

and consumption patterns, often without questioning the very core of capitalism (Hovardas, 2016). The above development of these discourses are, for example, the underlying background in which the Porter Hypothesis, the Environmental Kuznets Curve, the Forest Transition Theory, the concept of California Effect, and supply chain management, etc. were developed (Cole, Rayner, & Bates, 1997; Mather, 1992; Porter & van der Linde, 1995a; Vogel, 1995).

This trend moving towards 'governance' is partially due to the declining role of the sovereign state as the prime actor[4] in the global environmental governance. For instance, civic environmentalism is an influential force for change in the global forest governance. It has gained its popularity since the United Nations Conference on Environment and Development (UNCED) in 1992, which brought the use of terms such as 'stakeholder', 'gender', 'tenure security' and 'participation', into the international environmental agenda (Bäckstrand & Lövbrand, 2006). Furthermore, with the rise of international organizations and civil society, public participation is enhanced and more diversified actors are involved in shaping the environmental agenda and governance (Lemos & Agrawal, 2006). Similarly, the use of varying rules (public, private, voluntary, hybrid, etc.) in governing the environment has also increased.

3.2 Environmental law and economics

The New Institutional Economics and Law and Economics approach to environmental research have particular significance in understanding institutional arrangements, policy design and its implementation. It is a vast multi-disciplinary field that encompasses aspects of economics, history, sociology, political science, business organization and law (Kherallah & Kirsten, 2002). The theory of New Institutional Economics differs from the neo-classical economics in four main features: the assumption in bounded rationality among economic actors, imperfect information (Thiam, 2014), positive transaction costs and the acknowledgement of the importance of institutions.[5] The principal objectives of the new institutional approach are (Kherallah & Kirsten, 2002):

- to explain the determinants of institutions and their evolution,
- to evaluate their influence on economic performance, distribution and efficiency (Nabli & Nugent, 1989), and

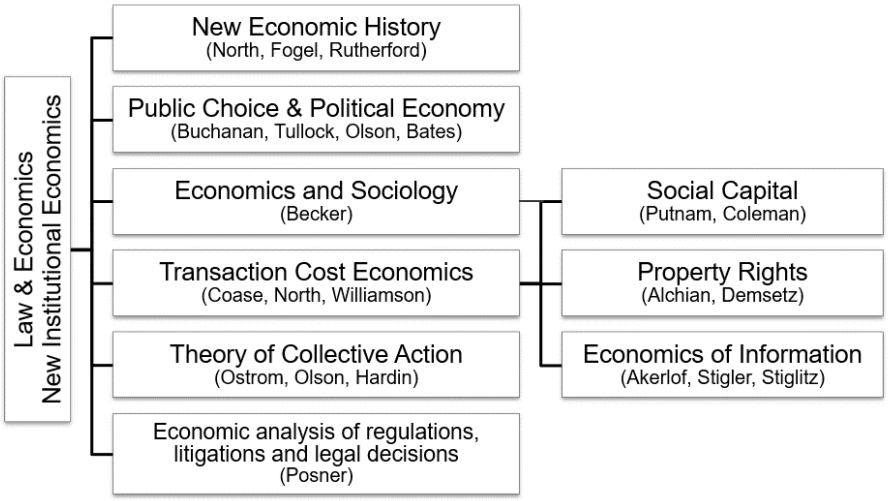
[4] In particular, for example the model of the Westphalian nation-state at the global level.

[5] Institution is commonly defined as a set of formal rules (laws, contracts, political systems, organizations, markets, etc) and informal rules of conduct (norms, traditions, customs, value systems, religions, sociological trends, etc.) that facilitate coordination or govern relationships between individuals or groups (North, 1990).

- to incorporate both heterogeneity and inter-dependence of economic agents with the decision choice, which improves the understanding of institutional efficiency and its conditions.

Law and economics is positioned in one of the expansions in modern economics, using the economic-type approach to politics, law, sociology, demography, criminology etc., which not only study prices, quantities and fluctuations, but also dispute resolution mechanisms of societies and governance structures (Olson & Kähkönen, 2000). Figure 3 by Kherallah & Kirsten (2002) shows a brief diagram of several areas within multidisciplinary modern economics and the primary academic contributors to each.

Figure 3: Branches of the New Institutional Economics



Source: modified from (Kherallah & Kirsten, 2002)

The new institutional approach seems to have its own promises for environmental research, decision making and governance, since in fact the emergence of new institutional economics was related to environmental issues.[6] In particular, the concepts of inter-dependence between various agents and institutional arrangement shed light on the characters of the increasingly complex environmental problems and governance at various spaces, levels of political

[6] "The problem of social cost" (1960) by Coase as his critical response to Pigou's (1920) treatment of externalities, is at the core of neoclassical environmental economics, and that launched new institutional economics as an intellectual discourse. Following the theory of public goods in the "Lighthouse Economics" (Coase, 1974) and the area of risk by Guido Calabresi all built up the foundation for environmental economics (Paavola & Adger, 2002).

decision-making and responses. It enables academics to examine how the inter-dependence and conflicts of economic agents are attributed to environmental resources, and how these can be solved by collective decision choice making and institutions. Moreover, it looks at the incentives and motivations that affect collective choices. The approach also takes account of policy implementation and determinants of governance outcomes. Finally, other than the traditional cost-benefits analyses and welfare implications of governance alternatives, the new institutional approach can facilitate the achievement of governance goals that are actually held by stakeholders and policy decision-makers, with the advantages mentioned above (Paavola & Adger, 2002).

3.3 Policy instrument choice theory and regulatory design

The term environmental regulation here has a broader sense than just conventional forms of direct command-and-control regulation. It refers to "more flexible, imaginative and innovative forms of social control which seek to harness not just governments but also business and third parties" (Gunningham & Grabosky, 1998, p. 4), and which include a larger range of complementary combination of policy instruments and actors. Through a careful examination of productive instruments combinations and their circumstances, this study focuses on achieving effective policy mixes for preventing tropical deforestation in developing countries.

Regulation is one of the most common and important strategies for solving environmental problems. This study uses the strategy of instrument mixes, which seeks to balance individual mechanisms with their strengths and weaknesses through complementarity. Rather than mere single policy instruments, pluralism design gives the policy mixes better flexibility and resilience to be able to competently address various environmental issues in different circumstances. A wide range of policy mechanisms can include economic instruments, information-based strategies, self-regulation and voluntarism. An example will be to combine command and control regulation with volunteerism. Command and control regulation has higher predictability and dependability, but in general also inefficient and inflexible. On the contrary, volunteerism is not coercive, or intrusive and is mostly cost-efficient. However, it has low reliability when being applied on its own. The combination of two is in particular suitable when different levels of "beyond compliance" environmental performance are needed (Gunningham & Sinclair, 1999. pp. 53-57).

The instrument choice theory and the smart regulation approach are based on the premise of rational-strategic policy analysis, which posits that political actors collectively are able to design an effective policy process according to rational argumentation and scientific knowledge (Arts, 2012; Sabatier, 2007). Some fundamental principles for regulatory design are discussed by Gunningham et al.

(1998). These principles for regulatory design are, for example, fewer interventionist measures preferred than highly coercive and prescriptive instruments, involving not only governments but also third parties and business, maximizing probabilities for win-win situations, and so on. More detailed concepts for these principles are included in the literature analysis in Chapter 3. In addition to the instrument mix literature, this research also uses insights from supply chain management and looks into incentives behind actors along the supply chains across governance levels. Supply chain analysis can enhance understanding of various stages of the supply chain and hence help in identifying effective levers for intervention in both private and public sectors.

3.4 Case study

Among all the direct deforestation and forest degradation drivers in the tropics, this research selects a type of commodity production as an in-depth case study – the global palm oil industry. I use a qualitative supply chain approach that examines actors such as producers, producer countries, suppliers, intermediaries, manufacturers, investors/financial institutions, retailers, consumers and importing countries. As such I attempt to look at the links between causes and observed outcomes within this particular industry. The information was gathered through literature searches for all palm oil related policy and actor involvements, using academic data bases, professional journals, conference publications, forestry and agriculture associations, environmental NGOs, documents of certification bodies, relevant government laws, policies and reports published by major authorities.

4 Limitations

This research and the thread of literature and theories which are used, fall mostly under the discourses of ecological modernization and sustainable development. As a result, the anthropogenic approach to sustainable development implies that the environment and conservation are both subordinate to human needs. In other words, the underlying assumption behind the theories which are used, views the environment and natural resources as sources of capital serving human benefits. Similarly, the discussion over the core of capitalism, the theory of economic growth and consumption patterns (e.g. the debate on the promotion of agro-industrial and export-led development) are not covered in the research. As ecological economists argue, the overwhelming focus on economic efficiency of policy instruments often comes with inadequate sensitivity to issues of equity and fairness (Costanza, Cumberland, et al., 2014). Thus it is important to note that other research beyond the discourses of ecological modernization and sustainable development could potentially add more to the understanding of the topic. Those fields of research are however largely outside of the direct scope of environmental law and economics and policy choice theory. In Chapter 3, sub-section 2.2

explains briefly where the environmental law and economics approach fits in among various methods of evaluating environmental resources and why this method has its limitations.

In addition, this research project takes up a broader approach on looking at many instruments at the same time and thus is more general in comparison with detailed investigation and analysis that focus on a single instrument (such as those broadly examining property rights or fiscal policies).

5 Structure of study

Apart from this introduction, this study will proceed in five chapters.

Chapter 2 will present an overview on global forest governance architecture, including detailed discussions on the negative global environmental impacts and the drivers of deforestation and forest degradation in the tropical regions. Then, after introducing the problems of deforestation, the general conceptual framework for sustainable forest management is provided. The chapter further enters into discussions on five major groups of components in global tropical forest governance and it will end with an analysis on how to reconcile the current fragmented forest regime complex through policy integration.

Chapter 3 is a theoretical framework which provides relevant economic theories in forest policy as well as a brief classification of policy instruments for forestry governance, including command-and-control, private and self-regulation, and incentive-based instruments. Under each category, more detailed reviews of specific instrument tools will be presented, such as private certification schemes, property-rights based approaches, market creation subject to benefits for the public good, fiscal instruments and payment for ecosystem services. The last section of this chapter gives reasons for the need of a mix of policy instruments for governing deforestation problems and further introduce the seminal work on Smart Mix by Gunningham et al. (1998), including regulatory design principles and four broad types of instrument mixes.

In Chapter 4 the study turns to an in-depth research on one of the biggest tropical deforestation drivers – palm oil. A thorough review of the characteristics of the global palm oil industry, including its environmental impacts, production and consumption patterns and the main governing challenges and difficulties. It then continues to examine the current policy measures taken to tackle these palm oil governing challenges by producer countries, importing countries, and the private sectors, as well as how the internationally prominent mechanism of Reducing Emissions from Deforestation and Forest Degradation (REDD+) addresses this particular tropical deforestation cause. The chapter ends with a discussion on the existing barriers arising from the previous section on effective sustainable palm

oil solutions. These barriers are then answered with a proposed policy mix solution in Chapter 5.

Chapter 5 continues from the preceding chapter's focus on palm oil. It suggests a so-called "jurisdictional policy mix approach" as a potential solution to better govern the production of tropical deforestation-driven commodities. The chapter first introduces the concept of jurisdictional approach, its theoretical relevance, key features and its advantages in such problem contexts. The next section further provides detailed analysis on the buy-in mechanisms for key actor groups along the global palm oil supply chains, the reasons and incentives for their engagements and the policy measures for them to undertake respectively. Additionally, it also presents two brief examples of this jurisdictional policy mix approach currently being piloted in Brazil and Indonesia. Subsequently, the overall synergies to solving tropical deforestation of such approach are discussed, along with its potential barriers and limitations. In the last section, the chapter broadens the scope beyond palm oil and discusses general policy trends associated with the jurisdictional policy mix approaches in governing tropical deforestation-driven commodity production, in particular on the interactions and trade-offs between the public and private sectors. Finally, it concludes with policy implications of the proposed solutions to other commodity productions in the tropical regions. The last chapter provides a summary and conclusions of this research.

This thesis explains the connection between tropical forest protection and agricultural deforestation causes and how forestry and agriculture are two inseparable sectors when addressing climate change and biodiversity issues. At the end of this book, an emerging landscape approach will be introduced, the so-called jurisdictional policy mix approach. It will explain how it is related to tropical deforestation driven commodities, more specifically palm oil. Finally, it also shows the current policy development trends and contentious issues regarding tropical deforestation as well as the limitations of taking a supply side approach.

Chapter 2: Global (Tropical) Forests Governance

1 Introduction

The utilization of forest lands through thinning, altering and clearing of forests is a human activity and phenomenon that has been continuously changing the planet surface throughout human history. It was not until the 1960s that the international community discerned the destruction of tropical forests and species as a result of large scale shifting agriculture, pollutions, over-exploitation for timber production and cattle ranching (Humphreys, 2004; Nagtzaam, 2009).[7] The vital functions provided by forests as renewable resources increasingly gained more and more attention. These services and goods include food, fuel, clean water, medicine, shelter, soil stabilization, flood control, climate regulation and all other important factors for the livelihood and sustenance of a large world population. More specifically, forests, especially tropical forests, contain up to 80 percent of terrestrial biodiversity and sequestrate up to 30 percent of global annual anthropogenic CO_2 emissions[8] (Bellassen & Luyssaert, 2014).

Deforestation, especially tropical deforestation, emerged as a global forest discourse in the 1980s. Deforestation and forest degradation occur at local level within sovereign states' territory, and these bring immediate impacts on livelihoods and loss of the local ecosystem services. Typically, the states themselves have the power to determine what forest practice they want to employ. However, over the long term, the consequences of deforestation and forest degradation in various regions worldwide pose serious threats to global climate and biodiversity. These global effects are much more challenging to observe, measure and predict than local effects and they are beyond the reach of each individual sovereign state. Hence due to the significant impact on billions of livelihoods and the global environment, the loss of tropical forest resources has been brought up and became an important part of the international agenda in particular since the United Nations Conference on Environment and Development in 1992.

[7] The Food and Agricultural Organization of the United Nations (FAO), established in 1945, was the first intergovernmental body to address sustaining and replenishing of the global timber supply after the Second World War. However, it did not take into account of the ecological aspects of forests nor did it address the causes of deforestation outside of timber sector. The main focus of FAO at the time was on producing maximum yield rather than the conservation of forests (Davenport et al., 2010).

[8] Another one-third is absorbed by ocean surface waters and mixed to the deep ocean (Caldeira, Herzog, & Wickett, 2001).

Despite this widespread sense of urgency for forest governance, there is no legally-binding global forest agreement. International efforts to support forests is a complex framework of overlapping soft law agreements and segments of relevant treaties and conventions. Notably, the global forest governance does not specifically differentiate among forest biomes (for example coniferous, deciduous and tropical forests) but concerns "all types of forests" (UN, 2008). Nonetheless, tropical forests are the most biodiverse ecosystems remaining on earth that have a decisive role for regulating global climate, and they support around 1.6 billion of livelihoods (UN, 2017). Moreover, due to the unprecedented destruction rate, tropical forests are in many cases the major focus in the current forest governance regime. Thus even though public institutions in the international arena use the term "forest" to refer to general "all types of forests", very often the underlying targets are tropical forests, due to their significance in preserving biodiversity and regulating global carbon cycle.

In addition, in order to govern tropical forests, the causes of tropical forest cover change need to be stressed again. These major causes are agricultural expansion and timber extraction, both legal and illegal. Hence, it is important to keep in mind that forest governance is on the one hand the management of productive standing forests and on the other hand the task of keeping forests standing. Furthermore, these tropical deforestation-driven commodities (agricultural products and extracted timber and its derivatives) are closely tied to international trade and thus trade-related policy measures are often used in the global forest governance.

The main purpose of this Chapter is to provide background knowledge of the tropical deforestation and forest degradation problems and to introduce the architecture of international (tropical) forest governance. In Section 2, brief factual linkages between tropical deforestation and forest degradation, tropical forest commodity production and climate change (and other ecosystem services) are presented. It further looks into two important issues regarding current tropical deforestation and forest degradation: 1) the critical role of the definition of forests used in international and national policy making and 2) the drivers of tropical deforestation and forest degradation.

The reasons for doing so are: firstly, the legal definitions of forest are decisive to determine the boundary of "deforestation" and therefore affect policy making at both international and national levels. For instance, whether a certain kind of plantation is counted as "forests" can determine the accounting of deforestation and forest degradation rates. Subsequently, it could, for example, affect a country's position in international negotiations or allow a country to extract forest resources unsustainably while receiving international support in the name of "forest protection". The last sub-section of Section 2 gives an overview and a

scope to the root of the problem: the drivers of tropical deforestation and forest degradation in different continents. These drivers are the fundamental focus of this research project and they demonstrate the inherent complexity and the difficulties of the issue. Hence an introduction of these drivers deserves special attention in this chapter.

After we identify the main problems at stake, subsequently, Section 3 describes the historical evolution of international forest governance and the main components that make it a complex regime. The main components of the international forest regime which are examined are: (3.1) global agreements, (3.2) international organizations and initiatives, (3.3) extra-territorial measures, (3.4) private governance and (3.5) non-profit organizations. These institutions include a number of key mechanisms such as Reducing Emissions from Deforestation and Forest Degradation (REDD+), the certification schemes and EU's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan on timber legality. Section 4 then enters into the discussion of global forest governance as a complex regime with its characteristics and policy challenges. Section 5 concludes.

2 Tropical deforestation and forest degradation

2.1 The depleted tropical forest resources and its functions

Tropical forests nowadays provide more than 5000 kinds of traded commercial commodities around the world, encompassing pharmaceutical products, food, fuel, timber, cosmetics and clothing, etc. (SCBD, 2009). These forests are thus vital to the economic welfare and development of the producer countries. Each decision on land use choice for the forest – either to leave it as standing primary forest, or to harvest it selectively (e.g. for timber products), or to clear cut the entire forest and convert it to agricultural use (e.g. palm oil or soy), reveals implications concerning both gained and lost values in various perspectives (Barbier, Burgess, Bishop, & Aylward, 1994, p.22). For instance, palm oil is the dominant export agricultural commodity in Indonesia (Petrenko, Paltseva, & Searle, 2016) and the same goes for soy production in Brazil (Weinhold, Killick, & Reis, 2013). Nevertheless, despite the beneficial economic contribution of these commodities, the growing global demand for them has driven rapid land use conversions from tropical forests into agri-business uses that result in adverse environmental impacts. It is estimated that more than half of the tropical forests have been cleared, which is one of the most serious anthropogenic land use alterations in human history (Lewis, 2006). Since the year 2000, 40 million hectares of primary forest have been depleted in the Amazon Basin, the Congo Basin and Southeast Asia (FAO & ITTO, 2011). In addition, the International Tropical Timber Organization estimated that around 850 million hectares of tropical forest and forest lands might be degraded (ITTO, 2002).

The causes of deforestation vary among countries and regions but in general, the major direct cause is the conversion of forest lands to other land uses, especially agricultural crops and tree crops (such as palm oil and pulpwood plantations and orchards). Tropical timber harvesting and logging, although they cause forest degradation,[9] are usually not the main direct driver of deforestation. However, the establishment of logging roads tends to facilitate the conversion of previously unreachable forest lands to agricultural use (UNEP, 2009). In addition, studies also show that degraded forests (due to logging or fuel wood collection etc.) are often the anterior phase of a process that ultimately leads to deforestation (Barbier et al., 1994, p.1; D. Boucher et al., 2011; UNEP, 2009). The difference between deforestation and forest degradation will be discussed in the next sub-section.

This severe tropical deforestation and forest degradation resulting from land conversions not only generates high levels of GHG emissions through biomass removal, soil disturbances and reduction of future carbon sequestration; it also impedes the supply of imperative ecosystem services (further discussed in the next paragraph) provided by tropical forests. For example, in Indonesia, palm plantation is estimated to account for more than 50% of total deforestation between 1990 and 2005 (both primary and secondary forests)[10] (Fitzherbert et al., 2008). Along with this, Indonesia as one of the world's top five GHG emitters, the land-use change in the country contributes up to 75% of its GHG emissions, including demolition of peatlands (Indonesian National Council on Climate Change, 2010). Moreover, this mass deforestation in Indonesia has devastating effects on biodiversity due to its great plant species richness, the high rate of endemic animal and plant species as well as several unique ecological processes (Petrenko et al., 2016). The loss of biodiversity could affect the vital functioning of ecosystems, including nutrient cycling, water purification, pollination, carbon storage and so on, and hence inhibits natural resource availability and human welfare. Last but not the least, wildfires caused by palm plantation and deforestation produce toxic smoke and haze pollutions that are detrimental (and

[9] Deforestation is the removal/clearcutting of forest for agricultural use, mining or infrastructure development, etc. It hence leads to a decrease in forest cover in a given area. Forest degradation on the other hand does not involve a decrease in forest area but a decrease in forest quality and its conditions. The cause of forest degradation can be selective timber harvesting, subsistence use, pest or fires, etc. A degraded forest is more likely to lead to further deforestation. For a more detailed discussion, see Sub-section 2.2.

[10] A primary forest is a forest that has been developed succeeding in natural disturbances and under natural processes without human interference (e.g. logging). Primary forests include those used inconsequentially by indigenous and local communities, whose traditional lifestyles are relevant for the conservation and sustainable use of the forest resources, ecosystem services and biodiversity. A secondary forest is a logged forest that has recovered naturally or artificially. Secondary forests do not necessarily sustain the same biodiversity values and ecosystem services as primary forests (UNEP/CBD/SBSTTA, 2001).

even fatal) to human health throughout Southeast Asia[11] (Finlay, Moffat, Gazzard, Baker, & Murray, 2012). In addition, this harmful haze usually brings the regional economies to a halt due to closed business, transportation and schools, and thus results in adverse economic impacts (L. K. Goodman & Mulik, 2015).

The ecosystem services are the direct and indirect benefits (including goods and services) provided by ecosystems that contribute to human well-being and make human life possible (TEEB, 2017). The ecosystem services and benefits provided by forests can be separated into four main groups: 1) provisioning services, such as food, water, timber and fibre; 2) regulating services, such as water purification, flood control and climate regulation; 3) supporting services, such as nutrient cycling and soil formation; and 4) cultural services, such as recreational, aesthetic, and religious benefits (Millennium Ecosystem Assessment, 2005). The depletion of tropical forest resources and its biodiversity, aside from their intrinsic values, threaten the resilience and provision of ecosystem services, including energy, climate regulation, water, food, livelihood and health security at both local and international levels. Table 1 below summaries some of the most important ecosystem services provided by tropical forests and its contribution to development. Table 2 further illustrates more details of the potential impacts of deforestation on their continuous provisions with some examples, as some ecosystem services might not be self-explanatory without descriptions.

Table 1: Tropical forests' goods and services contribute to development

Income	Timber, non-timber products, tourism	**Global public goods**	Carbon storage, biodiversity
Food	Bushmeat, wild foods, fresh water and coastal fish, forage and fodder, erosion control, irrigation, rainfall patterns, pollination	**Health**	Clean drinking water, clean air, medicine, mosquito control, fire control, recreation
Energy	Less dam silting, fuelwood and charcoal	**Safety**	Landslide prevention, flood control, tsunami mitigation

Source: (Seymour, 2015a)

[11] When developing palm oil plantations, fire is commonly used for land clearance and preparation of the peat. The fire occurring on drained peat lands is very destructive because it could last for extended weeks or months and emit carbon stored for centuries as well as toxic pollutants (such as fine particulate matter) into the atmosphere (Petrenko et al., 2016). Those toxic smoke and haze pollutions are detrimental (and even fatal) to human health throughout Southeast Asia (Finlay et al., 2012). Possible health impacts can include eye and skin irritation, respiratory and cardiovascular illness, and increased cancer risk etc. See Chapter 4 for more information on palm oil industry's environmental impacts.

Table 2: Selected forest ecosystem services and impacts of deforestation

Water regulation and supply	Forests and forest soils provide fresh water purification and storage from the rainfall and also maintain cycles of drought and flood. Additionally, through evaporation and the recycling of water vapor, forests regulate local and regional rainfalls (Aragão, 2012). Globally, forests supply approximately 75% of accessible fresh water (Shvidenko et al., 2005) and moreover supply water to more than one-third of the large cities in the world (Shvidenko et al., 2005). Research suggests that deforestation at the current rate in the Amazon basin could lead to a great reduction of up to 21% in annual precipitation (Spracklen, Arnold, & Taylor, 2012), which might increase forest vulnerability to further losses of its resources and functioning. This could bring negative economic impacts on the capacity of agricultural production or hydropower generation. Moreover it could affect the supply of clean drinking water and health security (e.g. enhanced risk of waterborne diseases and pollution due to droughts or extreme weather events).
Food provision	The ecological infrastructure and functions of tropical forests support agricultural productivity. These forests provide critical nutrition security from non-timber forest food products at the local level (such as bush meat, nuts, vegetables and fruits) (Sunderland et al., 2013). At the global level, tropical forests also supply commodities such as palm oil and soy products that can be found in more than half of the processed supermarket food (D. Boucher et al., 2011). Moreover, many farmers depend on forest insects for pollination and more than one third of fish population in Southeast Asia depends on coastal mangrove forests. The plant biodiversity in the tropics also functions as a gene pool reserve for agricultural crops and products (Hillel & Rosenzweig, 2008). These food provision and crop yields may be affected by deforestation and forest degradation through reduced precipitation as well as increased poverty and food insecurity for forest-dependent populations in the tropics.
Energy security	Fuel wood provided by forests is a major source of energy and income particularly in developing countries. For instance, in Africa, fuelwood and charcoal is the primary source for energy up to 90% in some regions (FAO, 2008). In addition, tropical forests are critical to the production of hydropower in many countries, due to their functions in regulating and providing rainfall and surface runoff. Deforestation would therefore potentially reduce these energy productions. In a world with growing energy

	demand, healthy tropical forests can support a future with better energy security.
Health security	Forests contribute significantly to health products around the world. Up to 90% of the people in developing countries rely on natural products (a great amount from forests) as their primary source of medicine (Collaborative Partnership on Forests, 2012). Moreover, these natural resources are often the sources of top selling drugs and the trade of medicine extracted from tropical forests was estimated at 108bn USD per year (Simula, 1999). Deforestation threatens the discovery of potential new medicines and obstructs the access of these resources from local population. The loss of forest cover could also destroy the disease regulation function of forests and result in an increase of incidence of disease. For example, the risk of malaria infections increases by 300 times with some heavily deforested areas (Vittor et al., 2006). There has also been discovered a link between the frequency of emerging infectious diseases (e.g. Ebola, SARS, Dengue etc.) and the escalated tropical deforestation rates and land use changes (Wilcox & Ellis, 2006). Consequently, negative socio-economic costs and impacts in various countries around the world could follow.
Climate stability	Tropical forests are critical in maintaining the global climate due to their function of carbon capture and storage. Forests can process anthropogenic emitted carbon through photosynthesis and respiration. Halting and reversing tropical deforestation and forest degradation could mitigate 24 to 30% of current global GHG (R. C. Goodman & Herold, 2014) and store approximately 2.8 bn tons of carbon per year (equivalent to around twice the annual carbon emissions from the United States) (Pan et al., 2011). In addition, the huge amount of evaporation from tropical forests creates clouds that reflect sunlight and also helps cool down the earth's surface. Axiomatically, land use change, deforestation and degradation of tropical forests (including peatland loss) not only inhibit these climate regulating services but also act as a major source of GHG emissions. Climate change and increasing temperatures are very likely to intensify the frequency of extreme weather events, and thus threaten water, health, energy and food security.

Source: (Rautner et al., 2013)

The United Nations Forum on Forests Secretariat calculates that achieving global sustainable forest management requires US$70-$160 billion per year and the Convention on Biological Diversity estimates US$150-$440 billion per year for stopping biodiversity loss. These costs might seem high. However, the multiple services provided by ecosystems are estimated to be worth more than US$200

billion per year and the negative impacts of global climate change have already cost the world US$300 billion annually (UN, 2016). Thus, the costs of correcting unsustainable terrestrial ecosystem use now is an investment and needed if we are to avoid the cost of replenishing our resources once they are depleted.

As shown above, the deforestation and forest degradation in the tropics is therefore a major concern. The health of forest ecosystems is critical to the global environment and development in various aspects. The protection and restoration of global tropical forests are hence of great importance to human survival and advancement. The loss of tropical forests cover is, however, limited to the local or regional scale but it has substantial global impacts on many aspects as mentioned in Table 1 and 2. It is a major challenge in this era to recognize these tropical forests ecosystem services as natural capital and integrate them into our economic and policy-making systems along with other commodity production. The remainder of this chapter is precisely the attempt to investigate policy interventions and mixes leading to a better tropical forests protection. A healthy and balanced tropical forests management is not only critical to curb global warming but fundamental to a sustainable and steady development path.

2.2 Defining forest, deforestation and forest degradation

Defining what constitutes a "forest" depends on various factors including agents (who define and classify it), scale (international, national, subnational or local level), context, purpose, cultural practice of indigenous communities, ecological functions, etc. (Islam, Khan, & Marinova, 2007). There is an extensive amount (hundreds) of definitions[12] of world's diverse forests (Lund, 2015; Romijn et al., 2013) that differ from the above mentioned factors.[13] Notwithstanding the

[12] Examples include: "forest is one of major types of vegetation, which comprises an aggregate of woody, scrubs, herbaceous and other (mosses, liches) plants, including fauna and micro-organisms; all these components are biologically interacted during their development, and impact both each other and environment"; "a complex, self-regenerating system, encompassing soil, water, microclimate, energy, and a wide variety of plants and animals in mutual relation. A commercial plantation, on the other hand, is a cultivated area whose species and structure have been simplified dramatically to produce only a few goods, whether lumber, fuel, resin, oil, or fruit."; "an ecosystem with a minimum of 10 percent crown cover of trees and/or bamboos, generally associated with wild flora, fauna and natural soil conditions and not subject to agriculture"; "land that can support at least 10 percent native tree cover under natural conditions. Forestland may include areas of grassland, shrubland, wetland, or other land classes" and "forest area is areas with crown cover (stand density) greater than around 20% of the area. Continuous forest with trees usually reaching a height of more than 7 metres and providing a source of wood". See (Lund, 2015).

[13] These definitions are based on properties such as land cover; land use; legal, declared or administrative unit, etc., and can be tailored for the needs of miscellaneous assessments, for instance physical characteristics (e.g. canopy cover, spatiality) for the purpose of assessing forest extent and botanical characteristics (e.g. species, structural properties) for the classification of forests (UNEP, 2009). Land cover refers to the physical characteristics and ecological state of land surface, such as open forests, closed forests or grasslands. Land use is the functions of land defined by human

likelihood of excluding the variability in forests' ecological conditions and perceptions, in an attempt to generally assess forests at regional and/or global levels, a few broad common definitions have been developed to fulfil this need. However, when it comes to evaluating the important role of forests in climate change, these common definitions seem to be insufficient and thus lead to controversies and implementation difficulties (Putz & Romero, 2014; Romijn et al., 2013; Sasaki & Putz, 2009).

There are three widely used definitions at the international level adopted by the Food and Agriculture Organization of the United Nations (FAO), the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD). The FAO defines forest as a land area more than 0.5 ha with trees taller than 5m and a canopy cover of more than 10%, including trees able to reach these thresholds *in situ.*[14] It excludes land that is predominantly under agricultural or urban land use (FAO, 2015, p.3), such as fruit trees, palm oil, olive orchards and most of the agroforestry systems.[15] CBD considers the FAO definition as basic and acknowledges other abundant definitions of forest (UNEP/CBD/SBSTTA, 2001). As for the Clean Development Mechanism (CDM) of the Kyoto Protocol, a forest is defined as a minimum land area of 0.05-1.0 ha and a crown cover of more than 10-30% with trees with the potential to reach a minimum height of 2-5m *in situ* (UNFCCC, 2002). Countries participating in CDM can apply definitions of forest within these specified threshold ranges in accordance to their national circumstances. The UNFCCC definition does not differentiate natural forests and plantations nor agricultural land uses. Table 3 summarizes the thresholds from the three forest definitions. Additionally, tropical forests refer to forests geographically located in the tropics, which is between 23.5S and 23.5N latitude (FAO, 1993).[16]

beings, such as forestry for timber extractions, protected areas, crop plantations, pastures, or settlements for mankind (Turner & Mayer, 1994).

[14] In the FAO definition's explanatory note, it further specifies that mangroves, areas with bamboo and palms that meet the above-mentioned criteria, as well as rubberwood, cork oak and Christmas tree plantations are also considered forests.

[15] Agroforestry refers to agricultural settings where trees are managed jointly with primary crops and/or animal production. By FAO definition, agroforestry systems with crops grown under tree cover are not classified as forest, except those systems where crops are grown solely in the interim of the first years of forest rotation.

[16] Tropical forests can be broadly categorized into four different types: the lowland formations, comprising the tropical rain forests; the moist deciduous forests; the dry and very dry forest zones; and the upland formations (FAO, 1993). When talking about deforestation and forest degradation in the tropics, all these types of tropical forests are included.

Table 3: Threshold parameters of forest definitions

	FAO	UNFCCC	CBD
Min. area (ha)	0.5	0.05-1.0	0.5
Min. height (m)	5	2-5	5
Crown cover (%)	10	10-30	10
Temporary (years)[17]	5	n/a	n/a

The FAO and CBD definitions in general apply universally to all countries and are used for different assessment or reports according to context. In contrast, the UNFCCC definition predominantly applies to forest related carbon mitigation accounting for CDM participating countries (and potentially other forest projects in the future). Therefore, in the UNFCCC context, the choice of definition on the one hand affects the estimation of forest cover and subsequently the extent of deforestation[18] and forest degradation areas. On the other hand it undermines the accounting of carbon emissions and the evaluations of drivers of deforestation and forest degradation (GOFC-GOLD, 2012). The UNFCCC definition is criticized for inadvertently allowing unsustainable forest resource extractions principally due to its unspecified distinction between natural forests and plantations as well as the low crown cover[19] and minimum height thresholds.[20] Thus it potentially leads to substantial loses of various forest values (e.g. biodiversity) and carbon stock (Romijn et al., 2013; Sasaki & Putz, 2009).

Similarly, there exists no globally agreed definitions of deforestation and forest degradation. Most definitions_typify deforestation as long-term or permanent conversion of forest to non-forest land (GOFC-GOLD, 2012), thus being a logical extension, it changes with the use of forest/non-forest definitions. The UNFCCC definition of deforestation emphasizes the element of "direct human-induced conversion" (UNFCCC, 2001) while the FAO definition does not

[17] The FAO and UNFCCC definitions both feature that "temporarily" unstocked forest land can be classified as forest given that those areas are expected to revert to forest and continue to service the land use as forestry. However, only the FAO definition explicitly explains that the default "temporary" years are roughly 5 years (FAO, 2015).

[18] The estimation of deforestation changes with the use of forest/non-forest definitions.

[19] Even though the FAO also set the minimum crown cover at 10 percent, the FAO further defines forest into various classification such as plantation and natural forest. Under natural forest, there are closed (crown cover >40%) and open (crown cover 10-40%) forests, which features different ecological functions (FAO, 2001).

[20] Concrete implications from the UNFCCC definition include conversion from forest to palm oil plantations or natural forest to quick-growing plantations are both within the "forest" classification. In addition, as long as the land remains under the management of forest institutions, when "temporarily" (undefined in the UNFCCC definition) unstocked, the land is still considered as forest, and therefore there is technically no "deforestation" in Indonesia for instance (Gupta et al., 2013).

distinguish between natural or human-induced causes (FAO, 2015).[21] In other words, the definition of deforestation indicates land use alterations or reductions in canopy cover to below the threshold.

As for forest degradation, the definitions vary considerably depending on the subject of focus[22] (e.g. biomass, productivity or biodiversity[23]). The FAO defines forest degradation as "the reduction of the capacity of a forest to provide goods and services (FAO, 2015)." In the context of the climate change regime, the Intergovernmental Panel on Climate Change (IPCC) roughly defines (with no thresholds specified) forest degradation as a direct anthropogenic persistent long term loss in forest carbon stocks without qualifying as deforestation (IPCC, 2003). A more general definition suggests forest degradation as "changes in forest structure, dynamics, and functions resulting mostly from human-induced causes relative to a preferred condition" (Thompson et al., 2013:1). While deforestation is a clearly identifiable ecosystem change, forest degradation is much more difficult to detect, measure and quantify.[24] The causes of forest degradation can include poor agricultural practices, unsustainable logging, invasive species, fuelwood gathering, road construction and wildfire, etc. To this date, there is still no adequate universal definition for forest "degradation" to inform decision and policy making (I. D. Thompson et al., 2013).

This lack of clarity in definitions together with the inherent subtler and gradual characteristics of forest degradation lead to difficulties in monitoring. So, for implementation of the mechanism such as Reducing Emissions from Deforestation and Forest Degradation (REDD+),[25] parameters for monitoring

[21] The FAO defines deforestation as "the conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10 percent threshold."

[22] For instance, when replacing natural forests to plantation in order to supply certain wood product, a forest manager would unlikely to perceive this forest as degraded. However, comparing to a fully functioning natural forest, plantation is less productive in terms of ecosystem goods and services, partly due to the loss of biodiversity, which to others would be regarded as degraded (FAO, 2011a).

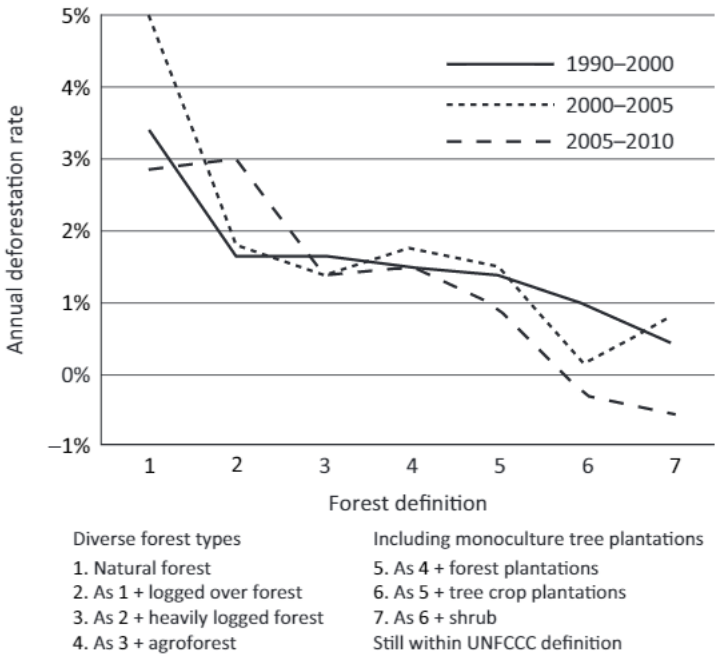
[23] For instance, the definition of forest degradation by CBD: "A degraded forest is a secondary forest that has lost, through human activities, the structure, function, species composition or productivity associated with a natural forest type expected on that site. Hence a degraded forest delivers reduced supply of goods and services from the given site and maintains only limited biological diversity. Biological diversity of degraded forest includes many non-tree components, which may dominate in the under-canopy vegetation (UNEP/CBD/SBSTTA, 2001)."

[24] There is still no agreed method to measure forest degradation. The FAO selects four criteria to qutantify forest degradation, including forest biological diversity; biomass, growing stock and carbon; productive functions and protective functions (FAO, 2011a). Similarly, Thompson et al. (2013) suggest productive functions, biodiversity, unsusal disturbances, protective functions and carbon storage as their criteria and indicators for defining forest degradation.

[25] REDD+ (REDD-plus) includes (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forests; (e) Enhancement of forest carbon stocks.

(e.g. time and percentage of carbon stock loss) should continue to be further developed along with the definition of forest degradation (Sasaki & Putz, 2009). Figure 4 shows an example of how forest definition can affect the percentage of tree cover and annual deforestation rate (as well as implied forest degradation) in Indonesia. As it indicates, the deforestation rate can differ from nearly 5% for intact natural forest during the period of 2000-2005 to a negative 0.5% (i.e. increase in forest) during 2005-2010 with the most inclusive definition of forest used by the UNFCCC (Ekadinata, Widayati, Dewi, Rahman, & van Noordwijk, 2011).

Figure 4: Dependence of annual "deforestation rate" in Indonesia on the operational forest definition applied in three time periods



Source: (van Noordwijk, Agus, Dewi, & Purnomo, 2014, p.683)

For the ongoing international endeavours to mitigate greenhouse gas emissions in the forestry sector, the current UNFCCC definitions may seem insufficient but can serve as a starting point for further refining and/or augmenting both at international and national levels. Sasaki and Putz (2009) suggest that an improved UNFCCC definition of "forest" should differentiate between natural forests and plantations and set the minimum crown cover at 40% with the minimum tree height at 5 m, alongside more detailed definitions set at the national level.

Additionally, aside from the deforestation rate or the net forest change, the alteration of forest characteristics and composition as well as the health and vitality of forest ecosystems (e.g. forest fragmentation) should also be taken into account (UNEP, 2009). As such, the suggested definition can encourage more responsible forest management and better prevent severe degradation of biologically rich natural forests while keeping the increasing monitoring cost to a minimum (Sasaki & Putz, 2009). It is relevant to acknowledge the current debate and the possible continuous refinement of the definition of forest since it plays an essential role in assessing the drivers of accelerated deforestation, and forest degradation as well as the consequences of land use change. This dissertation in general uses the term "forest" in a broad sense encompassing different views on the forest definitions with the majority of the studies and reports citing the FAO definition. Nevertheless, particular definitions are specified where appropriate or needed.

2.3 Drivers of tropical deforestation

Being at the root of the problem, it is fundamental and critical to comprehend the drivers of deforestation and forest degradation in order to conserve and restore forest ecosystems. Any policy and incentive design must effectively aim at altering current trends in these drivers in order to reach ambitious targets for both reforestation and reductions in gross deforestation.[26] A common simplified distinction is made between **proximate/direct** drivers and **underlying/indirect** drivers (D. Boucher et al., 2011; Davenport, Bulkan, Hajjar, & Hardcastle, 2010; Geist & Lambin, 2002; Millennium Ecosystem Assessment, 2005). Proximate causes directly influence local actors or human behaviour associated with forest cover changes or carbon losses. Underlying causes are often interactions between fundamental political, economic, social, cultural and technological development that indirectly or distantly affect the proximate drivers at the national or global level (e.g. poverty, population growth, economic structure, consumption demand, and development policy).

The global trend of deforestation since the 1990s has shifted from a state initiated process to a corporate-driven one (Nagtzaam, 2009; Rudel, 2007), resulting from a global market demand instead of demand from local populations (DeFries, Rudel, Uriarte, & Hansen, 2010). (Multinational) Corporations view deforestation as an economic beneficial alternative over other land use options. Furthermore, in the context of a globalized market, the drivers of deforestation are mobile and

[26] Gross deforestation refers to the loss of forest area resulted from conversion of forest to non-forest land over a given timeframe. In contrast to net deforestation, which is estimated as the difference in forest cover between two points in time (considering both deforestation losses and gains from tree plantations and/or forest regeneration)(GOFC-GOLD, 2012), targeting at reductions in gross deforestation generally reach a better outcome in respect to carbon emissions mitigation, biodiversity conservation, and hydrological services protection (Brown & Zarin, 2013).

the pressure for deforestation can be displaced from one area to another (E. F. Lambin & Meyfroidt, 2011), also known as "leakage" or "displacement". Today the prevalent drivers of tropical deforestation derive from global agriculture expansion (crop and pasture/food and feed). Expanding agriculture at the international scale is mainly driven by *trade liberalization (Rautner et al., 2013)*, *demographic changes* (including population growth and urbanization) and *diet alterations* (increasing resource-intensive production and lower food-feedstock conversion efficiency)[27] (D. Boucher et al., 2011; E. F. Lambin & Meyfroidt, 2011). These changes are further worsened by the global problematic food distribution system and food losses/wastage (FAO, 2011b; Gonzalez, 2015),[28] and consequently also affect global demands for fuel (biofuel and bioenergy), metals, minerals and forest products.

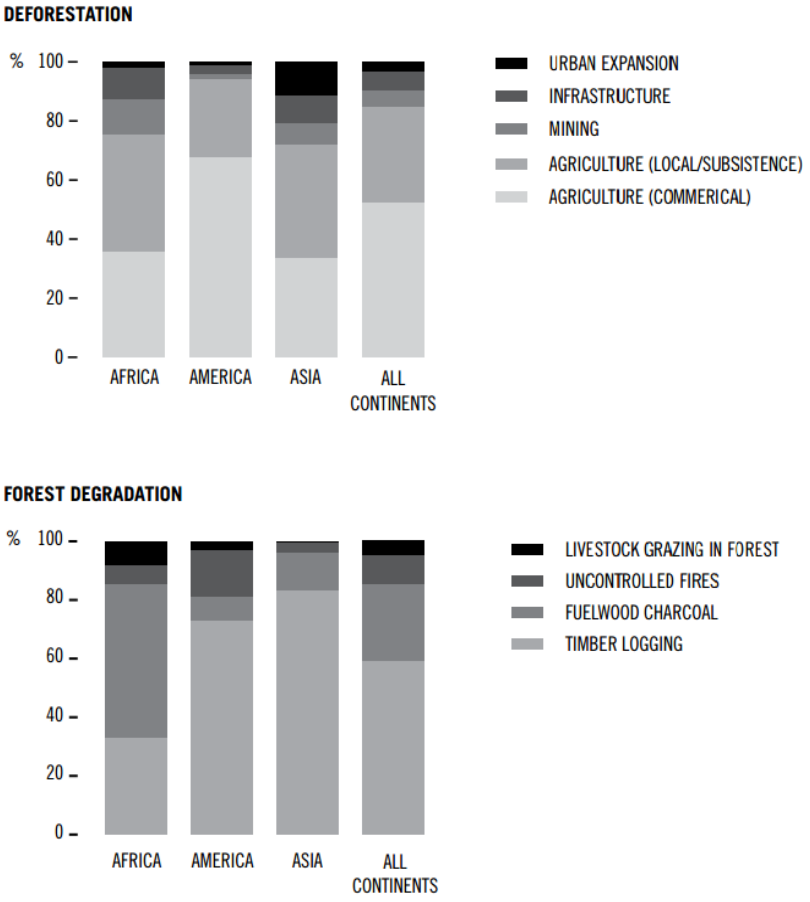
Proximate drivers can be broadly divided between deforestation and forest degradation (Hosonuma et al., 2012; Rautner et al., 2013). These proximate drivers vary significantly between continents. As displayed in Figure 5, globally, commercial agriculture is the dominant direct driver of tropical deforestation, and along with subsistence agriculture, they account for around 80% of the deforestation, while timber and pulpwood logging account for around 60% of the forest degradation occurrences. Researchers commonly attribute the worst of the tropical deforestation impacts to the production and consumption of palm oil, soy, cattle, and timber and pulp (Peters-Stanley, Donofrio, McCarthy, & Baldwin, 2015; Rautner et al., 2013).[29]

[27] Conversion efficiency refers to the energy content of product relative to the energy content of feedstock (vegetable food) or feed (animal food) (Wirsenius, Hedenus, & Mohlin, 2011).

[28] It is estimated that one-third (approximately 1.3 billion tons per year) of the edible food produced for human consumption are lost or wasted throughout the supply chain worldwide, particularly in medium- and high-income countries. This amount of food wastage is enough to feed about half of the current global population. Nevertheless nowadays still one-sixth of the world's population suffer from chronic hunger and malnutrition (FAO, 2011b; The UK Government Office for Science, 2011) whereas industrialized countries suffer from overeating at the same time. Such discrepancy posts enormous challenges on the implied inputs to food production, such as water, energy, as well as ultimately the land from deforested and degraded forest ecosystems.

[29] These commodities are also termed as tropical forest risk commodities, which are defined by Rautner et al. (2013:15) as "globally traded goods and raw materials that originate from tropical forest ecosystems, either directly from within forest areas, or from areas previously under forest cover, whose extraction or production contributes significantly to global tropical deforestation and degradation."

Figure 5: Principal proximate drivers of deforestation and forest degradation in tropical and subtropical countries across three continents, 2000-2010



Source:(Rautner et al., 2013)

In Latin America, commercial agriculture (e.g. soy and cattle) principally makes up for nearly 70% of the deforestation figure. In Africa and tropical Asia, commercial and subsistence agriculture are comparable, accounting for about one third of the total deforested area respectively. Palm oil plantations are located exclusively in Indonesia and Malaysia where logging usually takes place prior to conversion of pulpwood or palm oil plantations. Additionally, deforestation attributed to mining is of more importance in Africa and tropical Asia than in Latin America. Urban expansion is most notable in tropical Asia. As for forest degradation, logging is the main cause in Asia (over 80%) and in Latin America (over 70%), whereas in Africa firewood and charcoal collection contribute to the

larger part of degradation (Rademaekers, Eichler, Berg, Obersteiner, & Havlik, 2010; Rautner et al., 2013).

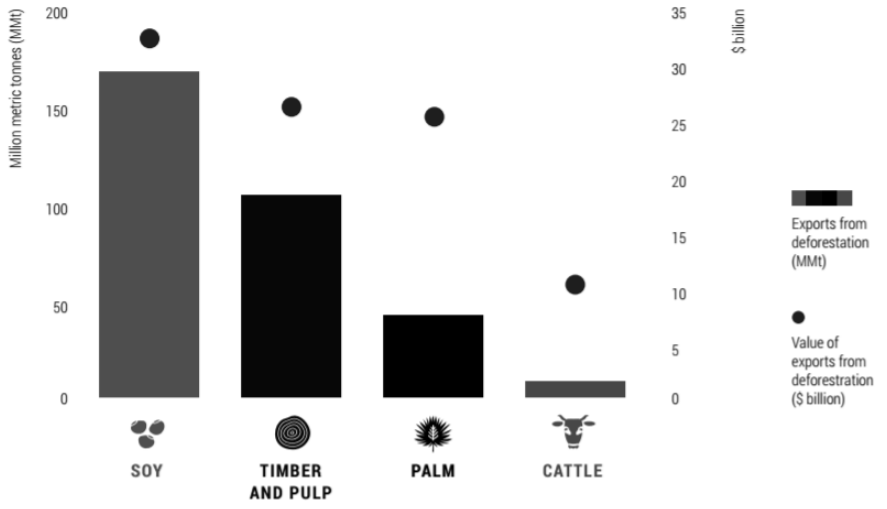
On the demand side, the goods produced on the costs of tropical deforestation and forest degradation are consumed worldwide. The economic value of these export products were estimated at US$98 billion in 2013 (Peters-Stanley et al., 2015). Table 4 shows primary exporters and importing countries of major commodity categories (palm oil, soy, timber and pulp, cattle) in global trade and Figure 6 illustrates their volume and economic value. Meanwhile, it is equally important to remember the considerable domestic market demands for some of these commodities. This dissertation selects the palm oil industry as a case study with extensive supply chain and the analyses of policy incentives design in Chapters 4 and 5.

Table 4: Main exporters and top 3 importing countries for different commodities

Commodity	Main exporters	Top 3 importing countries (from left to right)		
Palm oil	Indonesia, Malaysia	India (18.2%)	China (16.1%)	The Netherlands (7.4%)
Soy	Brazil, Paraguay, Bolivia	China (42.3%)	The Netherlands (8.7%)	Spain and Germany (6%, 6%)
Beef and leather	Brazil, Paraguay, Argentina, Nicaragua, Colombia	Russia (14.1%)	China (13.2%)	Iran (7.3%)
Timber, pulp & paper	Indonesia, Brazil, Cameroon, Ghana	Japan (14.8%)	China (14.3%)	USA (9.0%)

Source: (Rautner et al., 2013)

Figure 6: Global volume and value of main tropical deforestation-derived commodities exports in 2013



Source: (Peters-Stanley et al., 2015)

Any effort to undermine the drivers of tropical deforestation and forest degradation ought to confront the underlying *globalized economic pressure*. In particular, it is not difficult to imagine the immense scale of pressures imposed on tropical forests by billion-dollar commodity industries. Their highly profitable forest exploitation activities often make sustainable forest management an unrealistic proposition (Richards, 2000). Nevertheless, in some cases, the global private sector has shown itself to be a major driver of positive changes in recent years.[30] The causes of tropical deforestation and forest degradation show that forestry governance is in fact inseparable from the adjacent sectors, namely the agriculture products, land use and timber/wood products policies. Aside from the previously mentioned underlying drivers (e.g. *demographic changes* and *diet alterations*), there are other important factors affecting deforestation, such as conflicting (conservation/development) policies, resources management and weak governance (property rights, illegal activities and corruption), and so on (Rautner et al., 2013).

Hence, to overcome these difficulties, policy interventions, such as those discussed in Chapter 3, are critical to reverse and halt tropical deforestation and forest degradation (D. Boucher et al., 2011; Kissinger, Herold, & Sy, 2012). Policy interventions can include lowering growth in commodities demand; restructuring

[30] See for example Chapter 4 on palm oil industry.

the food system; transforming global business-as-usual practices;[31] systematically improving governance; decoupling the demand for deforestation and the demand for economic growth and food;[32] and other sustainable management for forests and forest products. Furthermore, these policies should be used in synergies to address the inter-dependent proximate and underlying causes as well as the complexity of the deforestation and forest degradation process.

2.4 Conceptual framework for sustainable forest management

Now that I have discussed the problems of tropical forest depletion, the definition of deforestation and forest degradation and their causes, this subsection attempts to clarify the conceptual framework of global sustainable forest management. The most common frame of 'sustainability' encompasses three aspects that are popularized by the Brundtland Report 'Our Common Future': the environment, the economy, and society (UN, 1987). Consequently, the goal of sustainable forest management (SFM) has become the guiding principle of modern day forestry. The most commonly used definition for SFM is formulated by the Ministerial Conference on the Protection of Forests in Europe in 1993, which was later adopted by the FAO. It states that

> *"sustainable management means the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems*" (MCPFE, 1993).

Nevertheless, this definition is not the only interpretation for SFM. For instance, the Convention on Biological Diversity has centred on an "ecosystem approach" to forests. The United Nations Framework on Climate Change, due to its relatively dominant influence on international environmental governance, has shifted the primary focus of SFM to its carbon storage/sequestration aspect (Davenport et al., 2010). Moreover, while maintaining the wider aims, definitions of SFM have to be tailored according to different localities, social and economic contexts, forest types and environmental changes.

Based on the normative concept of SFM, there are numerous forest-related aspirational goals and commitments made by international institutions. For example, the environmental goals in forest governance mainly comprise the

[31] e.g. redirecting supply chains away from tropical forests. Examples include Brazilian Soy Moratorium which boycotts soy grown on lands deforested and companies like Wilmar International who holds 45% of global palm oil trade commit to zero deforestation (D. H. Boucher, 2015b).

[32] e.g. by increasing the productivity of the existing land in use or directing agricultural expansion into other lands rather than forests.

reversal of forest land conversion, biodiversity loss and forest/ecosystem degradation. The economic goals include promoting trade in sustainable timber and other forest products and common but differentiated responsibilities (e.g. UNCED 1992, Rio Declaration, Principle 7; UNFCCC 1992, Article 3.1). Social welfare goals include livelihood, poverty alleviation, indigenous and labour rights. There are also other goals such as improving law enforcement (ITTA 2006, Article 1(n)), strengthening international cooperation, and a participatory decision-making process (UNCED 1992, Rio Declaration, Principle 10; CBD 1992, Article 14.1(a)), etc.

Parallel to the above broader normative notions or principles, there are two other distinct forms of instrument that are used to evaluate forest management via a consistent, cohesive and overarching scheme. Those instruments employ a thorough definition of SFM and translate principles into measurable goals. The first set of instruments are the criteria and indicators for SFM developed and catalysed through international agreements and inter-governmental processes. Instead of normative objectives, they emphasize national level monitoring and measurement. The second type of instrument is a market-driven, private certification scheme. These schemes specifically address the evaluation of procedural performance at the local level, namely the individual forest management unit and/or its associated forest producers (McDermott et al., 2010).

The criteria and indicator processes for SFM have been developed in seven major regions and two international initiatives,[33] engaging 150 countries since 1992 after the United Nations Conference on Sustainable Development (Rio Summit), which produced the Forest Principles and Agenda 21 (Wijewardana, 2008). The Collaborative Partnership on Forests (CPF) is a voluntary arrangement consisting of 14 international organizations and secretariats[34] to work for better cooperation and coordination on forests. The CPF analysed the above nine Processes and summarised seven thematic basic elements/criteria underpinning sustainable

[33] These criteria and indicators for sustainable forest management Processes are the African Timber Organization Process, the Dry Forest in Asia Process, the Dry-Zone Africa Process, the International Tropical Timber Organization Process, the Lepaterique Process of Central America, the Montreal Process, the Near East Process, the Pan-European Forest Process and the Tarapoto Proposal for the Sustainability of the Amazon Forest (Wijewardana, 2008).

[34] Centre for International Forestry Research (CIFOR), Convention on Biological Diversity (CBD Secretariat) , Food and Agriculture Organization of the United Nations (FAO), Global Environment Facility (GEF Secretariat) , International Tropical Timber Organization (ITTO), International Union for Conservation of Nature (IUCN), International Union of Forest Research Organizations (IUFRO), United Nations Convention to Combat Desertification (UNCCD Secretariat), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), United Nations Forum on Forests (UNFF Secretariat), United Nations Framework Convention on Climate Change (UNFCCC Secretariat), World Agroforestry Centre (ICRAF), World Bank

forest management (CPF, 2004) that are universally common to all at national or sub-national levels. They include:

(1) the extent of forest resources;
(2) Biological diversity;
(3) Forest health and vitality;
(4) Productive functions of forest resources;
(5) Protective functions of forest resources;
(6) Socio-economic functions;
(7) the Legal, policy and institutional framework.

For instance, the FAO's Global Forest Resource Assessment 2005 is based on this thematic framework (FAO, 2006). These criteria provide information for policy decisions and characterize the fundamental components of SFM. They are used to monitor and access trends in forest conditions and management across scales, and to further ascertain progress towards SFM.

Private forest certification uses market incentives to promote SFM through labelling and price premiums based on concerted environmental and social standards for responsible and sustainable forestry. Among numerous forest certification schemes, the Forest Stewardship Council (FSC) was established earliest and is commonly known as the most stringent and prescriptive set of standards (Bartley, Koos, & Samel, 2015, p.87). The FSC has developed ten principles and criteria for responsible forestry that can be applied worldwide (FSC, 2015). Here for the purpose of clarifying what exactly constitutes SFM, there are full details of the ten principles below in Table 5.

Table 5: The FSC Principles for sustainable forest management

(1) Compliance with laws	The Organization shall comply with all applicable laws, regulations and nationally-ratified international treaties, conventions and agreements.
(2) Workers' Rights and Employment Conditions	The Organization shall maintain or enhance the social and economic wellbeing of workers.
(3) Indigenous Peoples' Rights	The Organization shall identify and uphold Indigenous Peoples' legal and customary rights of ownership, use and management of land, territories and resources affected by management activities.
(4) Community Relations	The Organization shall contribute to maintaining or enhancing the social and economic wellbeing of local communities.
(5) Benefits from the Forest	The Organization shall efficiently manage the range of multiple products and services of the Management Unit to maintain or enhance long term economic viability and the range of environmental and social benefits.
(6) Environmental Values and Impacts	The Organization shall maintain, conserve and/or restore ecosystem services and environmental values of the

	Management Unit, and shall avoid, repair or mitigate negative environmental impacts.
(7) Management Planning	The Organization shall have a management plan consistent with its policies and objectives and proportionate to scale, intensity and risks of its management activities. The management plan shall be implemented and kept up to date based on monitoring information in order to promote adaptive management. The associated planning and procedural documentation shall be sufficient to guide staff, inform affected stakeholders and interested stakeholders and to justify management decisions.
(8) Monitoring and Assessment	The Organization shall demonstrate that, progress towards achieving the management objectives, the impacts of management activities and the condition of the Management Unit, are monitored and evaluated proportionate to the scale, intensity and risk of management activities, in order to implement adaptive management.
(9) High Conservation Values	The Organization shall maintain and/or enhance the High Conservation Values in the Management Unit through applying the precautionary approach.
(10) Implementation of Management Activities	Management activities conducted by or for The Organization for the Management Unit shall be selected and implemented consistent with The Organization's economic, environmental and social policies and objectives and in compliance with the Principles and Criteria collectively.

Source: (FSC, 2015)

These principles address legal, technical, environmental and social requirements. Legal requirements include, for example, clearly defined rights to the resource, legal operations and control of unauthorized activities. Technical requirements are those such as management and operational planning, forest inventory and assessment, economic viability, training and capacity-building and monitoring, etc. Environmental requirements include waste management, conservation and environmental protection, assessment of full environmental value and actions to minimize negative impacts. Social requirements involve the safety and health of the labour, worker's rights (e.g. fair pay and control of slave and child labour), assessment of social impacts, recognition and protection of the rights of indigenous people (Nussbaum & Simula, 2005). The social requirements are one of the three pillars of the broad SFM concept and are hence an important element in the forest certification's principles and criteria. Adequate social institutions facilitate economic and environmental sustainability, for instance, by addressing the accountability of stakeholders. It is for this reason, that although social aspects of the SFM are not the focus of this research, they are still listed here for the sake of completeness.

The criteria and indicators for SFM are mainly applied to standing forests. They cannot address the deforestation causes which originated outside the forest sector. That is to say if forest clearing takes place, there will be no forest for management. Notably, there are a number of other sustainable certification schemes for tropical deforestation driven commodities, such as palm oil and soy.[35] As the primary divers for tropical deforestation, they are closely related to SFM, however with similar but different sets of criteria and indicators. One of the most essential criteria related to tropical forest for these commodities, for example, is the no deforestation principle. To achieve global SMF goals, it is absolutely necessary to include the discussions and efforts from these commodity certification schemes in addition to those for timber production. Chapter 4 therefore discusses in detail one of the most influential tropical deforestation risk commodities - sustainable palm oil production.

All in all, the international community has attempted to address the issue of deforestation since the 1990s. For the reason that, as mentioned in this section, the negative impacts of local/regional tropical deforestation have significant global repercussions. After reviewing the deforestation problems and the ultimate policy objectives of sustainable forest management, the next section discusses the international governance framework and various efforts from both public and private sectors working towards the sustainable forestry goals.

3 Global (tropical) forest governance

Forest governance can be broadly defined as comprising all public and private, formal and informal regulatory structures, the interactions between public and private actors and the effects of either on forests (Giessen & Buttoud, 2014). This section introduces the core components of global forest governance, covering international agreements (3.1), international organizations (3.2), extra-territorial measures on forest legality (3.3), private arrangements (3.4) and non-profit organizations in civic society (3.5).

3.1 Global agreements with forest-focused or -related mandate

After the attempt to develop an international forest convention failed in 1992, the current international forest governance is a fragmented and complex web that is dominated by several soft-law agreements. Different aspects of forests are covered by a number of binding or non-binding international conventions. Table

[35] For palm oil , there is the private standard of the Roundtable on Sustainable Palm Oil (RSPO) as well as the national mandatory standards in Indonesia and Malaysia. As for soy, there is the Roundtable on Responsible Soy (RTRS).

6 first lists the global agreements discussed in this Subsection that are related to forest governance and then this is followed by the detailed discussions in each sub-subsection.

Table 6: Global agreements with forest-focused or -related mandate

UN forest negotiations	- Chapter 11 of Agenda 21 on Combating Deforestation - Forest Principles - Non-legally Binding Instruments on All Types of Forests (NLBI)
International Tropical Timber Agreement (ITTA)	ITTA is an agreement that promotes the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests and to promote the sustainable management of tropical timber producing forests.
Convention on the International Trade in Endangered Species (CITES)	CITES is related to global forest governance through the control of international trade in endangered specimens of wild animals and plants in order to ensure their survival.
Convention on Biological Diversity (CBD)	CBD concerns the aspect of biodiversity in forest ecosystems, which can only be sustained through the protection of forests. It aims to promote the conservation of biodiversity and sustainable, fair and equitable use and sharing of its components, including genetic resources.
The United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC deals with tropical forests primarily for their ecosystem functions of carbon storage and sequestration. Under the Convention, there are CDM with afforestation/reforestation projects and REDD+ at various levels (e.g. national strategy and local projects).
Other relevant international agreements	- Ramsar Convention on Wetlands of International Importance - Convention Concerning the Protection of the World Cultural and Natural Heritage - The United Nations Convention to Combat Desertification (UNCCD) - 2030 Agenda for Sustainable Development and Sustainable Development Goals (SDGs) - International Labour Organization Conventions No. 107 and No. 169 - UN Declaration on the Right of Indigenous People - General Agreement on Tariffs and Trade 1994 (GATT 1994) - Technical Barriers to Trade Agreement (TBT) - Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)

3.1.1 UN forest negotiations

In 1992, the United Nations adopted Chapter 11 of Agenda 21 on Combating Deforestation and Forest Principles [36] at the Conference on Sustainable Development (UNCED) in Rio de Janeiro (UNCED, 1992a, 1992b). This was the first international consensus on the need for nations and international cooperation to maintain the diversified benefits provided by forests. In fact before the UNCED's preparatory process, there already existed a debate on whether to negotiate a global legally binding forest convention or not. However, this legally binding global agreement on forests failed due to the absence of consensus and divided views. In particular, while developed countries (e.g. the OECD) favoured the convention, developing countries (e.g. G77 and China) were concerned about their national development priorities, sovereignty on the management of their own forests as well as the question of financing. Hence many of the developing countries, especially forest-rich countries, rejected the concept of forest being a global commons and stewardship (Humphreys, 2005). The non-binding Forest Principles were the resultant compromise. After the UNCED in 1992, many international activities with forest-focused institutions started to emerge. Following in 2000 and 2007, the United Nations Forum on Forests (UNFF) and the Non-legally Binding Instruments on All Types of Forests (NLBI) (UN, 2008) were established and adopted, which both aim at facilitating national efforts to implement sustainable forest management and enhancing international forest-related coordination at international, regional and national levels.

The discussion on the legally binding forest agreement continued for another two decades without progress (Rayner, Humphreys, Welch, Prabhu, & Verkooijen, 2010). However, this thread of trans-governmental negotiations often neglects and excludes the networks of the pivotal actors in agriculture, mining, and other business sectors that are closely engaged with tropical deforestation activities (Geist & Lambin, 2002; Rudel, 2007). Thus meanwhile, other forest-related development has been progressing on parallel tracks and has evolved to an extent that challenges the actual forest-mandated governance.

3.1.2 International Tropical Timber Agreement

Aside from the UN forest negotiations, the International Tropical Timber Agreement (ITTA) is the only forest product-specific and legally binding agreement, with the primary objectives "to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests and to promote the sustainable management of tropical timber producing forests" (Article 1 of ITTA 2006) (UN, 2006). The

[36] The Forest Principles is the informal name referring to the Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests.

ITTA was first negotiated in 1983 under the auspices of the UN Conference on Trade and Development since 1976 (UN, 1983). Unlike other international environmental agreements focusing on nature protection or reducing environmental harms, the ITTA is in fact more of an international commodity agreement with an attempt to regulate tropical timber as a strategic resource in the development of countries (Flejzor, 2005). Nonetheless, the ITTA 1983 did include the object of forest conservation (UN, 1983), which differs from most of the commodity agreements. Primarily as a commodity agreement, the ITTA 1983 focused on enhancing the structure of the global tropical timber market (e.g. expansion and diversification), ensuring impartial remuneration for tropical timber products and collecting trade data. Members of the agreement are divided into "Producer" (exporting) and "Consumer" (importing) countries, among which all producer countries reside in the tropics. A crucial mechanism created by the ITTA is the International Tropical Timber Organization (ITTO), funded by member states. The ITTO provides services such as market information and the approval, funding and management of projects (Poore, 2003). The ITTA was renegotiated in 1994 and 2006 and each of them is registered with the UN.

These ITTAs are to a great degree highly similar. Notably the 1994 ITTA added explicit goals to achieve sustainable tropical forest management and has greater emphasis on forest conservation, forest values and ecosystem services (UN, 1994). For instance, the ITTA 1994 included a member pledge to achieve sustainable tropical timber production by 2000 (Objective 2000)[37]. It also facilitated efforts on forest law enforcement, certification and the creation of protected areas in the producer member countries (Flejzor, 2005). However, to this date, the ITTO Objective 2000 has not been achieved in many countries and it has remained as an essential focus of the organization and in the subsequent renegotiation sessions. Despite limited progress towards the Objective 2000, the ITTO has raised the agenda for sustainable tropical timber management significantly since 1983. Some scholars even mentioned that ITTO's focus on forest management and conservation weakened its ability to address broader concerns of international trade policy as a commodity-based agreement (R. Tarasofsky, 1996) and may overlap with other international forest governance mechanisms. Nonetheless, on the other hand there is also literature criticizing ITTO for being dominated by forest exploitation interests of member states rather than focusing on conservation[38] (Nagtzaam, 2009) and the Objective 2000 is rather advisory than

[37] The consumer states also pledged to manage their own forests sustainably by 2000, however non-bindingly (Nagtzaam, 2009).

[38] This is especially criticized by environmental NGOs because of the voting structure in the International Tropical Timber Council, which allocates votes based on producer countries' share in international timber trade (Glück et al., 2010). In other words, the more you trade timber, the more votes one country can obtain. This somehow might contradict to SFM.

binding. Several environmental non-profit organizations (e.g. the WWF,[39] and the Rainforest Action Network) for this reason stopped attending the ITTO meetings since the early 1990s (McDermott et al., 2010; Poore, 2003).

3.1.3 Convention on the International Trade in Endangered Species

The conservation of species and biodiversity was one of the earliest issues the international community focused on. The Convention on the International Trade in Endangered Species (CITES) was signed in 1973 (CITES, 1973) and adopted in 1975. The goal of CITES is to control international trade in endangered specimens of wild animals and plants in order to ensure their survival. CITES controls trade in species via an institutionalized system of permits and certificates among member states. The system distinguishes three levels of risks and corresponding rules in three appendixes. Appendix I includes most threatened endangered species of which the trade is prohibited ; Appendix II includes less threatened species that are still subject to control; Appendix III includes species that are protected by member states' regulations to facilitate the prevention of their unsustainable or illegal exploitation. A large number of species are contained in these appendixes. However, there are controversies over CITES' role in regulating the trade of economically valuable species. As a result, very few tree species are listed in the appendixes despite the fact that some timber species are endangered due to over-exploitation and international trade (McDermott et al., 2010). Proposals were made during a few Conferences of the Parties to include timber species in Appendix II. Recently, one of the most important cases for tropical forests is the inclusion of rosewood species in Appendix I or II, in which the concerned species are subject to strict regulations in trade. This is because booming consumption of rosewood in China in the past decade has posed significant threats to these species in the tropical forests.

3.1.4 Convention on Biological Diversity

The objective of the Convention on Biological Diversity (CBD) is to promote the conservation of biodiversity and sustainable, fair and equitable use and sharing of its components, including genetic resources. It requires Parties to establish national programmes or strategies to achieve the above stated goals. These objectives overlap with the concept of sustainable forest management set out in the UN Non-legally Binding Instruments on All Types of Forests (NLBI) and several specific provisions of the CBD are also directly relevant to forest governance (e.g. Article 8, 10, 15) (UN, 1992). Following this, in a number of its subsequent Conferences of Parties, the conservation of forest biodiversity has

[39] The WWF was hence then predominantly involved in the creation of the Forest Stewardship Council (FSC) (Nagtzaam, 2009).

been established as an indispensable component to fulfil the CBD's objective. In the CBD's most recent Strategic Plan for Biodiversity 2011-2020, the Aichi Biodiversity Target 5 aims at halving the rate of all natural habitat loss, including forests by 2020. If feasible, it further aims towards zero habitat loss and significantly reducing degradation and fragmentation. Target 7 refers to sustainable forestry and Target 15 similarly aims at enhancing ecosystem resilience and the contribution of biodiversity to carbon stocks (CBD Secretariat, 2010). However, CBD is overall a binding treaty, namely a hard law, with imprecise obligations and soft commitments due to its high demanding inclusive and cross-sectoral policy approaches (McDermott et al., 2010).

3.1.5 The United Nations Framework Convention on Climate Change

Climate change is one of the most crucial constituents in the global forest governance network. It has brought forests to the top of the international agenda in the last decade. This subsection discusses the evolution of forests in the climate change regime and how the climate change regime strengthens global forest governance.

During the emergence of the international climate change regime, the critical role of forests in climate change was already discussed in the Noordwijk Conference on Climate Change in 1989, which urged developed countries to support developing countries in reducing deforestation and improving sound forest management for the interests of all nations.[40] Nonetheless, in the subsequent development of climate negotiations, forests did not receive the desired attention. Since at that time, after the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, emissions reduction from industrial sources was prioritized for its presumed better effectiveness and feasibility (Gupta, van der Grijp, & Kuik, 2013).

The Kyoto Protocol[41] was adopted in 1997, with the focus on quantitative net emission reduction from developed countries and their industries. Under the

[40] Ministerial Conference on Atmospheric Pollution & Climatic Change Noordwijk, N. (1989). *The Noordwijk declaration on climate change: atmospheric pollution and climatic change: Ministerial Conference held at Noordwijk, the Netherlands on 6th and 7th November 1989*. Leidschendam: Climate Conference Secretariat.

[41] The Kyoto Protocol is an international agreement went into force in 2005 under the UNFCCC. It is the first agreement between nations commits its signatories by setting internationally binding emission reduction targets. The Protocol recognizes the principle of Common but Differentiate Responsibility and Respective Capabilities. It mandates industrialized nation to cut their GHG emissions by an average of 5.2%, by 2012 as compared to 1990. The Kyoto Protocol established three market-based mechanisms an additional means for countries to meet their targets. These Kyoto mechanisms are International Emissions Trading, Clean Development Mechanism (CDM) and Joint Implementation.

Kyoto Protocol, the Clean Development Mechanism (CDM) was introduced in 2001 aiming to encourage developed countries to cost-effectively reduce emissions through carbon offset projects in developing countries. In the meantime, CDM was also designed to contribute to the sustainable development in developing countries through technology transfer (Lederer, 2011). As part of the land use and land use change and forestry activities, afforestation and reforestation projects in developing countries are the only activities included in the CDM programme.

Nevertheless, the fact that only a few of the afforestation and reforestation activities are eligible within the CDM programme, but that avoided deforestation or degradation (enhancement or protection of existing carbon sinks) are not eligible, has raised a lot of criticism and has left the largest carbon emission sources in developing countries unaddressed (Gupta et al., 2013). The reasons behind are the complex rules and the difficulties to accept an accounting methodology and monitoring at the project scale concerning issues such as additionality,[42] leakage[43] and permanence[44] (Dutschke & Angelsen, 2008). Some parties (such as the EU, Brazil, the Association of Small Island States) supported the restricted scope of afforestation and reforestation activities due to the large uncertainties of crediting 'avoided deforestation' and they feared that it might divert the focus from the imperative fossil fuel abatement (Rayner, Humphreys, et al., 2010).

Other parties, including Mexico, Costa Rica and Bolivia, however, supported crediting forest maintenance as incentives (Fry, 2002), since avoiding deforestation and sustainable forest management should be the priorities of the forestry options (Dutschke, 2007). This argument laid the path for the discussions in the post-2005 phase. Since 2006, several publications have shifted the political attention and the global forest agenda rapidly and drastically (Eliasch, 2008; IPCC, 2007; Stern, 2006). The mechanism of Reducing Emissions from Deforestation

[42] Additionality refers to the question whether carbon sequestrations and emissions reductions are considered as additional and occur as results of new incentives, such as the REDD+ or other forest projects. In other words, projects must demonstrate measurable and long-term benefits in preventing or reducing carbon emissions that would not exist in the absence of any forest carbon project/program (Arild Angelsen, 2008).

[43] Leakage and displacement refer to the risk of changes in anthropogenic GHG emissions removals or reductions caused by the activities within the program or one geographical area, that leads to an increase in emissions in another area. And the latter increased emissions are excluded from the accounting system. For example, if stopping the conversion of forest land to agricultural use in one region results in deforestation in another region, this is considered leakage (Arild Angelsen, 2008).

[44] Permanence is the time factor and the risk, whether the benefits of an activity (e.g. carbon sequestration, enhanced community and biodiversity benefits) will stay fixed for a long time period or be reversed (loss of forest carbon biomass) in the later stage (Arild Angelsen, 2008).

and forest Degradation (REDD+)[45] in developing countries was introduced in 2005 (during COP 11) under the UNFCCC, at which point the international climate arena was surrounded by an optimistic atmosphere and impressions that forests can mitigate global GHG with vast potential at a very low cost, timely and without much difficulty (Arild Angelsen & McNeill, 2012).[46] REDD+ has attracted extensive attention from the policy makers, researchers, civil societies, businesses and investors around the world as well as substantial amounts of finance. Between 2006 and 2014, aggregate pledges and investments raised were around US$10 billion, from both the public and private sectors (Norman & Nakhooda, 2015).

The initial defining features of REDD include first, the use of a financial mechanism through legally binding emissions reduction targets, or carbon markets, to trigger behavioural changes in forest users. To be more specific, the basic idea of REDD is to set up financial incentives under the UNFCCC for developing countries to contribute to global carbon emission reduction by stopping or reversing forest losses. The primary service - storing carbon - is expected to generate carbon rights that can be sold via the carbon market or via offset systems. This can be viewed as a form of Payment for Ecosystem Services, in which forest conservation (carbon storage and sequestration) was to create more profits than forest clearing. The second characteristic was the expected scale of funding available from the North, which was estimated to be tens of billions of dollars (Eliasch, 2008; Stern, 2006). Lastly, REDD was believed to deliver transformational changes and reforms beyond the forestry sector (UNFCCC, 2007), not only related to climate change mitigation but also to economic development. The developed countries are drawn by its potential economical effectiveness of low abatement cost, whereas the developing countries anticipate that it will bring stable and predictable financial resources and meaningful participation in the negotiations in the longer time frame.

Nevertheless, during the years, REDD+ has changed from its original idea of a market-based mechanism to broader policy reforms. Its focus also expanded from only carbon storage/sequestration to multiple objectives (e.g. livelihood, biodiversity, adaptation, good governance). Moreover, the international funding predominately was raised in public sectors and development aid budgets from the

[45] The REDD+ (REDD-plus) includes (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forests; (e) Enhancement of forest carbon stocks (UNFCCC, 2013).

[46] An estimate by the World Economic Forum of the incremental investment and cost for limiting the global average temperature increase below 2°C amounts to approximately US$700 billion, among which forests account for merely US$40 billion, or less than 6% of the total additional investment cost with a mitigation potential as high as 30%. In other sectors the required incremental investments are, for instance, US$139 billion for the energy sector, US$187 for the transport sector and US$331 billion for industry and buildings (World Economic Forum, 2013).

donor countries, which makes REDD+ in fact more similar to a form of conditional or results-based aid (Arild Angelsen, 2017; Seymour & Angelsen, 2012). In addition, these funding amounts are so far very small alternatives compared to the scale and business operation of tropical deforestation-driven risk commodities (D. H. Boucher, 2015a). However, even though the possibility of realizing a legally-binding carbon market and mobilizing large market funding has become indefinite, the REDD+ national strategy continues to be established in many tropical forest countries. After all, REDD+ is essentially about the improvement or reform of forest governance and management, which is inherently a lengthy process that requires long-term political will and resource inputs.

3.1.6 Other relevant international agreements

The 1971 Ramsar Convention on Wetlands of International Importance focuses on the conservation and wise use of wetlands through actions and cooperation across levels.[47] Freshwater, tree dominated wetlands, riparian forests, mangroves and peatland forests fall under the scope of the Ramsar Convention. There are currently over 2200 wetlands worldwide for special protection designated as "Ramsar Sites" (covering over 2.1 million square kilometres) that are managed according to specific plans (The Ramsar Convention Secretariat, 2017). Similarly, the 1975 Convention Concerning the Protection of the World Cultural and Natural Heritage also lists and protects forest sites with significant cultural and natural value.[48] The UN Convention to Combat Desertification of 1994 is pertinent to tropical forests (particularly in Africa) for the reason that forest degradation and deforestation foster and exacerbate desertification, land degradation and drought.[49] The UNCCD encourages parties to develop strategies for forest rehabilitation in accordance with their own priorities, supported with regional coordination and/or National Action Plans.

In 2015, the member states of the United Nations adopted the non-binding 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) (UN, 2015). Among these SDGs, the 15th Goal concerns life on land,

[47] Conference of Contracting Parties to the Convention on Wetlands of International Importance Especially as Waterfowl Kushiro-shi, J. (1993-1994). Convention on Wetlands of International Importance Especially as Waterfowl Habitat: proceedings of the Fifth Meeting of the Conference of the Contracting Parties: Kushiro, Japan 9 to 16 June 1993. Gland, Switzerland: Ramsar Convention Bureau.

[48] UN Educational, Scientific and Cultural Organisation (UNESCO), Convention Concerning the Protection of the World Cultural and Natural Heritage, 16 November 1972, available at: http://whc.unesco.org/archive/convention-en.pdf

[49] United Nations Conference on Environment and Development Rio de Janeiro, B. (1994). Convention on desertification. New York, NY, USA: Dept. of Public Information, Information Programme on Sustainable Development, United Nations.

biodiversity, forest and desertification. The goal targets protecting, restoring and promoting sustainable use of terrestrial ecosystems, managing forest sustainably, combating desertification, halting and reversing land degradation and ceasing biodiversity loss. Although the inclusion of forests in the SDGs is critical (since unlike biodiversity, endangered species and desertification, forests do not have their own convention), it still received substantial criticism from researchers (Mayers, 2014; Seymour, 2015b; Seymour & Busch, 2017). They maintain that forests do not get sufficient emphasis and attention for the main reason that forests contribute to reduce poverty (Goal 1), achieve food security (Goal 2), water and sanitation (Goal 6), healthy lives (Goal 3), access to modern energy (Goal 7), sustainable consumption and production (Goal 12), stabilizing climate change (Goal 13) and avoiding ocean acidification (Goal 14), but forests are absent in the texts of these many other goals. This overlooked importance of forests can potentially undermine SDGs.

In the non-environmental realm, for protection of the rights of indigenous people linked to forests, there are International Labour Organization Conventions No. 107 and No. 169 (ILO, 1959, 1989) and the UN Declaration on the Right of Indigenous People (UN, 2007). Indigenous and tribal people are closely linked with forest issues for the reason that they depend on forests heavily for their livelihood and are often struggling for their rights in the face of forest policy development. There are also agreements associated with the World Trade Organization, such as the General Agreement on Tariffs and Trade 1994 (GATT 1994)[50], the Technical Barriers to Trade Agreement (TBT)[51] and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).[52]

WTO's rules are often brought up in the discussion concerning the preferential treatment for sustainably sourced tropical forest risk commodities (Gupta et al., 2013). To be more specific, the governing norm of WTO agreements is trade and investment liberalisation without discrimination. Hence the GATT does not permit discrimination against "like products"[53] based on their manufacturing practice in the international trade. This can be interpreted as non-discrimination between 'sustainably managed' timber and other timber products. However, Article XX(g) of GATT allows trade restriction measures that are necessary to the

[50] GATT 1994: General Agreement on Tariffs and Trade 1994, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1867 U.N.T.S. 187, 33 I.L.M. 1153 (1994)

[51] World Trade Organization (2014) The WTO Agreements series – technical barriers to trade. http://www.wto.org/english/res_e/publications_e/tbttotrade_e.htm

[52] Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994).

[53] Products with similar characteristics or end uses.

conservation of exhaustible natural resources.[54] Likewise, this clause is relevant to the EU Timber Regulation (European Union, 2010) and the EU Resolution on palm oil and deforestation of rainforests (European Parliament, 2017). The former prohibits any import of illegally harvested timber and the later aims at phasing out unsustainable palm oil imports by 2020. Nonetheless, to this date, this clause has not been used or tested on a WTO dispute panel.

Lastly, there are also many regional conventions with either forest-focused or – related mandates, such as the Central American Forest Convention (R. G. Tarasofsky, 1999, pp. 147-153),[55] the ASEAN[56] Agreement on the Conservation of Nature and Natural Resources (ASEAN, 1985), the SADC[57] Protocol on Forestry (SADC, 2002), the Amazon Cooperation Treaty (ACT, 1978) and the Western Hemisphere Convention[58] (OAS, 1940).

3.2 International organizations

Aside from the international agreements with forest focused or related mandates, there are numerous intergovernmental organizations that work substantially on global forest issues. Here this sub-section presents a few major ones, including the Food and Agricultural Organization (FAO), the World Bank, the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and the Global Environmental Facility (GEF).

The Food and Agricultural Organization (FAO) is a specialized agency under the United Nations. It promotes food security and agricultural development. Already back in 1967, the FAO established the Committee on Forest Development in the Tropics. However, the emphasis back then was on the development of forests rather than the sustainable use of forest or conservation (Humphreys, 2004). The Forest Department is committed to the notion of sustainable development set out in the Brundtland Report, which balances social, economic and environmental objectives while taking into account inter-generational equality. The primary role of the FAO's Forest Department is to provide policy advice, technical supports

[54] GATT 1994: General Agreement on Tariffs and Trade 1994, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1867 U.N.T.S. 187, 33 I.L.M. 1153 (1994)

[55] The full name of this convention is the Regional Convention for the management and conservation of the natural forest ecosystems and the development of forest plantations

[56] ASEAN refers to the Association of Southeast Asian Nations, which is a regional intergovernmental organization consisting of ten Southeast Asian countries. For details please visit: http://asean.org/.

[57] SADC is the Southern African Development Community, an intergovernmental organization consisting of 16 southern African countries. For details please visit: www.sadc.int/.

[58] The full name is the Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere.

and information (for instance the five-year Forest Resource Assessments) to uphold a state's efforts in sustainable forest management.

The World Bank Group is a specialized independent agency operating under the Economic and Social Council of the Unitec Nations. It works closely with the International Monetary Fund (IMF). They were both established after the Second World War, aiming to stabilize the international economy. The World Bank mainly engages in forest activities within its over-arching policy objectives to reduce poverty. The early forest projects were generally the financing of industrial timber extraction operations. The Bank's strategy later gradually shifted from timber production towards social forest programs, aggro-forestry and eventually forest conservation and sustainable forest management paradigm. This evolution was a response to changing discourses in international forest governance (Maguire, 2013). The Bank has financed a large amount of forest projects in developing countries through the provision of loans, policy advice, technical assistance and guarantees since the late 1940s. In recent years, it has been actively involved in the Forest Law Enforcement and Governance (FLEG) process (a regional governance arrangement) and the development of various forest carbon projects. The World Bank has also partnered with various intergovernmental forest initiatives, such as with the World Wild Fund (WWF), the EU Forest Law, Enforcement, Governance and Trade (FLEGT) and the Forest Carbon Partnership Facility (a REDD+ focused initiative).

The United Nations Development Programme (UNDP), the World Bank and the United Nations Environment Programme (UNEP) co-established the Global Environmental Facility (GEF) in 1992. The GEF provides incremental funding and grants to projects that address pressing environmental issues. Specifically, the GEF executes funds for a number of environmental agreements, such as the CBD, the UNCCD, the UNFCCC and the Kyoto Protocol under it. In total, the GEF has funded around 380 forest-related projects with an investment of over US$2.1 billion, leveraging the additional US$9.5 billion in co-financing together with other stakeholders (GEF, 2018). The UNDP's work on forests includes technical support on-the-ground and project implementation in developing countries. Meanwhile, the UNEP typically works with forest-related activities under its biodiversity programme. It also facilitates the administration of a number of forest-related agreements, such as CITES, the UNFCCC, and the CBD (Haug & Gupta, 2012). Notably, due to the sense of urgency about climate-related forest values from the international community, there are huge interests in funding the REDD+ mechanism in the last decade. Hence several regional and international funds are administered by or associated with the above-mentioned international organizations, for instance the Forest Carbon Partnership Facility, the UN-REDD Programme, the Strategic Climate Fund and the MDG Achievement Fund.

In addition, there are a number of regional organizations and hybrid (public-private) initiatives which focus on or relate to forests governance, for instance, the African Timber Organization, the Central African Forests Commission (COMIFAC),[59] the Congo Basin Forest Partnership, the Amazon Cooperation Treaty Organization, the Asia Forest Partnership, the Heart of Borneo Initiative, the Green Heart of Africa Initiatives, and the Latin American Pueblo initiative, etc. Among these, one of the most influential regional governance arrangement is the Forest Law Enforcement and Governance (FLEG) initiative led by the World Bank and supported by various producer and consumer governments, international agencies, NGOs and the private sector. It is a series of ministerial conferences and processes in different regions[60] to improve domestic good forest governance and to fight illegal logging and illegal timber trade, as well as to promote better law enforcement, cooperation and communication (Blaser, Contreras, Oksanen, Puustjärvi, & Schmithüsen, 2005; World Bank, 2003). However, the FLEG initiative has been facing difficulties in implementation. Compromised efforts can be attributed to conflicts with the WTO rules, frequent absence of strong national leadership, high levels of corruption, poor donor coordination, insufficient involvement of non-state actors and poor focus on the deforestation drivers (Haug & Gupta, 2012; Pauli, 2009).

After introducing two major elements of global forest governance, namely international agreements and international organizations, the next sub-section turns to extra-territorial measures on legality control taken by the European Union and other countries.

3.3 Extra-territorial measures on legality control

The growing international concerns over illegal logging is one of the most important forest-related governance developments in recent years. The necessity to address weak governance in illegal logging and trade in illegal timber was identified in the 1990s. It was in particular raised as a major policy issue by a number of environmental non-profit organizations, such as the Environmental Investigation Agency, Global Witness, Friends of the Earth, Greenpeace, the World Wildlife Fund and the World Resource Institute (Luca Tacconi, 2012, p.1). Since then, the most progress has been made by the EU. Together with the United States, Australia and Japan, these major timber consuming countries have implemented extra-territorial measures (i.e. national legislations) to counter illegal

[59] The COMIFAC was established to coordinate and harmonize sub-regional policy and legislation concerning the forest conservation and sustainable management in Central Africa, on the basis of commonly agreed forest principles. It is also in charge of coordinating and monitoring REDD+, the implementation of FLEGT and CBD's Access and Benefits Sharing initiatives (Howlett et al., 2010).

[60] These conferences took place in East Asia and Pacific (2001), Africa (2003), Europe and North America (2005).

logging and influence policy-making in the producer countries. The "legality" of timber is defined based on relevant laws in the country of harvest.

The European Union Timber Regulation (EUTR) came into force in 2013, and it bans operators in Europe from placing illegal timber and its derived products on the EU markets (European Union, 2010). The United States expanded the scope of its Lacey Act of 1990[61] in 2008 to prohibit importing illegally harvested timber and forest products.[62] The Australian Illegal Logging Prohibition Act came into effect in 2012 and prohibits importing and domestic processing of illegally logged timber and its products (Australian Government, 2013). Japan implemented the Clean Wood Act in 2017 to secure the legality of domestic and imported wood (Government of Japan, 2017). This section primarily discusses the EU measures to address illegal logging and for its most extensive efforts to address this both from the demand and supply sides.

The EUTR was established under the EU Forest Law, Enforcement, Governance and Trade (FLEGT) Action Plan, which was established by the European Council in 2003 and adopted in 2005 (European Union, 2005). The overall goal of FLEGT is to promote good forest governance and reduce deforestation by requiring European business to only source timber from (tropical) producer countries that comply with ecological, social and economic requirements laid down in their own forest laws (Glück et al., 2010). The FLGET Action Plan covers both demand and supply side measures with two main components: the above mentioned EUTR and the scheme of Voluntary Partnership Agreements (VPAs) (European Union, 2005).

The EUTR prohibits the import of illegal timber and its derived products into the EU markets. It requires operators in the EU who place timber products in the market the first time, to exercise due diligence. In other words, operators bear extended liability (beyond the boundaries of the firm) and must have access to information regarding the source of timber and take necessary measures to minimize and assess the risk of illegal timber products. Afterwards, all the trade records have to be kept. The EUTR applies to a wide range of products, including pulp and paper. Alternatively, a producer country can also sign a VPA with the EU. VPAs are bilateral treaties between the EU and timber-producing/exporting countries that aim at halting the illegal timber trade. Under a VPA, the timber-exporting country can develop a timber legality assurance system, which is

[61] The Lacey Act of 1990 (16 U.S.C. §§ 3371–3378) is one of the oldest conservation laws in the United States that bans trafficking in illegal wildlife, including exporting, importing onto the U.S territories and transporting across any state lines (Prestemon, 2015).

[62] The Lacey Act was amended in the Food, Conservation, and Energy Act of 2008 (P.L. 110–234, 122 Stat. 923). Online access: http://www.aphis.usda.gov/plant_health/lacey_act/downloads/background--redlinedLaceyamndmnt--forests--may08.pdf

designed and negotiated based on its legislative framework and control mechanism in place. This national licensing authority can then issue FLEGT licenses for timber consignments which means that they comply with the EU Timber Regulation. Hence EU operators do not need to carry out due diligence checks when purchasing FLEGT-licensed timber. Currently, there are six partner countries[63] that have signed VPAs with the EU and nine ongoing negotiations.[64] Indonesia was the first country to export its FLEGT licensed timber products to Europe in November 2016 and within a year, the value of shipped verified legal timber from Indonesia to the EU exceeded one billion euro (EUFLEGT Facility, 2017; FLEGT.org, 2017).

The implementation of the EUTR and VPAs are still at a nascent stage. There are a number of continuing debates on various aspects of FLEGT, for instance, the product scope of the EUTR, the overlapping efforts between private certification and legality verification, and the limited coverage and impacts of these extra-territorial measures. Regarding the product scope, the detailed scope of timber and timber products to which the EUTR applies is specified in the Annex of the Regulation. However, products such as printed media (e.g. books, brochures and magazines), wood charcoal, musical instruments, further processed wood-based products and recycled products (e.g. recovered paper) are not covered in the Regulation. This current product scope has been criticized for the reason that some stakeholders consider it inconsistent and furthermore, the exclusion of certain products results in uneven competition and leakage. It is suggested that expansion and improvement of the scope of the EUTR is critical in order to strengthen its effectiveness and efficiency (Drewe & Barker, 2016; Janzen & Weimar, 2016).

Another issue discussed frequently is the interaction between private voluntary certification, in particular the FSC, and FLEGT. For example, the question arises whether they are complementary or competitive. Conceptually, legality verification is a regulatory approach that aims at eliminating the poorest forest practice (e.g. illegal logging), which uplifts the minimum bar of management operations. In a way, this complements voluntary certification, creates synergy and reduces the gap between "poor" and "better" forest production practices. In addition, the FSC has been promoting SFM for more than two decades. Therefore, it can also provide the more recent legality regime valuable experiences and models for implementation and monitoring.

[63] They are Cameroon, the Central African Republic, Ghana, Indonesia, Liberia and the Republic of the Congo.

[64] The ongoing negotiations are between the EU and Côte d'Ivoire, the Democratic Republic of the Congo, Gabon, Guyana, Honduras, Laos, Malaysia, Thailand and Vietnam.

On the other hand, compliance with relevant laws is FSC's first principle, which in theory means that FSC-certified timber should meet the legality requirement for the due diligence checks or the national legality assurance system under VPA. However, in reality, the private certification can only be a part of the due diligence used to mitigate risks. Operators still need to access additional information required by the EUTR. Similarly, FSC-certified timber does not automatically translate into a FLEGT-compliant product. Producer countries can only issue FLEGT licenses according to the negotiated terms and legality assurance system in the VPA. As such, private certification and timber legality schemes are in fact doing overlapping work, which can increase costs for forest owners to maintain two kinds of certification and licensing. Moreover, some scholars are concerned that legality compromises efforts to achieve SFM due to the above mentioned costs and the potential implication that a lower threshold can already suffice and/or secure better market access (Hinrichs & Helden, 2012).

Interestingly, the government of Cameroon has recognized the FSC Forest Management certificates [65] granted by Bureau Veritas (an accredited FSC certification agency) as "FLEGT-compliant" since January 2016.[66] So far, these companies with FSC Forest Management certification can receive legality confirmation from the Cameroon government directly (i.e. fulfilling all the legal requirements that comply with Cameroon's forest legislation). However, as Cameroon and the EU are still negotiating their VPA, the FSC certification, although recognized by national authority, currently is still only used for due diligence reporting in the importing countries. This ongoing process shows the possibility of integrating the FSC certification and the FLEGT timber legality assurance system. Similarly, the government of Congo is evaluating the validity of the FSC Congo National Forest Management standard as well for the same "FLEGT-compliant" purpose (FSC, 2016).

3.4 Transnational private governance arrangements

Non-state actors, both for-profit and non-profit, are key drivers of change other than governmental and inter-governmental arrangements. With the rise of the sustainable development discourse, they have grown substantially since the 1980s and play significant roles in policy coordination and governance at the global level (Arts et al., 2010). These non-state actors include "social movements, NGOs, transnational scientific networks, business organizations, multinational corporations and other forms of private authority" (Okereke, Bulkeley, & Schroeder, 2009, p.60). Public-private and corporate-NGO partnerships also have become more popular in the forest arena. In particular, with the rise of forest

[65] The FSC Chain of Custody certificate is not recognized yet.

[66] In the meantime, another certification standard in Cameroon, the Rainforest Alliance, is also expected to gain the same FLEGT-compliant recognition in the near future.

certification schemes, the international forest standard setting and rulemaking have, to a large extent, even been determined by the private actors.

The concept of forest certification already emerged in the 1980s within the ITTO as a policy tool for SFM at the management unit level (Poore, 2003). However, during the ITTO negotiations, it appeared that ITTO was unwilling to support sustainable timber labelling (Humphreys, 1996, pp.74-75; P. H. Pattberg, 2005). Moreover, the 1992 UNCED failed to produce a global legally-binding forest convention. As a response and alternative to the above disappointments, the Forest Stewardship Council (FSC) was launched in 1993 by an allied group of NGOs, timber traders, forest worker organizations and indigenous peoples' groups (Auld, Gulbrandsen, & McDermott, 2008; Gulbrandsen, 2004) to promote SFM around the world. The voluntary certification scheme generally provides incentives by using on-product labels to enable a possible price premium and product differentiation.[67]

The main goal of the FSC is to advance "environmentally appropriate, socially beneficial, and economically viable" forest management. Correspondingly, the FSC has a tripartite structure made up with environmental, social, and economic chambers, which is intended to assure that there is no dominant interest group to influence rule-making (Auld et al., 2008). State agencies are not eligible for the FSC membership but they normally serve as advisors when developing national/sub-national indicators and verifiers. As mentioned in sub-section 2.4, the FSC developed a set of global standards consisting of 10 principles. The principles and criteria can be tailored to meet specific conditions in different countries. There are two kinds of FSC certifications. One is for the forest management and another one is the chain-of-custody certification. The former applies to forest owners and managers and the latter applies to businesses and manufacturers that sell timber products. Audits of FSC standards compliance are done by independent third-party certification bodies, and these certification bodies are accredited mainly by an independent business entity - Accreditation Services International.

Shortly after the establishment of the FSC, another major certification approach, producer-backed and country-level, came into existence as competitive schemes. This is because many forest producers and national forest interest groups were opposed to the decision making power granted to environmental and social NGOs in the FSC, which can outvote economic interests (Gulbrandsen, 2004). Producers believe that the rules for SFM should be developed by companies and forest owners. On this assumption and background, a number of industry/producer-backed schemes emerged. The Sustainable Forestry Initiative

[67] This section mainly introduces the historical evolution and institution of the certification system, for a more detailed incentive structure of the certification instrument, see Chapter 3.

(SFI) was created in the United States in 1994; the Canadian Standards Association (CSA) adopted national SFM standards for certification in 1996 with support from industry associations, and the European forest owners' associations jointly established the Pan-European Forest Certification (PEFC) scheme in 1998.[68] Numerous national certification initiatives were also developed and endorsed by the ITTO, who argued that an international certification scheme was redundant given the limited amount of internationally traded timber (Poore, 2003).

The FSC and the PEFC are the two largest global certification standard setting organizations. They are in heavy competition for market dominance. Unlike the approach used by the FSC (a set of global principles and criteria), the PEFC primarily facilitates mutual recognition of national certification schemes. Its Council consists of national governing bodies, representing forest owner associations. It approves national certification schemes that are in conformity with the criteria, indicators, and rules of the PEFC umbrella scheme (Auld et al., 2008). Regarding the standard stringency, the FSC is viewed as a more ambitious standard supported by most of NGOs while the PEFC is less prescriptive and more flexible. Understandably, the more stringent the standards, the higher the burden to adopt behavioural changes, particularly for smallholders, and hence the uptake of a less stringent system is likely to be faster and broader.

As of November 2017, PEFC- and FSC-certified lands totalled almost 500 million hectares (304 million hectares and 194 hectares respectively), which is approximately 12.5 percent of global forest cover (FSC, 2017; PEFC, 2017). However, among these areas, developing countries account for merely around 10 percent of the certified forests. The FSC has approximately 15 percent of its certified forests in developing countries while the PEFC has 7 percent (FSC, 2017; PEFC, 2017). In other words, the vast majority of forest certification takes place in North America and Europe, which implies its limited reach in tropical forests. The lack of broader adoption of forest certification in the tropical forests can be attributed to, for example, insufficient resources, corruption, poor infrastructure, and lack of market demand (Pauli, 2009). Nonetheless, the use of certification to address deforestation in the supply chain is not limited to the timber and paper industry but is also important in the commodity industry that typically causes deforestation, such as palm oil and soy.

These agricultural commodity certification schemes include, for example, the Roundtable on Responsible Palm Oil (RSPO)(established in 2007), the Roundtable on Responsible Soy (RTRS)(established in 2006), and the Bonsucro Certification for sugarcane (established in 2011). These commodity roundtables normally place certain restrictions on tropical forest conversion, which addresses the fundamental cause of tropical deforestation. Moreover, many global

[68] Later in 2002, its name changed into the Programme for the Endorsement of Forest Certification.

multinational businesses and financial institutions have committed to zero-deforestation supply chains and investments due to the increasing reputational and operation risks imposed by environmental NGOs and consumer pressure.

Consumer markets in developed countries also increasingly demand higher commodity production standards, which sends strong regulatory and market signals to the private sector. Commodity certifications can help companies to achieve their commitments and potential future regulatory requirements. However, there also exist private arrangements between NGOs and business, working towards deforestation-free supply chains without necessarily involving certification.[69] The reason is that certification still has rather limited uptake and not all commodities have their corresponding, designated certification schemes. This model thus covers a wider range of tropical deforestation associated commodities, such as rubber, charcoal, coconut, etc. Additionally, in recent years, the investors and financial institutions are also increasingly involved in the product value chain with great importance. Similar to private companies, they are also sensitive to the risks of being associated with questionable environmental practices.

The active, heavy involvement of the civil society contributes greatly to the formation and implementation of forest policy and governance, including local to global NGOs and research institutes. Notably, although academic literature focuses predominantly on certifications, the impacts of other private arrangements and NGO actions[70] for zero-deforestation and/or sustainable commodity production are assuredly significant. It is for this reason that a separate sub-section will be dedicated to the important role of NGOs in global forest governance as a core component.

3.5 Environmental non-profit organizations

Non-governmental organizations (NGOs) and civil society groups are stakeholders in forest governance that act as a driving force behind stronger international cooperation and regulatory processes via active and effective mobilization of public support. They have been highly instrumental and influential in keeping deforestation issues high on the public agenda. Moreover, they exercise pressure and vigilance to push government and industry into taking environmentally appropriate actions.

Civic environmentalism and NGOs are generally distinguished into two broad categories by researchers. Humphreys (2004) categorizes system reformation and

[69] See Chapter 4, Section 4.3 for detailed examples.

[70] For example, the Brazilian voluntary moratoria on soy and cattle ranching expansion in the industry were a direct result from Greenpeace's consumer market campaigns (Rautner et al., 2013).

system transformation NGOs according to their over-arching strategies: a more collaborative insider approach or an outsider approach to target institutions. Similarly, Arts (1998) distinguishes pressure groups that advocate and lobby inside political arenas and institutions from the outsider protesting groups. Lövbrand & Bäckstrand (2013) group civic environmentalism into radical and reform-oriented approaches. The former promotes a fundamental transformation of consumption patterns in the developed countries and existing capitalist institutions towards a more eco-centric and equitable social order. On the contrary, the reformist approach advocates increased stakeholder participation to enhance public accountability and legitimacy. Lemos & Agrawal (2006) further emphasize that outsiders continue to have limited opportunities to participate in current governance efforts.

There is also literature that distinguishes NGOs by their functions. For instance, Gemmill & Bamidele-Izu (2002) set out five major roles of NGOs: information collection and dissemination, policy development consultation, policy implementation, assessment and monitoring and advocacy for environmental justice. Oberthür et al. (2012) indicate that NGOs perform functions such as enhancing the knowledge base, advocacy and lobbying, membership in national delegations, participation in review and enforcement procedures, ensuring transparency, supporting international secretariats, etc. Each NGO can have multiple functions at the same time and often an issue area is dealt with by different non-profits organizations from various perspectives and approaches.

Despite the common interest in environmental/forest protection, there are a vast amount of NGOs that work in the forest governance arena and they are immensely diverse. They include local, regional, national and international groups that have distinct characteristics and various missions devoted to a wide range of issues relating to forest or environmental degradation/conservation in general. There is often a lack of unity in their environmental actions. Nonetheless, the diversity of civic environmentalism in most cases is certainly a constructive strength rather than a weakness. A number of highly influential NGOs (or hybrid networks) include for example, the International Union for Conservation of Nature (IUCN), the World Wildlife Fund (WWF), Greenpeace, the World Resource Institute (WRI), the International Union of Forest Research Organizations (IUFRO), the Center for International Forestry Research (CIFOR), Global Canopy and many more. These non-profit, non-governmental organizations have critically catalysed and shaped nearly all the core components mentioned in the above four sub-sections and have greatly contributed to the current architecture of the global forest governance regime.

An example of such global efforts initiated by environmental NGOs, collaborating with public sector is the Bonn Challenge, launched in 2011. The

Bonn Challenge is a global initiative aiming to restore 150 million hectares of the world's degraded and deforested lands by 2020 and 350 million hectares by 2030. The restoration goals can simultaneously mitigate climate change, recover forest functions and support Sustainable Development Goals. It was driven by the Global Partnership on Forest Landscape Restoration, a network initiated by the IUCN,[71] WWF and the Forestry Commission of Great Britain. The global landscape restoration movement has rapidly gained momentum.[72] As of January 2018, the Bonn Challenge had mobilized commitments from 47 national and sub-national entities with unparalleled political will.[73] Countries are developing large scale national and sub-national restoration plans, policy and strategies that integrate restoration with sustainable development and conservation agendas (Chazdon et al., 2017). This paragraph is not to cover the details of the Bonn Challenge but to point out how civil society and NGOs have the power to influence the public and private sector and construct a forest discourse such as this one – forest landscape restoration.

4 Discussion: a forest regime complex

In Section 3, we discussed non-legally binding declarations and political commitments ('soft' law), legally binding conventions with important forest-related provisions ('hard' law), international treaty-based and relevant organizations, performance-based international initiatives of NGOs and certification schemes, regional organizations, and other setups such as the REDD+ and learning platforms. This wide range of arrangements has demonstrated the complexity and fragmentation of global forest problems, such as implicit/explicit rules and goals, public/private constituencies, bilateral/multilateral/global scope, and specific/general subject matter. Therefore in the literature, international forest governance is portrayed as a dynamic, heterogeneous, hybrid mixed "regime complex" rather than a mere "regime" [74]

[71] The International Union for Conservation of Nature (IUCN) is in fact a neutral forum and a membership union consisting of NGOs, media, academia, the private sector and governments. It is often broadly viewed as an environmental NGO or a hybrid NGO and being included in the discussion on civil society, see for example (Humphreys, 2004), (Arts et al., 2010, p.62), (Oberthür et al., 2012) and (Gemmill & Bamidele-Izu, 2002, p.11).

[72] In addition to the Bonn Challenge, the ambitious international restorations targets also include Aichi Target (mentioned in this chapter's sub-section 3.1, under Convention on Biological Diversity) and the New York Declaration on Forest (see Chapter 4, sub-section 4.3).

[73] See updates on the official Bonn Challenge website: http://www.bonnchallenge.org/.

[74] Regime is a commonly-used term in social science that refers to a set of governance arrangements. The application of the regime concept on international affairs dates back to 1970s, see (Ruggie, 1975, p.570) and (O. R. Young, 1980, p.332). The most widely-cited definition of an international regime is the one set forth by Stephen Krasner. He argued international regimes are "sets of implicit or explicit principles, norms, rules and decision making procedures around which actors' expectations converge in a given area of international relations" (Krasner, 1982, p.186). These actors include state and non-state actors, such as business, NGOs and private financial institutions.

(Rayner, Humphreys, et al., 2010). A regime complex is a set of governance arrangements and specialized regimes that are loosely coordinated together. These core arrangements of global forest governance, which we discussed, are supported by diverse political interest groups. They can interlink with each other in various ways. They can be mutually reinforcing or overlapping and conflicting (Keohane & Victor, 2011). We first discuss overlaps of regime linkages and then in the second part introduces the concept of policy integration from the literature.

4.1 Regime linkages

Oran Young distinguishes four types of institutional linkage: embedded, nested, clustered and overlapping (O. R. Young, 1994, pp. 1-2). Embedded linkage can be exemplified by the NLBI and CBD, which both acknowledge the principle of state sovereignty and use protected areas as main conservation strategy. The Kyoto Protocol, the REDD+ mechanism and the Paris Agreement[75] under the UNFCCC can be viewed as a nested structure, in which one agreement is made under a wider framework agreement. The Joint Implementation, CDM and Emission Trading[76] are the clustered type that combines different functional arrangements in the climate change regime (Glück et al., 2010). Lastly, overlapping is defined by Young as when the functional scope of one regime is protruding into the functional scope of the other, which can also be interpreted as externalities resulting from unintended or unforeseen effects of another regime (Rosendal, 2001). This fourth kind of linkage is often the most discussed in the forest regime complex.

Overlapping linkages can be incompatible or synergistic. For example, uniform plantations of fast-growing species established for the purpose of carbon sequestration (for instance, those used in the CDM afforestation projects) may have negative consequence for biodiversity, which is an incompatible aspect between the climate change regime and biodiversity regime. The pursuit of agricultural production and international free trade are also to a large extent incompatible with the protection of forest ecosystem functions (e.g. sequestrating and storing carbon, providing habitat and securing soil). More specifically, the use of sustainable certification can be in conflict with the trade regime, as mentioned in sub-subsection 3.1.6. On the other hand, the overlap between CITES and the CBD leads to mutual reinforcement. The former focuses on species-specific trade as a conservation tool and the later promotes conservation at the ecosystem levels. Hence the effective work and implementation of one can potentially uphold the

[75] The Paris Agreement is an agreement under the UNFCCC that was adopted in 2015 as a first universal, legally binding global climate deal. The agreement outlines a global action plan to limit global warming to well below 2°C in order to avoid dangerous climate change. The Paris Agreement marks an important milestone in the climate change regime after the Kyoto Protocol.
[76] See footnote 41.

other. A similar example can be found between the UNFCCC, the Montreal Protocol and the Vienna Convention for the Protection of the Ozone Layer.[77] The Montreal Protocol and the Vienna Convention both regulate the use of chlorofluorocarbons (CFCs) at the international level. CFCs are not only powerful substances that can destroy stratospheric ozone but also are greenhouse gases. Therefore the reduction in CFCs contributes to the goals of both regimes.

These different types of overlapping linkages can be further illustrated with an analytical framework proposed by Rosendal (2001, p. 97). The distinction is made between the overall policy goals and principles (*norms*) of a regime that are typically viewed as legitimate by participants and explicit regulations (*rules*) that prescribe specified requirements for state behaviour. Norms are normally set at the early stage of a regime formation whereas rules tend to appear later. Norms and rules can be compatible (mutually reinforcing or complementary) or divergent and the development is dynamic. For instance, as tensions are created by diverging norms and rules during the negotiations, parties might start constructive dialogues and efforts to develop more compatible arrangements or solutions. Table 7 below shows four types of possible situations based on the combination of compatible and diverging norms and rules.

Table 7: Matrix of different types of overlapping linkage between regimes

	Compatible norms	**Diverging norms**
Compatible rules	I (e.g. CBD/NLBI/CITES)	II (e.g. CBD/ITTA)
Diverging rules	III (e.g. CBD/UNFCCC-KP or REDD+)	IV (e.g. TBT/Forest certification, TRIPS/CBD)

Source: (Rosendal, 2001)

Type I represents a situation with great synergies. An example can be seen in the relationship between the CBD, the Ramsar Convention and CITES. However, even with a high degree of synergistic overlap, it does not automatically mean that the synergies are exploited. It can also result in significant duplicated work and an extra burden on bureaucracies (e.g. national reporting) if no cooperation or coordination mechanisms are in place (Rosendal, 2001, p. 98). Type II is a relatively synergistic scenario with diverging norms but compatible rules. Typical

[77] The Vienna Convention for the Protection of the Ozone Layer was a multinational agreement agreed in 1985. It set up global monitoring and reporting on ozone depletion and created a framework for the development of protocols for taking more binding action. The Montreal Protocol on Substances that Deplete the Ozone Layer is an international treaty adopted in 1987 under the Vienna Convention. The Protocol protects the ozone layer by phasing out the production of numerous ozone depleting substances. The Protocol regulates the use of chlorofluorocarbons (CFCs) at the international level. CFCs are synthesized substances for uses such as refrigerants, cleaning solvents and aerosol propellants.

examples are those between conservation treaties and resource management regimes, such as with the ITTA and the CBD.[78] Type III depicts two overlapping regimes with compatible norms but diverging rules. Cases as such can be found with the CBD and the UNFCCC, as described in the previous paragraph (on previous page) on the trade-off between carbon sequestration and biodiversity or other forest social values. It can also be exemplified by the Montreal Protocol and the UNFCCC. Both of their over-arching objectives are to mitigate global atmospheric threats. However, unlike the synergistic example used with CFCs (on the previous page), the wide application of hydrofluorocarbons (HFCs) as an alternative to CFCs conflicts with the UNFCCC. For the reason that HFCs although they are an effective substitute for ozone-depleting substances, they are also destructive greenhouse gases with high warming potential. Type IV occurs when two regimes have divergent norms and rules related to the same issue areas, which may represent the highest conflict potential, for instance between a trade regime and environmental protection.[79]

4.2 Policy integration

These overlapping linkages between various forest-relevant regimes again show the difficulties in coordination. Briassoulis (2005) points out that the supply side of policy arrangements finds it hard to meet the policy demand for complex contemporary environmental problems, which are often conflicting, overlapping and extremely complicated. For the reason that the supply of these numerous policies is mostly related to particular aspects of one or a few existing problems. Hence, in order to avoid creating more new policies each time when an issue emerges, she proposes policy integration through existing policies as a potentially applicable solution to reconcile and modify overlaps and duplications between policy components. This concept of policy integration can be applied to both at domestic and international levels (Biermann, Davies, & van der Grijp, 2009).

The forest regime complex is evolving constantly through new international forest-related declarations, instruments and voluntary private sector regulations.

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[78] Another example is the whaling regime, such as between the International Whaling Commission (IWC) and the International Convention for the Regulation of Whaling (ICRW). The IWC was established as the decision-making body of the ICRW. The initial objective of the whaling regime was to secure the stable supply of the economic resource - whales, and the long term income of the whaling industry. However, the rules of IWC has evolved greatly into a pure conservation focus (Rosendal, 2001).

[79] Rosendal (2001:100-101) proposes two assumptions concerning how overlaps may influence the effectiveness of global environmental cooperation and implementation. Assumption one, diverging norms in core aspects (fundamental principles and normative orientation) tend to cause higher scope of conflict compared to discord of perceptions about the criticalness of the issue and the relative significance of casual factors. Assumption two, diverging explicit rules, regulations and obligations are likely to have higher conflict potential compared to overlaps in rules used to enhance knowledge in an issue area.

The main challenges of this complexity are that the majority of these initiatives has other main objectives than mere forests, such as climate change, biodiversity, trade, or development. Therefore the need for better and more effective coordination is critical to improve forest governance. Overall, the various actors share the over-arching concept of SFM, although not consistently at times. This emcompassing nature of SFM is an opportunity for all actors with a stake across sectors and various levels.

Nonetheless, integration can alter particular elements of an existing policy mix to a certain extent in order to create a new mix. The new arrangement should avoid counter-productive or sub-optimal policy outcomes associated with previous arrangements and strengthen its other qualities, such as determinacy, effectiveness and sustainability (Howlett et al., 2010, p.94). Furthermore, the way to remedy a fragmented global governance arrangement is often to build more coherence and congruence via regional, national or local coordination efforts rather than continuing forming a top-down treaty (Howlett et al., 2010, pp. 96-97). What is more, especially in the case of forestry, it is also crucial to address the cross-sectoral policy coordination at national and sub-national level.

The multi-level nested/polycentric forest governance architecture is a form of policy integration. At the international level, although there is no global forest binding agreement, there are patches of forest-related arrangements. At the national level, the Forest National Programmes emerged in the 1990s when the international forest soft law (the NLBI) was developed. In addition, the regional binding and non-binding agreements have also proliferated in recent years. These sets of multi-level arrangements constitute important corner stones to diversify and widen the policy instrument toolbox. As for the subnational level, actions taken at the specific jurisdiction is what this research eventually focuses on. For the remainder of this dissertation, Chapter 3 first provides an overview of policy instruments for forest governance. The next chapter draws attention to the specific tropical deforestation cause, namely palm oil production, as well as identifies the current policy gaps regarding the governance between tropical forests and oil palm plantations. Subsequently, Chapter 5 enters into the discussion on a jurisdictional landscape approach with the use of policy instruments mix as a potential solution for sustainable palm oil production and tropical forest management. It thus contributes to the incremental additions to the existing regime elements and the multi-level cross-sectoral forest governance.

5 Conclusion

This Chapter aimed at providing an overall understanding of the predicament in tropical forests and the current international framework governing this significant global concern. In particular Section 2 focused on the direct causes of tropical deforestation - agribusiness expansion, to emphasize the often neglected link between sustainable forest management and cross-sectoral policy consideration. Section 2 also addressed the importance of a forest definition. The literature indicated the discrepancies related to the determination of deforestation and forest degradation when applying different definitions of a forest. These differences have critical implications, particularly concerning the accounting of the deforestation and forest degradation rates, as well as for the policy design and possible international forest projects finance. As a response to globally depleted forest resources, sustainable forest management emerged as the guiding principle for solving deforestation and forest degradation problems in the early 1990s. The extent of forest resources is one of the seventh global basic forest criteria underpinning sustainable forest management, but the private forest certification however does not specifically address reversing of forest land conversion. In other words, the private forest certification mainly focuses on managing and/or maintaining existing standing forests but not so much on expanding forest cover, for instance, through re-forestation or afforestation.

We have then identified a number of major arrangements central to global forest governance, encompassing a hybrid mix of hard law, soft law and private rules on either forest-focused or –related issues with diversified goals. Some of them are complementary and some are in conflict, which reflects different values and actor interests in the utilization of forest and forest conservation. The fundamental forest issue is to resolve conflicts between economic use of forest resources and strong concerns over environmental and social integrity. Notably, these conflicts between different advocacy groups often result in generalized agreements, imprecise policy goals and favouring soft policy tools, even in binding legal instruments. For instance, the CBD uses national programmes and strategies as a means to achieve its goals while other 'softer' instruments, such as certification and REDD+, use positive economic incentives and information to generate behavioural changes. Examples can also be found in FLEGT VPAs, which are built on voluntary consent of producer countries to commit and strengthen their rule of law. And as mentioned in sub-section 3.1, the CITES' permits system is influenced by powerful interests in the international tropical timber trade.

Nevertheless, the above issue reflects the multi-faceted complexity and drivers of current forest problems. The global forest regime complex is fragmented and comprises a wide range of policy tools and actors. The majority of them focus on national policy processes, such as international treaties, regional initiatives and extra-territorial measures. However, the importance of private governance arrangements in shaping and influencing the discursive dynamics (i.e. sustainable forest management, illegal logging, corporate social responsibility and certification) is no less than in the public sector. Nonetheless, given the complexity and sometimes conflicting goals between forest-related arrangements, the coordination of cross-level and cross-sectoral efforts to promote optimal forest policy integration is undoubtedly very challenging. In order to improve the fragmented forest governance architecture, scholars have proposed that instead of restructuring the current forest regime complex through a top-down manner, another promising alternative is to enhance the management of existing policy tools via a better multi-level nested[80] governance structure. For an issue area with great complexity, such as forests, multiple governance approaches and a regime logic are necessary (Howlett et al., 2010, p.103). Thus the section concludes with the need for a nested multi-level forest policy integration. This chapter has set the stage and drawn relevant inferences for the following chapters on theories and for the case study on palm oil production. In particular, the proposed policy solution in chapter 5 is related to the concept of policy integration and contributes to the incremental cross-sectoral addition of the overall forest governance.

Lastly, the content of this chapter reflects the mainstream literature on international forest governance, which predominantly focuses on the management of standing forests (i.e. timber production, its biodiversity and ecosystem services). However, the adjacent agricultural sector and international trade are equally significant, if not more so, concerning the problem of tropical forest depletion and sustainable forest management. Discussions on how to avoid forest conversion is to a large extent left out by this thread of literature. As such, this dissertation aims to fill the gap, and to bring this issue into focus and subsequently provides a more comprehensive discussion and analysis on tropical deforestation and forest degradation. It is for this reason that palm oil production, as one of the main tropical deforestation drivers, is chosen to be the study subject of this research. Ultimately, in order to achieve the goals of global sustainable forest management, the production of tropical deforestation-driven commodities and its policy design have to go hand-in-hand with forest management. Moreover,

[80] The term "nested" is used to describe semi-hierarchical institutions (Keohane & Victor, 2011) or institutions that are embedded within each other in concentric circles (Alter & Meunier, 2009).

this inter-sectoral characteristic of forest policy, namely the inseparability between forest management and deforestation drivers deserves weightier attention in the academic research and in the framework of international forest governance.

Chapter 3: Theoretical Framework

1 Introduction

In Chapter 2, the global problem of deforestation and forest degradation in the tropics and the current international forest governing structure were examined. It described the extend of the problem and its negative impacts, as well as the main drivers of tropical deforestation and forest degradation. Within the global forest architecture, five main groups of elements were introduced. They are global agreements, international organizations, extra-territorial legality control, transnational private arrangements and environmental non-profit organizations. Lastly, the chapter discussed different types of regime linkages (e.g. climate change, biodiversity, trade regimes, etc.) relevant to forests and the importance of building an integrated governance architecture in this forest regime complex.

After the discussions at global level, this chapter enters into more specific policy measures that can be taken by states and other actors, either at national/local level or linking international and national actors. The chapter sets out the underlying theoretical framework for this research. It consists of three main sections. In Section 2, it first provides relevant economic literature explaining the depletion of global forest resources. This thread of literature starts from introducing forests as a common pool resource, which very often is subject to the "tragedy of the commons" and therefore pose particular challenges on the arrangement of governance. Then it is followed by the current debate on economically valuing complex forests and forests ecosystems, including the limitations as well as the need to do so. Knowing how one can estimate the value of forests adds to the better understanding of the struggles for policy making in this specific area. In the last sub-section, the concepts of forest transition and the Environmental Kuznets Curve are briefly presented. These two concepts link forest resources (environmental quality) and human development (income changes), which act as a premise of the remaining content and put the forestry policy development into context across different periods of time and locations.

Section 3 provides a succinct review of the policy instruments that serve as interventions for global tropical forest depletion as well as to mitigate climate change. The section comprises reviews of command-and-control instruments, private and self-regulation and of more comprehensive discussions about incentive-based instruments. In addition to various types of government mandated regulations, a number of particularly important instruments used in the current forest governance regime worldwide are included in this section. They are certification schemes, property right-based approaches, market creation, fiscal and financial instruments, charges and payment for ecosystem services. Subsequently Section 4 introduces the concept of 'policy mix' and the classic

literature on 'smart regulation' by (Gunningham et al., 1998), including general regulatory design principles for environmental policy instrument mixes and brief examinations of different types of mixes. Section 5 concludes.

2 Economics for the forests[81]

Consideration of the economics of forests began with the calculation of optimal forest rotation and the choice of discount rate in the mid twentieth century (Gaffney, 1957; Newman, 2002). Subsequently, the topic of ownership of forest and the trade of timber products frequently came into the discussion. Later in the 1970s, the importance of non-timber resources started to emerge (Hartman, 1976). This improved and intensified the evaluation techniques to quantify the non-market value of forest ecosystem services, such as biodiversity, recreation, purification of water and air, etc. In the twenty-first century, due to the critical role forests play in mitigating GHG emissions (through carbon sequestration and storage), the economics of climate change has become an important element in forest conservation and management policies (Kant & Alavalapati, 2014). As a result, discussions relating to the adjacent agricultural sector, which is the main cause of tropical deforestation, have increased substantially.

By following this evolutionary path of forestry economics, this section examines the literature on the three most relevant perspectives of this research topic. Section 2.1 discusses the concept of common pool resources, which explains why a simple notion of resource ownership is not sufficient for economic analysis of forest ecosystems. It also shows the reason why forests are particularly susceptible to market failures (because they are expected to fulfil private and social goals, including the environment). As the objectives of forest management are broadened from the mere focus on resource extraction to the inclusion of non-market goods and services, Section 2.2 thus introduces the ecosystem valuation concept, which provides a rationale to develop estimations of non-market values of forests that should be taken into account in policy decision-making. Lastly, as deforestation and forest degradation have become the primary concerns in sustainable forest management in the tropics, Section 2.3 uses Forest Transition Theory and the Environmental Kuznets Curve to explain the land use patterns and the relationship between standing forests, human-induced drivers of deforestation (e.g. agri-business) that are distinctive to different phases of economic development in a country or a region.

[81] The title of this section is inspired by (Barbier & Swanson, 1992).

2.1 Forests as common pool resources

In this dissertation, the work of the literature on common pool resources is used as the underlying concept to characterize forests ecosystems (however, it should be noted that not all forests suffer from common pool resources problem). Two parameters that can broadly distinguish goods and services from one another are the degree of excludability and whether these goods and services are rival or subtractable in consumption and production (Faure & Skogh, 2005, p.61). By using these criteria, goods can be loosely classified as four categories shown in Table 8.

Table 8: Matrix of goods and services defined by excludability and rivalry

		RIVALRY	
		High	Low
EXCLUDA-BILITY	High	Private goods	Club (toll) goods/Low congestion goods
	Low	Common goods/Common pool resources	Pure public goods

Source: adopted from (Faure & Skogh, 2005)

Private goods are mostly those being produced and traded in private markets, such as food, cars, clothing, houses, etc. Pure public goods are those that can be enjoyed free of charge by individuals at the same time without diminishing the utility, such as (tax-based) national defence, the law, the court system and (indirect private funding) search engines, etc. Common goods and club goods are both impure public goods, which are not fully non-excludable and non-subtractable. Common goods might be non-excludable but can be congested, whereas club goods are the other way around. Club goods are not entirely subject to rivalrous consumption, i.e. only sometimes when there are too many users at a certain point, congestion becomes an issue. However, users can be easily excluded, for instance, through paying fees or blocking clogged roads. Examples of club goods include cable TV, access to private parks, swimming pools, etc (Mankiw, 2011). Common goods or common pool resources are generally typified by their costly and difficult exclusion of rival users. The rivalry manifests itself in the form that: resources subtracted by one user diminish the resources available to the consumption of others'. In other words, resources are accessed in common but the goods generated are private. Common pool resources include earth-system components, such as the atmosphere, marine and terrestrial ecosystems whose resources are regarded as depletable and renewable at the same time, as well as irrigation systems, etc. (E. Ostrom, Burger, Field, Norgaard, & Policansky, 1999).

The atmosphere is a global common pool resources (E. Ostrom, 2010) functioning as a sink for greenhouse gases that is openly accessible and can be

appropriated by anyone for free at most of the regions in the world.[82] Ecosystems like oceans and forest are not only sources to biodiversity and exhaustible commodities but link closely with the global carbon cycle: they provide vital ecosystem services by absorbing anthropogenic carbon dioxide emissions. Just like the atmosphere, the services provided by ocean and forest ecosystems, such as clean and breathable air, biodiversity and climate regulation, are public goods enjoyed by everyone. Nevertheless, these ecosystems themselves are global common pool resources. In other words, the forest itself and the absorptive capacity of the atmosphere (to neutralize GHG pollution over time) are common pool resources. The atmosphere is under pressure from excessive carbon dioxide which results in threatened life forms on earth. Forests, in particular tropical forests, are depleted at an alarming rate, which causes species extinctions and loss of ecological functions (D. Boucher et al., 2011; Rautner et al., 2013). Due to the special characteristics of common pool resources, the establishment of effective governance at the global scale has shown itself to be challenging (E. Ostrom, 1990).

Forests, classified as common pool resources, are subject to high subtractability and low excludability (Cooter & Ulen, 2004, pp. 146-150; Faure & Skogh, 2005, p.62). The problem with such an open access resource is that everyone could in theory take e.g. fish in the ocean or trees in a forest. As long as the marginal costs for accessing the resource remain below the resource's marginal benefit, such a difficult- or non-excludable valuable resource will easily become subject to over-harvesting (as in the case of public forests) or over-hunting (as in the case of wildlife). It is likely, therefore, to impair the continuous sustainability of such resources and lead to, for example, forest depletion or to extinction of species of fish. This phenomenon that open-access (free-for-all) resources will lead to depletion of resources has been described in a seminal paper by Garrett Hardin (Hardin, 1968) as the "tragedy of the commons"[83]. This "tragedy of the commons" results from the fact that no one is excluded from the use of the particular resource, as a result of which private ownership is simply established by the person who takes first access.

This first-mover advantage provides competing users with incentives to engage in a race whereby all try to harvest as much as possible and as quickly as possible from the resource in order to avoid others doing so. Without rules regulating the use of those common resources (such as forests or the oceans), extinction or resource depletion may be the result. In the case of forests, aside from forest

[82] Systems such as EU Emission Trading System that prices carbon emission can to a certain degree be viewed as exceptions.

[83] Here the commons actually refers to "open access" (a free-for-all) regime, in which is difficult to limit access, instead of a "common property" regime. In the latter case the size of the group is limited and behavioural rules exist to cure the tragedy of the commons.

resources, it also generates valuable ecosystem services, such as watershed and soil protection, carbon sequestration, biodiversity preservation, which can be regarded as positive externalities or public goods. These ecosystem services are likewise threatened by the first-mover incentives embodied in an unregulated forest. Hence this underscores the importance for society to develop mechanisms that allow an exclusive control of such a resource, i.e. vesting property rights.

The importance of exclusive control (enforced via private property rights) is associated with a seminal article by (Demsetz, 1967). Demsetz commented on the economy of hunting practised by the North American Indians. The demand for meat and skins increased at the same time that hunting methods became more refined. As a consequence, the buffalo that had roamed freely for centuries became nearly extinct. Beaver colonies in Canada, however, survived in spite of great demand and extensive hunting. Demsetz argued that the beaver colony survived because the Indian tribes in Canada divided the hunting territory among themselves. Hence, property rights were created, and an exploitation of the resource was avoided. Thus, the theory of Demsetz shows that property rights will emerge, naturally, to internalize the externalities that follow from open access.

While arguments based on Demsetz's theory indicate that extending private ownership on common pool resource can be a solution in the long run, private ownership in reality does not assure long term protection. Deforestation, for example, occurs in the situation in which farmers clear their private land for agricultural land use. Common pool resources can in fact be governed by various types of institutional arrangements, such as community, private and governmental ownership or co-management of these different forms of ownership (E. Ostrom, 1990) in combination with other policy instruments. The over-arching background point in question of this research is thus to contribute to policy arrangement analysis that aims at achieving improved environmental protection for common pool resources –the tropical forests.

2.2 Appropriating the value[84] of forests

The valuation of forests and its ecosystem services assists society and policy makers to make informed choices of the trade-offs (Barbier & Swanson, 1992; Ninan, 2007). Thus, during the development of relevant polices, it is essential to understand the way in which society appropriates forest values. For instance, decisions on logging, conversion or management of forest lands are normally dependent on economic factors such as the demand for agricultural land, timber or commodities for export. However, market transactions are not able to provide

[84] The term "value" used here does not narrowly presented in monetary sense but encompasses the act of assessing, appraising or measuring the ecological, socio-cultural and monetary importance (Gómez-Baggethun & Martin-López, 2015).

a complete picture of the total economic value of forests, because forest benefits that are not exchanged in the market are very often ignored in the decision making process. In other words, some parts of the forest benefits are not internalized into market prices. For example, typically the 'price' of tropical timber products or agricultural products obtained from the converted forest land does not take into account the lost (economic) value in tourism, non-timber products, disrupted forest ecological functions, the loss of biodiversity or the increased risk of forest fire.

The under-valuation of these services that contribute to total welfare, results in implicit distortions in efficient resource distribution. Therefore, in theory, some monetary estimation of partially marketed or non-market forest functions along with the development of appropriate mechanisms that capture the estimated economic value can enhance the efficiency of resource allocation (Adger, Brown, Cervigni, & Moran, 1995). Nevertheless, the value of forests does not merely hinge on economic factors but is also embedded in social, cultural, ethical and aesthetic considerations (Gómez-Baggethun & Martin-López, 2015) whose values cannot easily be monetized. Along these lines, the study on ecosystem services valuation is divided between those who hold valuing forests (nature) in monetary terms as a pragmatic option, and those who oppose it on ethical, political or methodological grounds (Costanza et al., 1997).

Although there are concerns and criticisms regarding the limit of any anthropocentric approach to nature conservation, it is unavoidable to engage in this debate since our society and its very material foundation depend on ecological life support systems. Many scientists have supported monetary valuation as a pragmatic strategy in the short-term due to its persuasive ability to communicate with the dominant political and economic notions (Costanza, Groot, et al., 2014; Ninan, 2007). The debates after years have progressed into discussions about defining appropriate conditions that may be valued in monetary terms or otherwise based on considerations such as whether the valuations are socially just, scientifically sound or ethically fair (Gómez-Baggethun & Martin-López, 2015). In addition, in order to avoid commodification of ecosystem services, despite the hegemonic role of monetary valuation, scientists have paid increasing attention to other valuation methods (such as socio-cultural and ecological) that include multiple, non-commensurable and conflicting values (Gómez-Baggethun & Ruiz-Pérez, 2011).

The multiple values in the literature on ecosystem services include ecological, social, economic, cultural, spiritual, therapeutic, symbolic, relational values as well as insurance and place values. Broadly, these values can be grouped into three domains: ecological, socio-cultural, and monetary (Gómez-Baggethun & Martin-López, 2015). Ecological values are related to the integrity of abiotic and biotic components that sustain ecosystem service provision (e.g. habitat and regulating

services), and its resilience in the face of disturbance and change. Some scientists suggest that ecological values necessitate particular analytical treatment (e.g. Material Flow Analysis, land cover flows, Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism)[85] instead of being compressed into socio-cultural or monetary values (Pascual et al., 2011). Socio-cultural values (emotional, affective, symbolic, aesthetic, artistic, educational, spiritual and scientific values, etc.) in most cases are extremely hard to capture in meaningful monetary metrics or commodity metaphors. Thus the socio-cultural valuation techniques include a heterogeneous compilation of methods and approaches (e.g. Social Network Analysis, Q-methodology and Mental models)[86] that are not related to biophysical or monetary measurement (Gómez-Baggethun & Martin-López, 2015). As for monetary values, these are what Environmental Law and Economics are traditionally associated with.

The monetary valuation approach of the environment originated from the concept of "(negative) externality" (Pearce & Turner, 1990; Pigou, 1920) and extended to include environmental amenities and ecosystem services (Costanza et al., 1997; TEEB, 2010). The literature on monetary valuation often separates values into use and non-use values and is further disaggregated into various values components which are added up to the Total Economic Value framework (Ninan, 2007; TEEB, 2010). As shown in Table 9, the use value of tropical forests contains direct use value (such as timber extraction, plant breeding, tourism and aesthetic

[85] Material Flow Analysis is a common methodological tool used in industrial ecology which physically quantifies material, energy or substance stocks and flows and integrates environmental accounting throughout process chains, such as Life Cycle Analysis, physical input-output tables, and ecological footprint analysis (Daniels & Moore, 2001). Land cover flows are tools developed by European Environment Agency used to describe and account detailed land use changes (accruement and reduction) and conversions between broad classifications combined with geodata (European Environmental Agency, 2006). The Multi-Scale Integrated Analysis of Societal and Ecosystem Metabolism is an accounting approach that incorporates quantitative data and information produced by various types of models in order to provide analysis on the patterns of metabolism of socio-economic systems. This approach builds on the concepts of Bio-economics and Complex Systems Theory and it is normally applied to analyse the nexus between food, water, and energy taking into account heterogeneous factors such as demographic dynamics, land use changes and greenhouse gas emissions at different levels (Giampietro, Mayumi, & Ramos-Martin, 2009).

[86] Social Network Analysis is a tool used to discover the important patterns of interactions between interdependent individuals or units and to further investigate social structures and institutions. This approach builds on formal mathematical theories and systematic analysis on empirical data and the linkages among actors are the flows of material or non-material resources (Wasserman & Faust, 1994). Q-Methodology is a research methodology and technique to study people's opinion and subjectivity (mostly through interviews) and to present qualitative data in a quantitative form, normally used in the field of social science and psychology (McKeown & Thomas, 1988). Mental models are psychological explanations of individual's thought process about the reality or hypothetical/imaginary situations. The theory of mental models is based on principles (axioms) and then extends to infer probabilities, desision making and recursive reasonings (Johnson-Laird, 1983).

enjoyment), indirect use value (such as ecosystem services) and option value**.** Option value is the satisfaction obtained from ensuring the option of future use. The non-use value category includes existence and bequest value, which are related to intra- and inter-generational concerns. All these values combine together leading to the Total Economic Value of the tropical forests.

Table 9: Total economic value of tropical forests

Use value	Direct use value	**Extractive**: Goods and services provided by forests (e.g. timber, non-timber products, recreation, etc.)
		Productive: Plant breeding
		Non-extractive: Tourism, cultural services, aesthetic enjoyment
	Indirect use value	**Ecological regulating services**: soil fertility, water purification, pollination, climate regulation
	Option value	**Satisfaction derives from ensuring the option of future use** (e.g. bioprospecting)[87]; the expected value is derived from delaying conservation of forests today
Non-use value	Existence value	Individuals who do not currently make use of forests but wish to see them preserved to be available for other people or other species in their own rights
	Bequest value	Individuals place a high value on the conservation of forests for the future generations to use

Source: (Ninan, 2007)

There are three common valuation techniques for monetary valuation: direct market valuation approaches; revealed preference approaches (shadow prices in parallel markets: hedonic pricing method and travel cost) and stated preference approaches (anticipated consumer behaviour in a hypothetical market: choice modelling and contingent valuation) (Gómez-Baggethun & Martin-López, 2015). Among various economic valuation techniques, methods assessing hidden, yet real economic costs or benefits in general provide more dependable information compared to stated preferences in abstract simulated markets. Similarly, aggregated figures derived by adding real, potential and hypothetical values that then are used in extended cost-benefit analysis is in general considered to provide very limited insights for natural conservation (Boeraeve, Dendoncker, Jacobs, Gómez-Baggethun, & Dufrêne, 2015).

[87] Bioprospecting (biodiversity prospecting) is defined by the CBD as "the exploration of biodiversity for commercially valuable genetic and biochemical resources." In other words it is "the process of gathering information from the biosphere on the molecular composition of genetic resources for the development of new commercial products." (CBD, 2000) However, the scope of the definition varies from narrowly only including the searching process to the development and application of such materials. Therefore the commercial profitability aspect of bioprospecting and the related concerns regarding property rights remain debatable (Slobodian, Kinna, Kambu, & Ognibene, 2015).

Notwithstanding that environmental law and economics typically deals with monetary valuation, it should be remembered that monetary valuation is only one of the valuation languages of integrated ecosystem services valuation. Monetary valuation should take into account different concepts dealing with environmental impacts from economic activities (for instance, in addition to externalities, the concept of social cost and cost-shifting gains)[88] (Kapp, 1950; Rodríguez-Labajos & Martínez-Alier, 2013). Moreover, it should focus on specific contexts in which monetary valuation has special contributions or complementarities compared to other valuation methods in order to serve goals that are aligned with a broader, socially just, ecologically sustainable, and financially viable economy. Lastly, this sub-section is also a reminder to point out the limitations of the anthropocentric approach used by this study, in which the majority of the valuations are only based on human utilization rather than the value of environment, the species itself and its existence.

2.3 Forest Transition theory

To better understand the global forest challenges, a transition approach[89] can help us to assess the underlying drivers affecting empirical patterns in the past and perceive possible changes in the future. The concept of forest transition, introduced by Mather (1992), refers to an empirically observed sequence of recurring changes of forests and their transformations in relation to human societies. It has developed into a widely applied theoretical tool for comprehending present-day land use changes (Rudel, Schneider, & Uriarte, 2010) and has managed to describe the forest change patterns in Europe, North

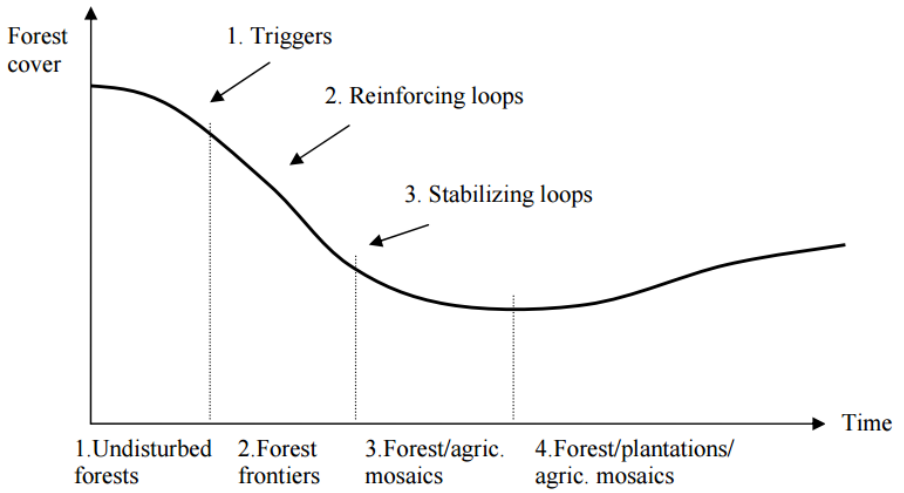
[88] The institutional and ecological economist Karl William Kapp (1950) considers the term "externality" misleading because it implies that uncompensated side effects are uncommon and incidental rather than prevalent and systematic. Kapp thus chose to use the term "social cost" and sees it as something resulting directly from the market systems in a systematic manner rather than mere third party spill-over effects. Instead of regarding an externality as market failure, Kapp introduced the concept of "cost-shifting" in *The Social Costs of Private Enterprise,* describing that "private enterprise under conditions of unregulated competition tends to give rise to social costs which are not accounted for in entrepreneurial outlays but instead are shifted to and borne by third persons and the community as a whole (Kapp, 1950, p. xxvii)." For more information, see (Swaney & Evers, 1989) and works of K. William Kapp.

[89] Demographic transition, Environmental Kuznets Curve, and the stages of economic growth are examples of a transition approach. The global population transition describes that as a society develops, death rate and birth rate fall, then comes an accelerated population growth before ultimately reaching a higher stabilized equilibrium (W. S. . Thompson, 1929), which is anticipated to rise to over 9 billion by 2050 (United Nations, 2015). The Environmental Kuznets Curve postulates that as a society transcends a critical level in per capita income, pollutants and environmental pressure decrease (Kuznets, 1955). The stages of economic growth theory argue that developed societies in general tend to evolve from a subsistence economy, mechanized specialization, trade and industrialization and then reach maturity with mass consumption and dominant service sectors (Rostow, 1960).

America and some developing countries (such as Vietnam, China, Costa Rica, El Salvador, Cuba and India)[90] (Gupta et al., 2013; Rudel et al., 2005).

The forest transition characterizes four stages of the forest cover changes in a nonlinear, U-shaped curve. The forest cover declines along with industrialization and urbanization and then starts to increase at a slower pace until it stabilizes or continues to increase in some cases. As shown in Figure 7, deforestation in initial primary forests is triggered by various drivers and hastened by reinforcing loops that lead to a forest frontier period. Subsequently, forest scarcity which results from high deforestation rates, along with other socio-economic or political forces, decelerate deforestation and initiate stabilizing loops, which then bring the third stage of forest/agriculture mosaics. Ultimately, these stabilizing loops will lead to the fourth stage of forest/plantation/agricultural mosaics by regeneration, reforestation or afforestation (Arild Angelsen, 2007).

Figure 7: The stages and main drivers in the forest transition



Source: (Arild Angelsen, 2007)

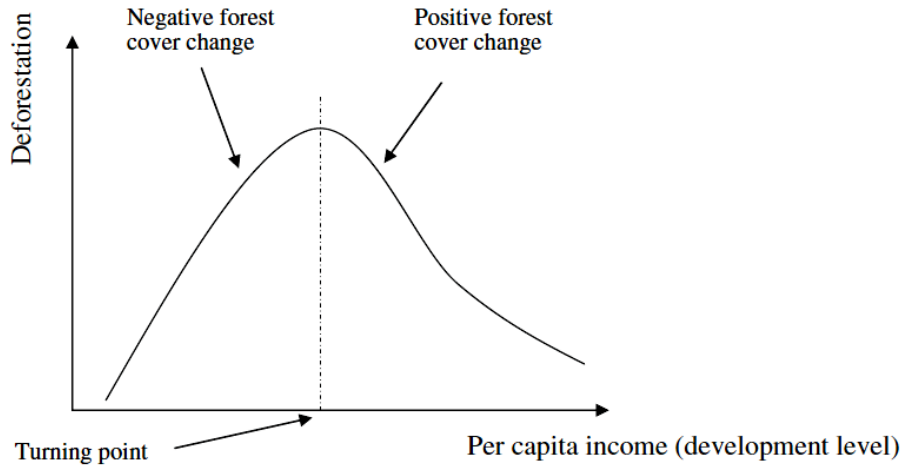
On a similar notion, the theory of the Environmental Kuznets Curve (EKC) was developed around the same time (Grossman & Krueger, 1991; Panayotou, 1995; Shafik & Bandyopadhyay, 1992). The EKC is an inverted U-shaped (bell-shaped) statistical artefact that summarizes a systematic relationship between environmental quality and income changes. The logic of this EKC relationship shows that when the per capita income level is low in the anterior phase of

[90] Nevertheless, in countries such as Haiti and Ethiopia, their economic status does not improve as they deforest, but they rather stay in the cycle of poverty and subsistence farming while forest cover loss persists (Culas, 2012).

economic development, there exist rather intact environmental conditions. As the economy grows and industrialization progresses, more environmental deteriorations occur, such as depletion of natural resources and rising emissions of pollutants. However, there is a reversing point (the top of the bell-shape) where economic welfare and income level increase to such a degree that environmental quality starts to improve and reaches higher standards (Faure, 2011; Yandle, Bhattarai, & Vijayaraghavan, 2004).

For deforestation, the Forest Transition theory and the EKC are at times used interchangeably. The EKC implies that deforestation takes place for the sake of economic growth in the beginning. Forestland is converted to agricultural uses or other forest products. As income level rises beyond certain level, deforestation would reduce (See Figure 8) (Culas, 2012; Rudel et al., 2005). The two notions, Forest Transition and EKC, are indeed related in some underlying ideas. They are however not identical. The variable used on the x-axis for the EKC is normally income per capita, whereas the Forest Transition generally uses time. Furthermore, the EKC entails a strong assumption of hastened deforestation at an early stage of economic development with no specified reforestation afterwards while the Forest Transition simply indicates a period of deforestation in the first phase and predicts a later stage of forest regeneration (Arild Angelsen, 2007).

Figure 8: An inverted U-shaped EKC for deforestation



Source:(Culas, 2012)

Notwithstanding the differences, the EKC is still a valuable tool for examining the course of forest transition. In the literature related to both notions, there have been similar ample investigations into the interaction between income and environmental quality in the EKC as well as the explanations for Forest Transition.

Discussions explaining their causalities include pollutants/deforestation displacement, change of economic structures/demand for goods and services, technology improvement, institutional development (such as more secure property rights under the rule of law and better enforcement), education, shifted consumer preference, enhancement of market and institutional efficiency, strengthened public awareness and willingness-to-pay (Culas, 2007; Faure, 2011; Yandle et al., 2004). These broader explanatory normative lessons drawn from this literature provide valuable insights into the policy analysis and study of this dissertation. They are addressed in the remaining research as and when needed.

Turning back to Forest Transition theory, the transition stages of forest development are closely linked with the drivers of deforestation and forest degradation (see Chapter 2, subsection 2.3) as well as with those forest policies adopted to affect the behaviour of actors (see examples in next section). Thus it is essential to understand the trajectory on which a country or a forest stands. Without doubt, this research focuses on the first three phases in the Forest Transition where the majority of degraded open-access forests and natural forests exposed to deforestation in the tropics are located. Moreover, the distinction between managed forest, degraded open-access forests and natural forests in these phases is important for the reason that the same policy and market determinant can have reversed effects on different types of forests (Hyde, 2012).

For instance, incentives of a premium or better price on timber can induce the improvement or expansion of (sustainable) forest management for countries with managed plantations or countries at the third or fourth stage. Nevertheless, it can also incentivize more deforestation in natural forests which brings negative impacts, particularly for countries at the first and second stages of forest transition. In these countries, the cost of harvesting from natural forest is lower than investing in forest management. Likewise, technical assistance or subsidies for forest management might have little impact for forests at the first and second stages. Another example, a policy that aims at intensifying agricultural production by concentrating on existing agricultural land or on the most productive land, can decrease deforestation or spare land to facilitate reforestation/afforestation for the third or fourth stages. However, despite the possible negative ecological effects of intensified practice, the rebound effect of the policy[91] can by chance expand deforestation (Patrick Meyfroidt & Lambin, 2011) in forests or countries in the first two stages.

Nevertheless, the forest transition pattern is more of a generalization. When it comes to reality or more particular cases, the situation varies depending on the interplay of a different multitude of determinants, various driving forces and the policy instalment in specific contexts, locality as well as other society

[91] i.e. an increase in commodity demand due to a price decline from improved production efficiency.

developments. For this reason, the predictive power of the forest transition theory is rather limited (Gupta et al., 2013). It is however a valid conceptual starting point to understand the contemporary changes and transition processes in forest cover worldwide (Rudel et al., 2010).

In addition, as tree plantations increasingly becoming one of the major land uses around the globe (Eric F. Lambin & Meyfroidt, 2010), many studies included planted trees in forest transition research. Likewise, the formation of tree cover in programs under the UNFCCC include both native forests and tree plantations. However, it is important to keep in mind that tree plantations and natural/native forests are ecologically disparate. Compared to natural forests, tree plantations are often identified with lower biodiversity, lower carbon sequestration potential (Hall, Holt, Daniels, Balthazar, & Lambin, 2012), more erosion, higher evaporation rates and a lower water flow in catchment streams (Van Holt, Binford, & Portier, 2016). Thus a net increase in tree cover from expanding tree plantations and declining primary forests can result in distinctly different ecosystem services supply.

Last but not least, the acceleration of modern day globalization reinforces the outsourcing and displacement of international land use via trade in timber and agricultural products. Globalization thus plays a role in the forest transition process. Countries can reach forest transition sooner by importing more (legal and illegal) timber and agricultural products instead of utilizing their own lands. This would potentially lead to a displacement of deforestation and forest degradation in neighbouring countries. Similarly, the availability of cheaper products from abroad can also undermine a country's efforts in reforestation and forest management in depleted forest lands (Patrick Meyfroidt & Lambin, 2011).

3 Policy instruments in forestry governance

The economics of forestry are about the interactions between human activities, forests and forest ecosystems (Hyde, 2012, p.13). In the process of global population growth and trade liberalization, it has been proven that human activities are the main driver of landscape change and the main cause of subsequent greenhouse gas emissions from the forest sector (Nabuurs et al., 2007). Environmental policy instruments in tropical forest governance aim at halting and reversing this trend of deforestation and forest degradation in the tropics, while maintaining the sustainable supply of timber, forest products and other ecosystem services. They alternate behaviour in more environmentally conserving ways through providing incentives for actors contributing to environmental degradation and over-burdening ecosystems. These actors include producers, resource users, intermediaries, developers, consumers and government entities (Stewart, 2008, p.148).

As such, the environmental economics literature in general considers policy as government intervention that aims at internalizing negative external effects (Baumol & Oates, 1988; Pigou, 1920; Sterner & Coria, 2012). The subject matters of policy regulation include three common groups: products (e.g. characteristics, use and disposal); product and process methods (e.g. manufacturing, resource extraction and agriculture) and other types of resource use, consumption or development. The objective of a regulatory programme can be to protect specific resources (e.g. tropical forest, wetlands, atmosphere, endangered species) from external stresses or to aim at controlling the specific stressor, such as pollution, development or consumption activities (Stewart, 2008, p.148). Policy instruments used in international forest governance, are typically categorized into two broad command-and-control [92] and incentive-based (economic) instruments. Some literature often adds private/self-regulation or persuasive/information instruments as a category (Costanza, Cumberland, et al., 2014; Gupta et al., 2013; Hyde, 2012; Sterner & Coria, 2012; Stewart, 2008). This research thus places an environmental policy instrument for forest governance into: command-and-control, private and self-regulation and incentive-based instruments,[93] which may all be designed to achieve certain environmental quality goals or defined limits on environmental stresses or pollution.

The command-and-control regulatory model has been widely used by the industrialized countries since the late 1960 and early 1970s as the awareness for environmental protection increased (Gunningham et al., 1998, p.38). In particular, the United Nations Conference on the Human Environment in Stockholm in 1972 was viewed as the outset of global environmental regulation. Command-and-control was the predominant legal discourse that shaped early environmental policy formulation. However, by the late 1970s, the command-and-control regulation in many cases appeared to be ineffective and insufficient (Arts et al., 2010).

The market self-regulation and voluntary policy instruments were advocated in the 1980s. They fitted into the neo-liberal trend to strongly rely on the beneficial effects of market mechanism. Market-based environmental instruments were assumed to be more efficient and effective than the top-down regulatory system

[92] The command-and-control is also referred to as regulatory approach. (Costanza, Cumberland, et al., 2014, p.234) distinguish two terms by indicating that command-and-control terminology is more appropriately used in central planning for an economy rather than used for a substitute of environmental policy instruments. They also maintain that command-and-control is often used by those who disapprove of it. Nonetheless, in this thesis, the term command-and-control follows the use by Gunningham et al. (1998). It does not have the above implications but simply used as an interchangeable term for regulatory approach.

[93] There is no particular logic or rationale in the order of introducing these types of instrument. Literatures present them in various order, see for example Gunningham et al. (1998), Stewart (2008), Ring & Barton (2015) and Hyde (2012).

(David Osborne, 1992; Humphreys, 2012). Even though the traditional command-and-control does have its merits in mitigating environmental degradation in various aspects, it was downplayed by the hegemonic discourse on neo-liberalism at the time (Gunningham et al., 1998). The international soft law instruments on forests, namely Chapter 11 of Agenda 21 and the Forest Principles[94] were established against this background in 1992. These voluntary rules were over time further developed into criteria and indicators for sustainable forest management, and eventually also influenced the forest certification approach as a non-state market driven governance model.

Meanwhile, incentive-based instruments also have increasingly played a prevalent role in both public and private forestry institutions (Gunningham et al., 1998; Maguire, 2013). These instruments or policy measures take a variety of forms. They attempt to strengthen or modify the incentives (positive or negative) held by resource managers in order to motivate the conservation and restoration of tropical forests, while fulfilling broader socially desired objectives, such as production and allocation. As self-regulation and incentive-based instruments have often not performed in the way which policy makers intended, Gunningham and Grabosky (1998) therefore promoted another regulatory approach, termed "smart regulation", which has received substantial consideration in the scientific policy literature. Smart regulation refers to using cleverly designed policy instrument mixes as solutions to complex environmental problems. The combination of instruments can include public, private, voluntary and incentive-based policy measures.

The main research question we are examining in this dissertation concerns deforestation and forest degradation in the tropics and its resulting impacts, including climate change, biodiversity loss, threatened ecosystem services, the exploitation of common resources and other spill-over effects. Although these negative impacts are generated at the local level, they cause detrimental influences at international, and regional, as well as local scales. However, as the tropical forests fall under the jurisdictions of the countries where they grow, it is not likely that an international body would have direct authority to regulate actors involved. These dimensions of global and regional impacts caused by local actions add complexity and raise distinctive issues associated with instrument choice. Typically, states would first agree to an international arrangement on certain obligations to protect the environment, and then implement them through domestic regulatory measures (Stewart, 2008, p.161-162). Thus although the policy instruments discussed in this section have global implications, they are principally under the control of certain states. Nonetheless, regulations and policies applied by these states may often be affected by the international agenda. Private and self-regulation are on the other hand, by their nature, a different group

[94] See Chapter 2, Section 3.1 for more details on Chapter 11 of Agenda 21 and the Forest Principles.

of instruments. A significant amount of tropical forest risk commodities (e.g. timber, pulp and paper, palm oil, soy, etc.) are traded internationally and hence their production, manufacturing and consumption are governed by multinational corporations to a large degree, rather than by a given country.

The remainder of this section is divided into three sub-sections to introduce the three main categories of policy instruments used in forestry governance. Sub-sections 3.1 and 3.2 focus on the command-and-control and private self-regulation. Afterwards, in sub-section 3.3, a definition of "incentive-based instrument" and a brief classification of it are introduced, then followed by a succinct review of a few incentive-based policy instruments that are prevalent in forest policy. They include property right-based approaches, market creation subject to the public good benefits, fiscal and financial instruments, charges and payment for ecosystem services. Some of them are directed to the use of products and its consumption, and some of them are directed to product and process methods, such as resource extraction, manufacturing and agriculture. Lastly, in Section 4, the importance of mix or a combination of policy instruments is discussed.

3.1 Command-and-control instruments

Command-and-control instruments are also known as regulatory instruments. Regulations are normally adopted by government authority in the form of binding absolute physical standards (including performance-based and specific process-based standards)[95] with no market component, for instance a quantitative limit on water or air pollutant emissions and subsequent penalties when applicable. Usually different sectors are compartmentalized, such as land, waste, air and water. Thus different industries and natural resources have separate regulations (Gunningham et al., 1998, p.39). At the global scale, international law and multilateral environmental agreements provide the regulatory architecture for global endeavours, such as the UNFCCC and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). These agreements are normally not just legal tools but offer financial support and technical guidance for ratifying countries. There are also bilateral trade agreements such as the Voluntary Partnership Agreements of the EU Forest Law Enforcement Governance and Trade (FLEGT) action plan, using trade restrictions as measures targeting illegal timber.

Command-and-control regulation is noted for its dependability (Gunningham et al., 1998). For the reason that it is rather straightforward to enforce the law when

[95] Performance-based standards mandate the environmental result or goal to be achieved but not the means used. Specific process-based standards mandate the means that actors must apply with the objectives of limiting or preventing the amount of pollution or other external stress (Stewart, 2008).

there are breaches of legal standards. It also offers legitimacy, surveillance and enforcement mechanisms (Skjærseth, Stokke, & Wettestad, 2006). In fact, Porter maintains that stringent regulations and compliance requirements can motivate technological innovation and thus strengthen international competitiveness (Porter, 1998). Nevertheless, command-and-control can be rigid, non-inclusive, inflexible, slow to respond to societal changes and favouring bureaucratic, hierarchical systems. It is also costly to enforce and monitor as authorities need to have comprehensive and accurate information of the industry that is being regulated. In addition, command-and-control lacks incentives for actors to go beyond compliance and to make continuous improvement (Costanza, Cumberland, et al., 2014, pp. 234-239; Gunningham et al., 1998, pp. 41-47).

In terms of forest governance, national regulations can encompass both supply side and demand side at various operational levels. At the commodity consuming or processing demand side, there is legislation addressing illegal timber or wildlife products, such as the US Lacey Act, the EU Timber Regulation and Australia's Illegal Logging Prohibition Act.[96] On the supply side, forest regulations that aim at better managing or reducing forest commodity's provision frequently include: logging concessions, restrictions on destructive harvesting techniques (such as clear-cutting), rules for shipment, usages of herbicides and pesticides, and requirements for reforestation and silvicultural practices, decentralization, spatial planning laws, moratorium, information reporting, monitoring and surveillance, and strengthened law enforcement, etc. (Gupta et al., 2013; Hyde, 2012).

There are cases where command and control regulations are successful in curbing unsustainable forestry or forestry related agricultural practices. For example, between 2005 and 2012, Brazil reduced its deforestation rate by 70% through strengthened law enforcement, expanding conservation areas, and interventions (e.g. moratorium) in soy and beef supply chains (D. Boucher, Elias, Faires, & Smith, 2014; D. Nepstad et al., 2014).[97] Nonetheless, command and control regulation is sometimes criticized for its limited effectiveness due to the use of uniform standards as well as higher administrative costs (Gunningham et al., 1998, pp. 44-46). Thus in order to achieve better policy outcome, regulations are often hard to be separated from other types of instruments, such as land rights, subsidies, taxes and charges, or forest certification required by public procurement etc. In fact, in general, effective enforcement of many incentive-based instruments relies heavily on regulations (Cohen, 2004). Table 3 lists some of the common regulations used in forest governance. These plentiful regulations are not discussed in detailed here but some of them are examined in the following

[96] See Chapter 2, Section 3.3 for more details and information regarding bans in illegal timber and timber products.

[97] For example, in Brazil, farmers that were identified as causing illegal deforestation lost access to bank credits and accounts (Bregman, 2015).

Chapters together with other incentive-based instruments according to the topic of focus in that specific Chapter.

Table 10: Common regulations for forest governance

Regulation	Examples
Trade restrictions	Banning trade in illegal or unsustainable timber and timber products
Binding forest rules	Reforestation requirements, sustainable forest management prescriptions, silvicultural practices prescriptions
Spatial planning	Protected Area, coordinated national land use planning, zoning regulations, habitat protection
Restrictions on specific activities	Log harvests and shipments, use of pesticide and herbicide, clearcutting, streamside management
Permit requirements	Concessions, sustainable forest logging, performance bonds
Reporting, monitoring, surveillance requirements	Illegal practice or sustainable practice reporting and monitoring
Decentralization	Adjusting policies to local circumstances and needs
Land rights	Establishing land rights, recognition of existing rights, defining the bundle of rights among actors
Law enforcement	Punishing illegal practice

Source: adopted from Gupta et al. (2013, p.120) and Hyde (2012, p.43)

3.2 Private and self-regulations

Private standards differ from public standards in two main aspects. First, the standards are mostly aimed at business organizations. They are market-oriented instruments directly targeting producers. Second, private standards are not primarily regulatory. They attempt to alter behaviour via a complex mix of incentives instead of depending on external, deterrence-based enforcement. Organizations typically adopt private standards as a result of market or reputational incentives (Morrison & Roht-Arriaza, 2007). Additionally, self-regulations can be described as "a process whereby an organized group regulates the behaviour of its members" (Gunningham et al., 1998, p.50). This category of regulatory instruments is very often discussed together with volunteerism and information-based approaches, since they all leave the regulatory flexibility to actors in determining the environmental goal and means for attaining it (Stewart, 2008, pp.152-154). The private, self-regulations, together with the incentive-based instruments in the next sub-sections, are in general more flexible compared to command-and control regulations. They can serve as precursors and intermediate steps that provide grounds for command-and-control; as gap-fillers and/or technical basis for public regulation; as time to show that industry can solve the problem and that public regulation is unnecessary, or they can also strengthen

command-and-control by augmenting implementation (Morrison & Roht-Arriaza, 2007). Furthermore, more ambitious, precise targets and norms are sometimes more easily achieved than the hard, binding regulations. Nevertheless, private, self-regulations and incentive-based instruments can possibly lead to more uncertainty and, especially for the private regulations, the legitimacy issue is often unclear. Additionally, participatory and collaborative processes can be time-consuming and costly (Glück et al., 2010).

In this sub-section, self-regulation, private voluntarism, guidelines and standards promulgated by NGOs or corporations and informational instruments are grouped under this category. Private and self-regulations here can include industry level self-regulation, [98] voluntary actions by individual firm or landholder, education and training, information disclosure, product certification and corporate environmental reporting. The product certification scheme is especially important in the global forest governance regime and thus will be discussed in detail in the remainder of the sub-section.

In theory, private and self-regulation can react more rapidly and provide better flexibility, efficiency and sensitivity to market changes (Gunningham et al., 1998, pp. 50-56). The industry itself consists of the practitioners who have detailed information and knowledge within the industry thus arguably, offering more practicable and efficient standards. Moreover, private and self-regulation normally contemplates ethical codes of conduct that go beyond the law. Together with the utilization of peer pressure, this could potentially uplift the environmental standards of business behaviour substantially (Gunningham et al., 1998, pp. 50-69). Nonetheless, in practice the theoretical promise is often not met. In contrast, especially when significant gaps exist between the public and private interests, private and self-regulation typically serve the interests of industry at the expanse of the public. These standards are usually relatively weak and lack accountability, credibility, enforcement and sanctions. Thus environmental organizations or other public interests groups frequently place external pressure on the industry by exposing their impaired images from undesired environmental performance, which may adversely affect their commercial advantages. The strength of these external pressures and independent oversight exercised by third parties can determine the effectiveness of private and self-regulation.

[98] Such as nation-wide forest management certification system

3.2.1 Certification schemes

International, private voluntary certification schemes developed through multi-stakeholder processes have emerged as one of the most popular mechanisms for creating market demand and preference for (socially and environmentally) sustainable goods. Building on the economic literature of information,[99] standards, certification and labelling are designed with the attempt to modify the market failure resulting from information asymmetry (OECD, 2011), in particular for credence goods.[100] Under the certification scheme, certifiers supply information to the industry and final consumers. Certified products fulfil a certain set of standards/principles that are verified by an independent third party. When buyers value or desire these revealed attributes (e.g. sustainable production method or legality) behind products, this change in expected purchasing behaviour provides economic incentives for actors along the supply chain to engage in the scheme. Moreover, it can stimulate profitability of a product via improved supply chain management, better efficiency, a price premium and possible greater market access (Rautner et al., 2013). Thus certification schemes can potentially influence every stage of the supply chain. Over the past decade, the production processes of a few key commodities such as timber, palm oil, soy and fish, have taken part in the certification mechanisms that are either initiated by civil society, business industry (typically voluntary), or at times by public sectors.

The certification schemes come in different forms. The two main approaches are the one exemplified by the Forest Stewardship Council (FSC), and the other - commodity-based round-table. The first approach focuses on standards development that aims at reassuring consumers about the higher production standards and thus creates a niche market. Sustainability certification of timber and timber products serves as a means to increase demand for such merchandises in an environmentally conscious market. In this kind of market, consumers are willing to pay a premium for certified products and thus provides incentives for more sustainable forest management practices (Richards, 2000). The landowners seek to join a certification scheme when they perceive that the advantages of obtaining the certification offset or outweigh the costs either through a price premium, an increased market share, a more secure access in the future to an existing market or more opportunities for new markets entrance (Hyde, 2012).

The other more recent approach, the commodity roundtable, such as the Roundtable on Sustainable Palm Oil (RSPO), is a business partnership model that focuses on greater industry participation throughout the broader array of the supply chain from the beginning. So the major leading companies (multinational

[99] In particular referring to the work of Akerlof, Stigler and Stiglitz. See for instance (Stigler, 1961), (Akerlof, 1970), (Stiglitz, 2002) and (Nobel Prize Committee, 2001).

[100] Credence goods are those whose product attributes cannot be observed or evaluated by the consumers even after purchasing (Dulleck, Kerschbamer, & Sutter, 2011).

buyers) can be involved and participate in the process and lead to possible market transformation (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012). Roundtables often use a "pre-competitive" approach to exclude non-certified products or raw materials in the supply chain as a measure contrary to post-competitive market selections by conscientious consumers. The concept of the pre-competitive approach enables companies to cooperate as a group due to the reputational risk associated with raw materials that needs to be addressed at the industry level. Unlike timber, commodities like soy bean and palm oil are not sold in the market directly as (relatively) single-component products but usually as one ingredient in numerous retail products, and therefore it is harder to apply a consumer labelling approach (D. C. Nepstad, Boyd, Stickler, Bezerra, & Azevedo, 2013). In addition, some agricultural commodities (e.g. soy and palm oil) are dominated by a relatively small number of processors and traders in comparison to the timber industry, which is advantageous for a round-table approach.

Another main difference between the "consumer choice" standards (such as FSC) and roundtables is that the former one usually sets a higher performance bar from the very beginning, while round-tables set a lower bar for the initial performance and then become more stringent over time (D. C. Nepstad et al., 2013). This important difference along with the pre-competitive approach affect the implementation rate of these certification schemes. As one can imagine, round-tables, especially RSPO, have a quicker and broader adoption rate than FSC (Rautner et al., 2013). However, as a result, there exist constant concerns for the validity and rigorousness of these standards developed by roundtables (Steering Committee of the State-of-Knowledge Assessment of Standards and Certification, 2012). The remainder of this sub-section briefly introduces forest certification for timber and pulp in order to provide a better understanding of certification schemes. More detailed discussions on the round-table certification schemes for palm oil are presented in Chapter 4.

Forest certification is a popular voluntary instrument developed by non-state actors in the 1990s after the failure of reaching a consensus for an international forest convention in the United Nations' Earth Summit. A certification system provides the consumer information on the product regarding whether it meets certain standards. Forest certification, for instance, creates performance-based standards that are inspected and certified by an independent third-party. The inspection is based on the evaluation of the management process and on the verification of the forest products' chain of custody from the producer to the end-user.[101] Forest certification has increasingly become a vigorous source of standard

[101] The performance-based approach is mainly developed and used by the Forest Stewardship Council. The Program for the Endorsement of Forest Certification and other certification program have different systems.

setting and governance in this realm (Auld et al., 2008). Essentially, forest certification is not a part of government policy. However it is widely advocated and could possibly be included in policies in the future. In principle forest certification creates non-regulatory and market incentives for sustainable forest management. Therefore it has the potential to overcome the problem of limited political will and weak institutions in developing countries and catalyses dissemination of technological information on the best management practices. Moreover, it can also shape comprehensive coverage of social environmental preferences and standards in both private and public sectors (Blackman, Raimondi, & Cubbage, 2014).

The major international forest certification programs include the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification (PEFC), and the Sustainable Forestry Initiative (SFI), account for 23%, 38% and 17% of the market shares respectively (Fischer, Aguilar, Jawahar, & Sedjo, 2005). There are 84 countries with public forests certified by FSC, around 36 countries (mainly in Europe) with public forests certified by PEFC schemes and SFI applies principally only in the United States and Canada. FSC certified forest area covers around 194 million hectares and PEFC covers around 304 million hectares (due to its endorsement of national or subnational forest certification schemes) (FSC, 2017; PEFC, 2017).[102] The mass majority of certified forest areas are located in North America and Europe, but developing countries account for merely 8% of the total certified forests (2% in Asia, 3% in Latin America and another 3% in Africa). Among these rather small certified areas in developing countries, FSC has the highest penetration of which 15% of its certified forests in developing countries (one-third of commercial plantations and the other two-thirds for natural forests) (Fischer et al., 2005; FSC, 2017).

The rather low percentage of certified timber in tropical and developing countries shows that the validity of certification is precarious for loggers, landowners and small producers at the first two stages of forest development and transition in those areas. In addition, the large share of unsustainable managed forest products also poses higher monitoring costs or weakens the reliability of certification (Guariguata, 2011). Therefore the successful implementation of certification requires a downturn in extractive activities at the forest frontier. To make this happen, certification should be accompanied by policies with the following targets for instance (Hyde, 2012): a growth in production from managed forests at the third stage of forest transition; uses of improved wood-saving technologies in mills; a reduced demand in wood products; and harvest restrictions and reforestation requirements, etc. While there are still challenges to be addressed

[102] Data on FSC-certified and PEFC-certified forest area and the number of countries can be found on FSC and PEFC's official websites respectively with latest updates.

and resolved, forest certification will continue to be an important instrument for global forest policy.

3.3 Incentive-based instruments

This dissertation applies the definition by Panayatou (1994, p.7) which defines incentive-based instruments[103] as "[a]ny instrument that aims to induce a change in behaviour of economic agents by internalizing environmental or depletion cost through a change in the incentive structure that these agents face (rather than mandating a standard or a technology)." Stewart (2008, p.151) describes economic incentive-based instrument systems as those that "impose a price or opportunity cost on each unit of pollution, waste, stress, or resource consumption by regulated actors." An incentive-based instrument is typically considered as a tool that promotes better efficiency, cost-effectiveness, technological innovation, flexibility and adjustability (Panayotou, 1994; Wiener, 1999). These potential advantages include raising public revenue, signalling pollution-intensive products to consumers, and moving the monitoring burden from the government to polluters etc. (Costanza, Cumberland, et al., 2014). It is worth considering that most incentive-based instruments necessitate the state to set standards, and on top of that use incentives and markets to drive agents towards compliance, which might be higher than the standards reached by command-and-control (Cohen, 2004). Furthermore, incentive-based instruments count on substantial groundwork of government regulation for their effective enforcement and monitoring. This is also to say that the command-and-control regulatory approach itself has a significant role in governing forestry.

The proponents of a more extensive use of incentive-based instruments argue that incentive-based instruments are important to off-set or correct the following market failures: externalities (in particular pollution), open-access resources, inadequate provision of public goods (due to " due to the fact that they cannot be excluded or depleted), poorly defined property rights, uncertainty and incomplete information, and myopic time discounting. Thus they should be applied as alternatives or supplements to command-and-control regulatory policies. Nonetheless, incentive-based instrument also have their concerns related to distribution and equity issues and limitation of scientific information (Costanza, Cumberland, et al., 2014, pp. 239-247).

While there is no harmonized classification, Table 11 attempts to classify incentive-based instruments in the context of nature resource management, adopted from Panayotou (1994) and Richards (2000). However, the classification

[103] Incentive-based instruments are very often used interchangeably with economic(-incentive) instruments or market-based instruments. Here the term "incentive-based instrument" is used throughout this dissertation for the sake of consistency.

shown here is no more than a way of understanding the meaning of incentive-based instruments used in this dissertation. There exist different terminology and other valuable ways to classify different approaches, depending very much on the disciplines. Likewise, the boundaries between these categories are not clear-cut and moreover, depending on the context, it is not always clear what is regarded as an instrument (especially when there are multiple rules combined together). Many instruments fall into more than one single category or in combinations, e.g. tradable development rights and concession bidding are also market creations; carbon offset trading is also both a property right-based and a quantity-based approach; forest certification is also both a voluntary and a price-based instrument, and so forth. This sub-section selects four broad groups of the most discussed incentive-based instruments and examines them in detail. They are property right-based approaches; market creation subject to public good benefits; fiscal instruments, charges, and financial instruments; payment for ecosystem services.

Table 11: Classification of incentive-based instruments for tropical forestry

Property right-based approach[104]	- Ownership rights: ▪ Land titles ▪ Water rights ▪ Mining rights ▪ Tradable development rights/quota ▪ Intellectual property rights	- Use rights: ▪ Community usufruct rights ▪ Overlapping property rights ▪ Stewardship ▪ Licensing ▪ Concession bidding
Market creation subject to public good benefits	- Water commoditization eco-tourism charges - Carbon offset/emission permit trading - Tradable catch quotas	- Tradable water/resource shares Forest certification - Fair trade - Bioprospecting deals
Fiscal instrument	- Pollution taxes (effluent, emission) - Input, product, export taxes - Import tariffs - Ecological Fiscal Transfer	- Differential taxes - International timber trade taxes - Other international taxes
Charges	- Pollution, user, betterment, administrative charges	- Impact, access fees - Road tolls
Financial instruments	- Soft loans, grants - Location/relocation incentives - Favorable interests rate	- Hard currency at below equilibrium exchange - Debt-for-nature swaps - International funds

[104] The ownership rights and user rights here are just to distinguish between two main types of property rights shown in the table. There are more detailed land user types and bundles of rights in the relevant literature, for example, see (Schlager & Ostrom, 1992). However their detailed contents are outside of the scope in this succinct review.

	- Revolving fund - Preferential procurement - Sectoral funds	- Area-based payments to forests managers
Performance bonds	- Environmental performance bonds (e.g. forest management) - Land reclamation bonds (e.g. mining)	- Waste delivery bonds - Environmental accident bonds (e.g. oil spill)
Liability instruments	- Legal liability - Non-compliance charges - Joint and several liabilities	- Natural resource damage liability - Liability insurance - Enforcement incentives
Others	- Payment for ecosystem services - Removal of perverse incentives	

Source: author's own illustration adopted from Panayotou (1994) and Richards (2000)

3.3.1 Property right-based approaches

Compared with some classic policy instruments, such as subsidies, taxes, permits, bans and zoning, limits and standards (etc.), property rights are considered as a more subtle type of policy instrument (Bromley, 1991). The very nature of property rights constitutes a relationship between the natural environment and human beings (Bromley, 1989). The value and importance of the establishment of property rights are closely linked with the progress of different types of scarcity (Hanna, Folke, & Maler, 1996).

Property rights in land and resources can be defined as a bundle of rights that include assess, use (withdraw), management, exclusion and alienation (to sell or lease the above mentioned rights) (Schlager & Ostrom, 1992). In general, "owners" are not the only users of the resources. For example, (Schlager & Ostrom, 1992) distinguish users of a resource system among owner, proprietor, claimant, and authorized user with different degrees of rights holdings. One of the important differences between ownership rights and user rights, for instance, is the certainty or control a user or owner has over the resources. Resource users who only have use rights (whether temporary or long-term) would face different incentives, both negative and positive, from the actual resource owners. Or in another situation, when externalities are mostly restricted at local level, communal property (ownership) rights combined with private use rights that are governed by a cohesive community, could internalize external cost with better efficiency (Panayotou, 1994).

Here in this research the broadly defined property rights include not only land ownership, but also the recognition of existing property rights and removal of barriers for creating new ones; leases of public land for various uses; unbundling land ownership and land-use rights; minimum interruption of firms or individuals

on the usage of their properties; and granting the trade between various conservation and resource rights (Gunningham et al., 1998, p.84).

The property rights regimes in land are generally classified into four types by the sort of ownership and the strands of property rights bundle (Bromley, 1989; McCay & Acheson, 1987; E. Ostrom, 1990). These four forms of property regimes are private property, common property, government property and open-access (non-property), as depicted in Table 12.

Table 12: Types of property rights regimes

Property rights regimes	Ownership
Private property	Individuals or firms who can exclude others
Common property	A group or collective users who can exclude others
Government property	State (citizens) that can regulate or subsidize use
Open access (nonproperty)	None, absence of enforced property rights

Source: (E. Ostrom et al., 1999)

The dynamics of the open access regime are fundamental to the tragedy of the commons. When treasured common pool resources fall under an open-access regime, probable degradation and destruction are the outcome (E. Ostrom, 1990). The Demsetz hypothesis (previous mentioned in Section 2.1, the importance of exclusive control that is enforced via private property rights) has been empirically tested (Lueck & Miceli, 2007), and supported by many studies, however, in some cases, property rights did not emerge. In those cases, the problem of open access either continued to run its course towards the tragedy of the commons, or alternative rules were developed, often based on command and control regulation, or alternatives to private property, such as common property.

In the literature, common property is viewed as an intermediate case between open access and private ownership (Lueck & Miceli, 2007), which allows the use of economies of scale in enforcing the exclusive rights to the asset. In certain respects, some researchers hold that common property resources management appears to be a preferable institution principally for common pool resources (Baland & Platteau, 1996; Migot-Adholla, Hazell, Blarel, & Place, 1993; E. Ostrom, 1990; Stevenson, 1991). Furthermore, they maintain that an adequately designed and properly functioning common property resource features as private property (Baland & Platteau, 1996; Migot-Adholla et al., 1993; E. Ostrom, 1990; Stevenson, 1991). An example is the increasing trend in which the state has insufficient capacity to manage open access forest and therefore has assigned long-term usufruct rights to support community-based sustainable forest management (Agrawal & Ostrom, 2001; Arnold, 1998).

In addition, there are also approaches such as partial privatization and overlapping property rights. The former allows partial private exploitation/use of forest products and services, while the government retains control over public good services protection (Bass & Hearne, 1997). Overlapping property rights or user permits can be designed for different services and goods in the same forest area and can be traded for the purpose of efficient allocation (Richards, 2000). Another group of property-based approaches is using more intangible rights of the resources or ecosystem services as incentives, such as forming water rights, carbon rights, development rights and intellectual property rights over the genetics resources in certain ecosystems. This group of approaches is often used in combination with market-based instruments. It is worth noting that these approaches would require strong administrative and regulatory capacity from the state.

Last but not least, it is not possible to determine one single type of property rights regime as a remedy for resource depletion or degradation (Dasgupta & Heal, 1974). Different property rights regimes exist in combinations along the spectrum from private ownership to open access. More specifically, effective control of resources relies upon well-defined, context-specific and enforceable property rights regimes (Hanna, Folke, & Mäler, 1995).

In general, it is widely accepted that insecure (weak/ill-defined) land tenure and property rights[105] restrain investments in the long-term and valuable productive measures in the forestry or land improvement (Gunningham et al., 1998, p.70; Naughton-treves, Robinson, & Holland, 2011). For the reason that the resource owner or user might face a higher discount rate or a myopic time horizon due to limited capital access (Panayotou, 1997). Thus the secure allocation of private or common property rights or the assurance of protected property rights, is considered as a remedy to the free-riding problem and can better facilitate contractual arrangements and a lower discount rate from resource managers (Faure & Skogh, 2005, p.64; Soberon, Quadri, & Villalon, 1997).

Nevertheless, it is important to keep in mind that a secure property right or land tenure does not guarantee sustainable forestry nor solve the externalities problem. Land reforms that provide higher tenure security also increase the net present value of land conversion (Arild Angelsen, 1999; Araujo, Bonjean, Combes, Motel, & Reis, 2009). For example, secure tenure can enable resource owners to consider the potential future value when making decisions. In some cases, this could induce more sustainable management practices, but it could also lead to investment in

[105] Land tenure and property rights can actually be used interchangeably. Here in this research, to be more specific, property rights refer to the bundle of rights (access, withdraw, management, exclusion and alienation) and land tenure refers to a set of property rights in land and those policies and institutions that determine how the land and the resources are owned, accessed or used at the local level (Bruce, Wendland, & Naughton-Treves, 2010).

agricultural business which is often associated with forest cover clearing. Thus in fact it is not clear whether improvements in tenure security have positive or negative effects on forests.

Despite the complexity and the context dependent characteristic of land property rights, secure and clear land tenure and property rights commonly act as a firm underpinning for enabling effective implementation of other catalysts (e.g. market creation). However, the laws and the distribution of land rights to forests and resources in many developing countries are often unclear, incomplete or poorly enforced (Rayner, Humphreys, et al., 2010). Hence in many cases public measures to secure and clear land tenure and property rights, as well as the establishment of decision-making processes and institutions are the most essential conditions for the solution of forest governance. Moreover, when it is combined with adequate economic incentives, forest conservation or sustainable management can then become a potential fair investment option (Richards, 2000). For example, the security and clarity of land property rights can lower financial risks of both private and public investments (e.g. REDD+ or other agricultural productivity projects) and facilitate longer term strategy, management or project planning. Notwithstanding, land tenure reform (clarification) that confers or enhances more robust rights on the holder, might require strong political commitment, because it can be a time consuming and expensive legislative process and moreover requires long-term investment in consistent monitoring and enforcement afterwards (Rautner et al., 2013).

3.3.2 Market creation subject to public good benefits

The approach that mimics a market or creates a market for the desired environmental quality is to assign a kind of "use right" (the right to treat the environment as a waste sink), which can be priced and traded. The aggregated allowable assignment and allocation of the rights to use the environment are established below current emission levels so as to create an artificial scarcity and specify shares for parties. This requires regulatory authorities controlling a total amount of tolerable activities. Pricing and trading the limited number of use rights would facilitate more rational and efficient use of the finite assimilative capacity of the environment (Panayotou, 1994). These kind of tradable emission permit(quota) systems allow a regulatory body to solve the missing market component in an environmental problem, which enables users to negotiate solutions upon the property structure established by regulator (Swanson, 1995). This surrogate permits market has been widely applied in air and water pollution, as well as greenhouse gases.

Theoretically, compared to direct regulation, the use of market creation provides firms and users with greater flexibility in adjusting responses according to their circumstances, given the assumption that firms can better identify appropriate

moves than regulators due to information availability. Thus different degrees of marginal abatement cost between firms can all be exploited effectively (Gunningham et al., 1998, pp.71-74). In addition, government would still maintain effective control through determining the overall allowable level of activities with strong enforcement. However, in practice, there are some difficulties. These include the complexity in finding a rational basis to allocate permits; difficulties in enforcement and monitoring when there are numerous disparate, small, mobile or non-point sources of pollution; difficulties in accounting transboundary effects; and problems in giving uniform permits to a mix of various pollutants (Gunningham et al., 1998, pp.71-74).

The system of forest carbon offset trading allows tropical countries to use their comparative advantages to provide environmental services to industrialized countries. Forest activities in the tropics that either directly sequestrate atmospheric carbon through plant growth or avoid carbon emitting from declining or deforested plants are considered as supplying the services of carbon storage. This primary service of storing carbon is then expected to generate carbon rights/credits that can be sold via carbon markets. The main international forest carbon market was developed by the UNFCCC, more specifically the Clean Development Mechanism (CDM) under the Kyoto Protocol and the Reducing Emissions from Deforestation and Forest Degradation (REDD+)[106] mechanism.

The CDM creates a system whereby Annex I Parties[107] to the Kyoto Protocol can choose to meet their GHG mitigation targets cost-effectively by investing in emission reduction projects in non-Annex I countries[108] that simultaneously contribute to sustainable development through technology transfer (Dutschke, 2007). The only forestry activities eligible under the CDM are afforestation and reforestation projects. Moreover, these projects only accounted for less than 1% of the total CDM projects by 2012, mainly due to complex rules, methodological difficulties and large uncertainties (Gupta et al., 2013). The restricted scope of forestry activity in the CDM has led to criticism of ruling out the largest carbon

[106] REDD+ (REDD-plus) includes (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forests; (e) Enhancement of forest carbon stocks.

[107] "Annex I Parties include the industrialized countries that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States." (UNFCCC, 2014a)

[108] "Non-Annex I Parties are mostly developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures." (UNFCCC, 2014b)

emission sources in developing countries, which are avoided deforestation, forests degradation, enhancement or protection of existing carbon sinks activities.

In 2005, REDD+ was proposed under the UNFCCC to fill this gap of the restricted scope of forestry activity in the CDM (UNFCCC, 2005). At its original design, REDD+ attempts to create financial incentives via carbon markets. The development of REDD+ has thus been one of the major focuses of the international climate negotiations, and attracted much attention as well as substantial amounts of finance. Many developing countries have prepared and started to implement their national REDD+ policies/strategies. Nonetheless, the precise contents of REDD+'s structure of behavioural incentives, the conditions of the payments and the purpose for which they will be utilized are largely determined in bilateral contracts and remain therefore rather vague. The decade long efforts of the REDD+ development show the significant challenges faced by forest carbon markets.

The carbon credits generated from afforestation and reforestation projects under the CDM are excluded from the EU's emission trading system (Dutschke & Angelsen, 2008) and almost all the carbon credits from REDD+ are solely used in the voluntary carbon markets (Simonet et al., 2014). The reason why the majority of the international compliance carbon markets hesitate to include these credits generated from forestry is because of their high uncertainties. These key challenges and concerns include the choice of reference level, leakage and displacement, additionality, social/environmental/procedural safeguards, difficult measuring, reporting and verification (especially for forest degradation) and the issue of permanence/reversals and liability assignment (A. Angelsen, Brockhaus, Sunderlin, & Verchot, 2012; Arild Angelsen & Wertz-Kanounnikof, 2008; Dutschke & Angelsen, 2008; Gupta et al., 2013; Sunderlin et al., 2014). So far, the GHG mitigation potential of a forest carbon market is yet to be further developed.

3.3.3 Fiscal instruments, charges and financial instruments

Fiscal instruments and charges mostly involve the principle of "the polluter or beneficiary pays" in their distributional rules. These instruments attempt to internalize external costs into private returns and modify economic behaviour (Richards, 2000). Instead of establishing property rights over unpriced or common resources, fiscal instruments and charge systems establish a price on these resources as an alternative way to internalize externalities and incentivize a more efficient resource use (Gunningham et al., 1998, p.75). In forestry, examples of these instruments are charges on water users to remunerate upstream landowners or taxes on fuel and petroleum as payments for the environmental services provided by forests in Costa Rica (Pagiola, 2008). Economic literature indicates that compared to command and control measures targeting the same

level of pollution reduction, taxes and charges enable industry to achieve the goal at lower costs (Baumol & Oates, 1988). This feature is similar to market creation, since these approaches can exploit dissimilarities in marginal abatement costs among firms and thus lower the total costs (Hamilton & Cameron, 1994). In general, the choice between tradable permits and taxes depends on some practical issues such as the number, size and location of polluters (Gunningham et al., 1998, p.75).

One of the main concerns for taxes and charge systems is the difficulties in assigning the correct level of amount to be taxed or charged. For the reason that policy makers might not have the necessary information or that policy makers are constrained or subject to business lobbying. The other concern emerges when the prices are rather inelastic with limited chance for substitution. In this way the imposed tax or charge might just be redirected to final consumers without significant environmental benefits. Lastly, there is the possibility that taxes and charges legitimize harmful environmental behaviour (Gunningham et al. 1998, pp.76-77; Maatta, 2006, pp.48-50). Additionally, difficulties in environmental taxes can also result from transboundary conditions and different tax jurisdictions.

Another approach is a differential land use tax, where land taxes (or fees through permits) can potentially dissuade deforestation or better manage forest degradation. For example, in Mali, the forestry legislation imposes a differentiated tax for exploitation of wood based on the types of ownership, forest surface area, transfer rights and quantities, etc. The revenue then goes into a fund and is reinvested in sustainable forest management (Kanoute, 2010; Maigi, 2001). A similar example can be found in the Farmland and Forest Land Assessment Act in Pennsylvania, where a preferential property tax program provides tax relief to encourage eligible landowners to operate, maintain or preserve their land as agricultural or forest reserves. Furthermore, in most of the cases, the land owner is liable for a roll-back penalty in case of land use changes (Jacobson & McDill, 2009).

Other approaches include user fees and forest pricing for state-owned forest. Examples include an entrance fee to the conservation/protected area, performance bonds and competitive bidding for forests concessions. The performance bonds require companies to deposit a refundable bond or lump sum before the concession, and the value of bond and interest will be gradually returned based on regular inspections of the concessionaire's good practice or after proper restoration. Thus the responsibility and costs of pollution control, monitoring, enforcement or even reforestation/restoration can be shifted to producers in advance to minimize potential damages (Panayotou, 1994). Likewise, by altering the short-term incentive to enduring forest management, the discounting issue of forest is resolved (Richards, 2000). In either of the above-

mentioned approaches, the institutional and administrative capacity of the public forestry sector is usually crucial to the success of these instruments.

Financial instruments can come in various direct or indirect forms, such as financial aid, revolving funds, subsidized interest rates, soft loans, or technical/advice assistance for forest management and free or discounted seedlings, which aim at saving costs for forest managers. The direct financial assistance (or forest incentive payments) provide monetary inducement to engage in a forest management program. For instance in China, the government dedicates a substantial amount of expenditure to a series of forest ecosystem compensation related programs, providing direct financial payments to eligible farmers for forest conservation or reforestation (Bennett, 2009). From the 1970s to the 1990s, a forest incentive program in Chile[109] reimbursed 75% of the costs to landowners one year after successful reforestation in its key provision. This program led to a substantial increase in private plantations and forest management that contributes to a strong timber production industry in the country (J. Williams, 2001). Technical assistance in general provides up-to-date information and technologies to local or community operations, such as advice on better logging techniques and land management options. The subsequent adoption of the preferred new techniques depends on, for example: whether the uncertainty is affordable to landowners; how rapid can the successful experiences be observed and the degree of cost saving of the new techniques (Hyde, 2012).

Another group of financial instruments is the various environmental international funds that transfer financial resources in a non-market fashion between countries (in general from developed to developing countries) in appreciation of the forest value as a global public benefit. The classic example is the Global Environmental Fund (GEF). GEF is an international financing mechanism for the UNFCCC and the CBD aiming at financing the incremental domestic expenditure of environmental protection projects (Richards, 2000). Nowadays, there exist numerous international funds for climate change and forest (in the context of greenhouse gas reduction) such as the Green Climate Fund, the Amazon Fund, the Carbon Fund of the Forest Carbon Partnership Facility, the Congo Basin Forest Fund, and so on. These funds mostly have specialized or focused regions and areas of expertise. However, the effectiveness of this type of instrument (such as its impacts on user incentives and underlying drivers) is still debated and discussed.

[109] (Forest law) Decreto Ley 701 (DL701), see https://www.leychile.cl/Navegar?idNorma=6294.

3.3.4 Payment for ecosystem services

Payments for ecosystem services (PES) is a relatively new tool (dating from the second half of the 1990s)(Haug & Gupta, 2012). It is designed to use economic incentives, based on voluntary transactions between parties, to establish a system in which the payments are conditional on continuously protecting, ensuring or improving the delivery of well-defined environmental services (Wunder, 2005).[110] The logic of PES is that those (local land owners and users) who provide environmental services for securing conservation or restoration to others are paid for this supply and those (external beneficiaries) who receive external benefits from environmental services pay for the provision (Wunder, 2007). Thus the contractual relationship can be between government agencies, individuals, firms, international non-governmental organizations, international development agencies and banks. The major advantages of PES is that it is able to use a monetary system whereby a payment takes place for ecosystem services without the need for an accurate valuation of those services given the difficulties of such valuation discussed in Section 2.2 in this Chapter.

The appealing features of using PES are that it should be able to generate its own financing, to potentially create a win-win sustainable situation with various co-benefits, and it is considered more direct and efficient (because it is negotiated and contracted directly and voluntarily between buyers and sellers who in theory have the most information). These features are especially reflected in direct user-financed PES programs, which are referred to as 'Coasian' since they resemble the bargaining solution discussed in the Coase theorem (Engel, Pagiola, & Wunder, 2008). The above are the PES concepts based on mainstream Coasian economics.

Alternatively, a definition of PES by (Muradian, Corbera, Pascual, Kosoy, & May, 2010) is also considered inclusive: PES is "a transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources (p.1205)." For instance, in the situation where property rights are hard to clearly define and enforce, transaction costs are high (Coase, 1960), and when the environmental services are public goods (such as biodiversity), government involvement might have to take place. In this way, the free-rider problem can be reduced and moreover, government can cost-effectively reduce transaction costs, through for example, economies of scale and existing administrative infrastructure (Engel et al., 2008). In many cases, the design of a PES system or program combines various incentive instruments, such as taxes, funds, market creation, subsidies or area-based payments.

[110] This definition is the most extensively cited literature. However, there are debates on different interpretations, but these are not relevant within the scope of this chapter. See for example (Karsenty, 2011), (L Tacconi, 2012), (Karsenty et al., 2016).

A variety of models came to be categorized under this common terminology, encompassing stringent market arrangements to nation-wide public policies. The majority of the PES schemes are building on negotiated bilateral agreement among parties without necessarily creating an actual market (Wunder, 2007). However, some PES schemes, especially for carbon sequestration, use markets as an intermediary for buyers and sellers. The new institutional economists consider markets as a platform where legal property rights are exchanged. As Coase expressed: "… what are traded on the market are not, as is often supposed by economists, physical entities, but the rights to perform certain actions (Coase, 1992, p.717)." Building on this, the transfer of property rights requires a shift in ownership of tangible assets, and the transfer of a service from seller to the client can be considered as based on an agreed working time (Karsenty, Ezzine-de-blas, Karsenty, & Pes, 2016), such as ecosystem services. Emission rights (or rights to harvest in forests, catching rights in fisheries) can be considered as transferable property rights, which allow holders to engage in certain activities and these rights are exchangeable on the markets.

To get a clearer impression of the workings of a PES scheme in practice, we consider here the example of Costa Rica. Costa Rica's PES program is a mixed system of economic and regulatory instruments, established in 1996. This programme results in more than 50% of the country's land area now being covered by forests (returned from a low of merely 20% in the 1980s). The scheme encompasses four main ecosystem services: atmospheric carbon capture and storage, water protection, biodiversity conservation and scenic beauty. Five categories of land use are applied: forest protection, commercial reforestation, agroforestry, sustainable forest management, and regeneration of degraded areas (Porras, Barton, Miranda, & Chacón-Cascante, 2013).

The program is primarily financed through a tax on fossil fuels. Other sources of funds come from the sales of water, biodiversity and carbon services to the private sector (voluntary agreements with private and semi-public corporations, such as hydroelectric plants, and revenue from carbon credits sales internationally), and bilateral agencies (such as the Global Environmental Facility) and international financial institutions (loans and agreements). The program is available for private landowners with property titles or possession rights over a minimum land area of one hectare. The national government acts as a buyer of these ecosystem services from private forest owners via the National Forestry Fund as the primary intermediary, which is in charge of the administration, commission, and technical support (Eurosite, 2011).

The most valued characteristic of the program is its "policy mix" approach, which includes the Forest Law,[111] annual presidential decrees, regulatory plans and the

[111] Costa Rica: Forest Law – N 7575, 1996. http://faolex.fao.org/docs/pdf/cos7778.pdf.

determination of buffer and conservation areas. These policy rules contain rewards and punishments for specific outcomes; required, allowed or forbidden actions at specific times, eligibility and exit rules defining holder and non-holder stances, etc. For its present funding, the program relies heavily on public revenues. However, it has engaged actively with the private sector and is seeking funding via voluntary, national and international carbon markets (Pagiola, 2008; Porras et al., 2013).

3.4 Summary

This section has discussed a number of policy instruments used in the forestry governance in three groups, both at international and national levels. The rationale for the instrument order here is quite simple. Command-and-control is typically the earliest and most prevalent instrument in environmental policy. Thus just as other literature in environmental instrument choice, it is listed as the first group. Private and self-regulation is listed right after command-and-control for the reason that it is the opposite of the public sector. As for the incentive-based instruments, they are listed last because in this research they include a wider range of actors and to a certain degree, a combination of instruments. Notably, this order does not imply any prioritized use of instruments as they all have different strengths targeting various stages along the supply chains. Before entering Section 4 on mix of policy instruments, Table 13 below briefly summarizes the environmental instruments for forests mentioned in this section.

Table 13: Summary of policy instruments used in forest governance

Broad category of policy instrument	*Examples*
Command-and-control	- Trade restrictions - Binding forest rules - Spatial planning - Restrictions on specific activities - Permit requirements - Reporting, monitoring, surveillance requirements - Law enforcement
Private and self-regulation	- Certification - Information and education - Volunteerism - Corporate social responsibility
Incentive-based	- Property-right based approach - Market creation subject to public good benefits - Fiscal instruments, charges and financial instruments - Payment for ecosystem services

4 Mix of policy instruments

Each category of instruments has its own strengths and weaknesses and serves different purposes. This indicates that securing global forest sustainability requires a wide and flexible use of policy instruments. In particular, forest ecosystems with a high level of biodiversity are complex systems. This complexity, which occurs at multiple spatial and temporal scales, needs to be taken into account when designing institutions to enhance and sustain forest common-pool resources. Ostrom indicated that contemporary policy analysis related to conservation mostly focuses merely on two groups of solutions to manage common-pool resources: the creation of market institutions and the creation of national agencies. The third option - a polycentric system[112] based on the law of requisite variety, has not received sufficient attention (E. Ostrom, 2013).

Interestingly, the Law of Requisite Variety echoes with another line of research on policy mixes. As shown by the PES program in Costa Rica, PES itself is a policy mix. The three main categories of instruments discussed in the last section: command-and-control, private/self-regulation and incentive-based (economic) instruments[113] provide global forest governance with a wide variety of instrument options. We should take advantage of mutually reinforcing and complementary instruments and institutions to establish encompassing strategies in response to the complexity in multiple tropical deforestation drivers. These contribute, for instance, to incentive-based instruments which are seldom devised and implemented alone but rather complement or build on preceding regulatory instruments in practice (Ring & Barton, 2015). Some instruments are introduced deliberately to enhance another instrument's outcome, such as using informational instruments to provide relevant knowledge to augment regulatory or incentive-based instruments. In some cases, incentive-based instruments are applied as a complement to regulatory approaches, such as financial aspects. This section mainly summarizes the classic literature on regulatory design principles and various instrument mixes analysed by Gunningham et al. (1998).

The notion of policy mix in environmental policy appeared in early publications by Gawel (1991) and Schwarze (1995), then followed by Australian scholars Gunningham & Young (1997); M. D. Young et al. (1996); O. R. Young (2002). Despite an increasing number of studies in different scientific domains using the term "policy mix", a coherent definition of policy mix is hard to find. A more general over-arching concept refers to the combination of a number of

[112] A polycentric system is an arrangement that combines numerous relatively autonomous local governance systems for certain common-pool resources with larger scale governance regimes (Ostrom 2013).

[113] Some literature also groups another category as persuasive instruments, including informational, motivational, educational, voluntary instruments, etc. (Gunningham & Young, 1997; Sterner & Coria, 2012).

instruments and their emerging, evolving and interacting processes that aims at achieving certain objective(s)[114] (Flanagana, Uyarraa, & Laranjab, 2011; Lehmann, 2010; Rogge & Reichardt, 2013). In the conservation area, a definition by (Ring & Schröter-Schlaack, 2011, p.15) can provide a rigorous idea for analysing policy mixes that is close to the subject of this research: "a policy mix is a combination of policy instruments which has evolved to influence the quantity and quality of the service provision for biodiversity conservation and ecosystems in the public and private sectors." The protection and conservation of forests are inherently dynamic and complex (OECD, 1999), which involves heterogeneous multiple objectives and the spatial features of public goods[115] at various governance levels engaging diversified actors. Thus in accordance with the economic theory on the Tinbergen Rule,[116] a combination of several instruments are required in order to address this multi-dimensional feature of deforestation and forest (ecosystem) degradation and to achieve a first-best optimum (OECD, 2007; Tinbergen, 1952).

4.1 Regulatory design principles

Gunningham et al. (1998: 387-422) identify five core regulatory design principles for optimal environmental 'smart' policy mix:.[117] The principles dicussed below are meant to be addressed in sequence.

- Principle 1. Prefer policy mixes incorporating a broader range of instruments and institutions
- Principle 2. Prefer fewer interventionist measures in the viable circumstances
- Principle 3. Ascend a dynamic instrument pyramid necessary to achieve policy goals

[114] (Flanagana et al., 2011) suggest that studies focus only on the combination of instruments without their interaction and emerging processes should refer to the term "instrument mix". However, some studies use these two terms interchangeably, for instance (Ring & Schröter-Schlaack, 2011).

[115] The spatial externalities refer to the situation that the benefits of forest conservation and protection normally accrue at national or global levels but the costs are ofttimes carried at local or subnational levels. Moreover, these costs in general are unevenly distributed between economic sectors and administrative units. Therefore these differences in the benefits and costs of forest conservation suggest using various incentive-based instruments as compensatory measures to reconcile the global benefits and local costs (i.e. among pubic or private sectors, individuals, business, or society, etc.) (Ring & Barton, 2015).

[116] The Tinbergen Rule states that for each and every desired policy objective, at least one policy instrument is required (Tinbergen, 1952).

[117] Here Gunningham et al. (1998:26) mainly define 'optimal' in terms of improved effectiveness (contributing to improving the environment) and efficiency (improving the environment at minimum cost, including administrative simplicity). In addition, they also take into account equity, fairness and political acceptability.

- Principle 4. Empower participants who are in the best position to act as surrogate regulators
- Principle 5. Maximize opportunities for win-win outcomes

Principle 1 reiterates that in most circumstances, a single instrument is not sufficiently resilient and flexible to address multi-faceted environmental problems. A systematic design of complementary instruments combinations can exploit the benefits and strengths of instruments and also involve a wider range of institutional actors. Principle 2 defines 'intervention' in terms of prescription and coercion.[118] The more coercive and prescriptive the instruments are, the more interventionist they are. Highly interventionist strategies rate poorly on efficiency, effectiveness and political acceptability. For the reason that highly coercive measures typically require significant administrative resources, and highly prescriptive measures are inflexible and unfavourable for low-cost solutions. In addition, those people who are regulated are more responsive to positive economic incentives while they may present more resentment and resistance from intrusive interventions.

Principle 3 continues the concept in principle 2 and proposes a regulatory enforcement triangular pyramid of escalating degrees of coercion from base to peak. The three dimensions of the triangular pyramid represent first parties (government), second parties (business) and third parties. The use of increasing coercion of instruments can occur at any face of the pyramid and not just for government actions. For instance, the Forest Stewardship Council (FSC) is an entirely third party-based quasi regulator. Moreover, the degree of coercion can be increased through the interaction and sequencing of complementary instruments and institutions. For example, one can start with the private sector's volunteerism or an educational program, facilitate it with third party audit, and finally use government enforcement or third-party loan foreclosure.

Principle 4 emphasises the inclusion of second and third parties (both commercial and non-commercial) in the regulatory process, serving as quasi regulators. These include, for example, industry associations, financial institutions and environmental pressure groups. In some cases second and third party quasi-regulation might be more influential and cost-effective than governmental intervention, such as a warning issued by a bank to foreclose a loan or commercial and comsumer pressure. Furthermore, exploiting and harnessing the power of the market are necessary to change industry behaviour and supply chain practices. In the meantime, the government can empower second and third parties' participation by creating the required preconditions for

[118] Prescription is the extent to which external actors determine the type, level and method of environmental improvement. Coercion is the extent to which external actors or instruments exert negative pressure in order to improve performance (Gunningham et al. 1998: 391).

them to undertake a higher share of regulatory responsibility. These preconditions can include mandating information disclosure, providing financial support to public interest groups, enacting community rights and recognizing legal standing, etc. In this way, the government in fact acts as a facilitator which orchestrates a coordinated instrument mix and a gradual escalation of the instruments' coercive power (described in principle 3).

Finally, principle 5 indicates that the key challenges for policy makers are to optimize win-win oppurtunities and to support 'beyond compliance' behaviour as well as an improvement of standards. The win-win outcomes here refer to business/industry benefiting from better environmental performance and compliance due to improved efficiency and quality, enhanced corporate image, access to new environment-related market oppurtunities, technologcal innovation, greater consumer acceptance and reduced legal liability (Cairncross, 1991; Porter & van der Linde, 1995b). However, despite the potential apparent advantages from adopting a proative environmental management system, the majority of businesses are inhibited by their bounded rationality and myopic view of profit maximization (Jacobs, 1991). [119] This is precisely where governmental regulations can be used to nudge businesses towards cleaner production by providing information (project demonstration, technical and consulting assistance, databases, etc), financial inducement, encouraging full cost accounting (including environmental costs and benefits) and other facilitative programs.

4.2 Instrument mixes

Gunningham et al. (1998, pp. 422-448) further distingush four main categories of instrument interactions: mixes that are inherently complementary; mixes that are inherently incompatible; mixes that are complementary if sequenced; and others that are context specific.

4.2.1 Complementary mixes

Complementary interactions are in general positive effects that enable one or more instruments to make them become more effective. For instance, command-and-control may be the precondition for certain financial instruments (e.g. mandatory piping and measurement appratus are a prerequisite for a tax on effluents) (Huppes & Kagan, 1989). Another example, government purchasing preferences may facilitate the rise of certain sustainably produced product markets

[119] Other reasons that hold back enterprises from exploiting the economic advantages of going beyond environmental compliance include the lack of technical expertise and information, institutional inertia, ignorance of marginal cost curves, scarce resources, a reluctance to borrow capital and uncertainty (Jacobs, 1991).

that would otherwise not occur spontaneously. The instrument mixes which fall into this category include:

- Informational instruments and all other instruments
- Volunteerism/self-regulation and command-and-control regulation
- Command-and-control/self-regulation and incentive-based instruments (targeting different aspects of a common issue)
- Incentive-based instruments and compulsory reporting and monitoring provisions

Information strategies are used to compensate or rectify information asymmetries between, for example, regulator and regulatee, community and business, buyer and supplier. Information strategies are in most cases a fundamental prerequisite for continuous environmental improvement and thus an important complement to most of the main policy instruments. Volunteerism/self-regulation complement performance-based and process-based command-and-control regulation when 'beyond compliance' environmental performance is intended. Namely, when they target different levels of performance. For instance, a minimum performance baseline or compulsory environmental management system with voluntary based measures that encourage industry to make additional efforts. However, when volunteerism/self-regulation are used in combination with technology-based command-and-control regulation, it is unlikely to generate complementary outcomes. The reason is that technology-based command-and-control regulation is highly prescriptive, and therefore the potential to go beyond compliance performance is rather limited (Gunningham et al., 1998, p.433).

Incentive-based instruments in the form of tax concessions, soft loans and subsidies complement command-and-control and self-regulation. For example, when they both target environmentally preferred technologies or when they use regulations to prevent land conversion and subsidies to encourage sustainable management of protected lands. These supply side incentives can also be used as a transitional measure. Incentive-based instruments in the form of pollution tax or tradable permits complement command-and-control and self-regulation when they target different contributory dimensions of common environmental problems. For instance, a technology-based regulation is directed at the producer while a pollution tax is directed at the consumer. The last category of combinations is singled out in order to address the importance of compulsory reporting and monitoring to the effective and efficient functioning of incentive-based instruments.

4.2.2 Incompatible mixes

There are certain instruments and interactions that are counter-productive or sub-optimal. This means that the efficiency and effectiveness of instruments is substantially diminished when used in combination. One instrument might weaken or impede another. Thus sometimes this category of instrument mix would require some other over-riding imperative (Gunningham et al., 1998, pp.437-443). Such combinations include:

- Command-and-control/self-regulation and incentive-based instruments (targeting at the same aspects of a common issue)
- Technology-based standards and performance-based standards

When command-and-control instruments, especially prescriptive performance-based and technology-based regulation, are used in combination with an incentive-based instrument, the intended flexibility of the incentive-based instrument will be compromised. For the reason that incentive-based instruments are designed to maximize the choice of regulatees in deciding the methods and levels of their environmental performance in order to exploit differences in marginal costs and to drive innovative improvement. Prescriptive regulations on the other hand dictate and predetermine preferred solutions and thus are in conflict with such incentive-based instruments. Nonetheless, process-based regulation is less likely to be incompatible with incentive-based instrument as neither of them seek to impose definitive technological requirements or performance levels. Additionally, to the extent that self-regulation imitates the effect of a command-and-control instrument it would also be incompatible with incentive-based instruments such as pollution taxes or tradable permits.

Performance-based standards typically leave the decision of compliance methods and technological solutions to individual businesses while technology-based standards usually directly or indirectly mandate the use of specific technologies. Therefore these two approaches are highly unlikely to operate positively at the same time due to their inherent incompatibility.

4.2.3 Complementary if sequenced

The sequencing of instrument introduction is one approach to avoid potential negative outcomes resulting from employing counter-productive instruments simultaneously. It is also a way to increase the operational options of compatible instrument mixes and improve the overall dependability of the policy mix. There are two main types of sequencing instrument combinations. One is to introduce the reserved instrument if and when other instruments fail to meet predetermined benchmarks. The other type is when only a pre-existing instrument is enforced, then the sequential instrument will be invoked to supplement the weakness of the

other. This sequencing thus reflects a progression of increasing degrees of intervention (Gunningham et al., 1998, pp.444-445). Examples of such sequencing include:

- Self-regulation and sequential performance-based command-and-control
- Self-regulation and incentive-based instruments

The sequencing combination of self-regulation and command-and-control is also referred to as co-regulation. This means that if and when business or industry had not been able to deliver their self-regulated promises, then the regulatory authorities could impose compulsory requirements. Hence here the performance-based command-and-control regulation acts in a complementary role in enhancing the effectiveness of self-regulation. On the other hand, process-based and technology-based regulations may be duplicative even when used sequentially with self-regulation. In the case of self-regulation and certain types of incentive-based instruments (e.g. pollution taxes and tradable permits), the latter are imposed when the self-regulatory regime has been unsuccessful. For instance, the industry can self-regulate a reduction of greenhouse gas emissions by a certain percentage, and if it fails to achieve this target then the government would impose its previously announced carbon tax.

4.2.4 Other context specific mixes

In addition to the above identified combinations, there are other combinations where it is hard to tell in theory whether they will bring positive or negative outcomes. Instead, it depends on the particular context in which instruments are combined. In addition, it is important to bear in mind that instrument mixes are commonly not only bipartite but multipartite. Often there will be additional synergies derived from combining a number of complementary instruments. The possible combinations and alterations of multipartite instrument mixes are numerous. The policy instruments mentioned in Section 3 may all be considered for policy mixes. By selecting these instruments, the importance of multi-level and multi-actors governance, the interplay between public and private sectors are addressed as well as the common pool resources characteristic of the forest. This section has provided a brief examination and examples of instrument mixes that will serve to provide some analytical insights into the synergies and interactions of policy mixes on the tropical deforestation and forest degradation problems in the next two chapters.

5 Conclusion

This chapter has reviewed the relevant theories in forest economics. It first elaborated the problem of forests as a common pool resource and explored the way in which humanity values the forest ecosystem as natural capital in decision making. It then incorporated Forest Transition theory into the human development picture to help identifying drivers of deforestation and forest degradation that may be associated with different forest transition stages. Following in Section 3, policy instruments in forestry, including command-and-control, private/self-regulation and incentive-based policy approaches, were introduced as interventions to halt and reverse the trend of global tropical forest losses. More specifically, this chapter devoted ample focus to certification schemes, property-right based approaches, market creation, fiscal and financial instruments, charges, payment for ecosystem services and in addition, the influential role of policy mixes for the global forest ecosystem governance and its challenges were discussed.

The main regulatory discourses: command-and-control, self-regulation, incentive-based instruments and mix of policy, are the main relevant research fields identified in the global forest policy literature. They were originally initiated in sequence but are now used in parallel and/or in combination. In the early 1970s, command-and-control was the preferred instrument for regulating environmental deterioration and during the 1980s, it was believed that market forces would solve the environmental problems. Until the 1990s, a shift towards a pluralistic approach (a combination of policy instruments) to environmental protection emerged.

The main strength of command-and-control regulation is its clarity, consistency and dependability (with competent monitoring and enforcement). It has been relatively effective in controlling point-source pollution, preventing hazardous substances and toxic waste, and in protecting endangered species. However, command-and-control is in general inflexible and less efficient. On the contrary, incentive-based instruments tend to be efficient but not dependable in most cases. Volunteerism, informational strategies and self-regulation are not coercive or intrusive and are usually cost-effective. They are however, less reliable, especially when used in isolation or when there are disparities in public and private interests (Gunningham et al., 1998, pp.37-88). The policy instruments discussed in this chapter can all be used for forest governance in suitable contexts. The regulatory design principles in sub-section 4.1 suggest that when combining instruments, progressively increasing levels of coercion and prescription should be taken into account. Moreover, the instrument mix should be dynamic, sequential if necessary, and involve a wide range of actors.

The regulatory design principles and instrument mixes discussed in the previous section are generic categories for all environmental policy instruments. Nevertheless, in Section 3, we examined three major groups of policy instruments in forest governance, which are command-and-control, private and self-regulation (information) and incentive-based instruments. The various policy instruments examined in these groups can all be applied in Section 4. For instance, Principle 4: empowering participants who are in the best position to act as surrogate regulators,[120] can be seen in the private, self-regulation (Section 3.2). Certification schemes (e.g. FSC, PEFC and their accreditors) are included in the regulatory process as the second and third parties. The consumer pressure imposed on the producer through actions taken by environmental NGOs, for instance, Greenpeace's campaign on pulp and paper production in Indonesia which affects buyer's willingness in the consumer markets in East Asia, is also an example of empowering actors to act as surrogate regulators. Another example on instrument mix applying the options mentioned in Section 3 can be a complementary mix between an incentive-based instrument and a technology-based regulation, targeting different contributory dimensions of one problem. For instance, in order to manage timber production in a more sustainable manner, the policy mix can employ a minimum requirement for production practice on the supply side and impose a tax on unsustainably produced timber products on the demand side.

Besides the broad category of instrument mixes provided in Section 4.2, the more detailed, specific mixes of particular instruments in particular circumstances for forest governance are context-specific and therefore hard to put together deliberately. Some instruments are related to international mechanisms and governance processes, some are linked entirely to states' forest policy, and some are used by the private sector. The adoption of certain instruments might be the result of a particular stage in a country's forest transition, but it might also be exogenously affected by an international agenda (Gupta et al., 2013, p.44). In addition, as already mentioned in Section 3, the boundaries between these categories of instruments are not clear-cut and it is not always clear what is regarded as an instrument (especially when there are multiple rules combined together). Many instruments fall into more than one single category or in combinations. Thus instrument mixes are difficult to be purposively and rationally designed, especially for a complex issue problem such as tropical deforestation, which is not only related to the forest sector but also to agriculture and international trade. In particular, in a polycentric governance setting, institutions and actors often emerge and combine spontaneously (Decaro, Chaffin, Schlager, Garmestani, & Ruhl, 2013). They, moreover, interact in unintended and unexpected ways. Their development and impact are path independent and context dependent. Appropriate policy instrument mixes vary from jurisdiction

[120] See Sub-section 4.1 in this chapter.

to jurisdiction and over time, depending on, for instance, different policy objectives and organizational structures.

Nonetheless, there are some trends of instrument interaction regarding tropical forests governance which we can see in Chapters 4 and 5 when examining the global palm oil industry. Chapter 4 focuses on the tropical forest commodity of palm oil. Similar to this chapter, a range of instruments used in regulating the negative effects of palm oil production on tropical forests are analysed. Furthermore, after examining the current regulatory environment, we identify policy gaps. These policy gaps will then be dealt with in Chapter 5, using a policy mix approach based on the theoretical framework built up in this chapter. Ultimately, through an in-depth case study of the palm oil industry, this research provides a better understanding of existing instrument mixes, which contribute to the attempts at coordinating and orchestrating institutional design tailored to specific environmental goals.

Chapter 4: A Case Study on Global Palm Oil Industry

1 Introduction

In the previous two chapters, we reviewed the problem at hand, namely the depletion of tropical forest (through deforestation and forest degradation) and the very reasons that cause it. We also looked into current international forest governance structure (Chapter 2) and the more detailed policy instruments that can be, and are, used in forest governance (Chapter 3). At the end of Chapter 2, it mentioned that the international forest regime complex concerns tropical deforestation but still predominantly focuses on the management of standing forests, whereas the adjacent agro-business sector is equally important in terms of forest protection. Preventing forest conversion (into agricultural lands) should thus be included in a more comprehensive discussion and analysis of tropical deforestation and forest degradation. Connecting and filling in the literature gaps between the fundamental causes of tropical deforestation and the literature on global forest governance is exactly what this research attempts to achieve. The approach to reach this goal is through an in-depth case study on one of the major tropical deforestation drivers – the palm oil industry in Chapters 4 and 5.

The expansion of the global palm oil industry in the last few decades has been criticized for its linkage with the significant loss of tropical forests, endangerment of species, accelerated wildlife crime and smuggling, disruption and displacement of human and animal inhabitants and populations, severe pollution, and local land conflicts as well as its substantial contribution to climate change (D. Boucher et al., 2011; Gatto, Wollni, & Qaim, 2015; S. B. Hansen et al., 2015; Potts et al., 2014). This chapter analyses the current policy gaps in the governance of the global palm oil industry through an extensive review of its characteristics and current policies applied to mitigate the negative environmental impacts of the palm oil industry.

The central research question which this chapter and the next chapter try to answer is how policy mixes can strengthen the current instruments in use and/or new instruments to further address the continuous alarming tropical deforestation caused by global palm oil production. This research question is further broken down into two steps. Chapter 4 first identifies the current policy gap and Chapter 5 subsequently suggests a potential solution to address this gap. The main methodology used is literature analysis, including environmental policy studies and law and economics theories. These two chapters on the one hand provide positive studies on the presently applied policy measures at both international and national levels, identifies their strengths and weaknesses and policy gaps. On the other hand, they provide a normative aspect of policy suggestions and their

potential synergy effects. The present literature on this subject is quite scattered as the industry changes very fast and is primarily governed by private sectors with voluntary guidelines that have evolved swiftly in the past years. There is a need for research that in particular focuses on organizing and analysing the key policy instruments targeting palm oil production and how they can be combined and strengthened. This chapter contributes to the literature by bringing the policies and research together, providing a systematic analysis and policy suggestions.

The remainder of the chapter, first in Section 2, presents an overview of the industry in focus, including the properties of oil palm, its observed ecological footprints and social implications, the production and consumption pattern, industry characteristics and value chain. Section 3 specifies the issues and problems at hand and then introduces the current palm oil 'sustainability' that is commonly discussed by the private sectors and NGOs, which leads to the specific policy goals stated for the instruments. Section 4 assesses and provides substantial information on the policy measures used to address the negative impacts of the palm oil industry at international and national levels. These policy measures are grouped into four subsections: the regulatory environment in the producer countries, in importing countries, in the private sectors and in the international climate change arena. The policy instruments discussed in Section 4 can be command-and-control, incentive-based mechanism, private-self regulation or a mix of these, taken by various actors involved in the palm oil supply chain at different levels. Section 5 then further addresses new insights and policy gaps observed from the interactions among producer country's public authorities, private sectors, environmental NGOs and importing countries in the west. Section 6 concludes with the complexity of regulating the palm oil industry, which leads to the suggested policy solution in the next chapter.

2 Overview of global palm oil production

In June, 2015, the French Minister of Ecology, Segolene Royal, speaking on French network television, suggested a boycott of Nutella because the palm oil contained in the spread causes tropical deforestation and other ecological harms (Brinded, 2015; Mathiesen, 2015). However, this statement soon attracted criticism not only from the palm oil industry but also from a number of leading environmental activist groups, such as Greenpeace and the WWF. They held that the Nutella maker, Ferrero, is in fact a leading actor in the industry that progressively improves its palm oil production practices. Furthermore, they maintained that boycotting this agricultural crop and dropping suppliers who have bad practices will not instantly stop tropical deforestation and environmental deterioration in any case (Brinded, 2015; Mathiesen, 2015). This incident highlighted the common misconceptions about palm oil and the lack of effective communication between the palm oil industry, non-governmental organizations and the mass public. Thus before entering into relevant discussions on policy

design, this section provides an overview for the global palm oil industry to build up some background knowledge. The section first draws attention to the notorious environmental impacts that have brought this industry into the global spotlight. It then introduces its demand and supply market pattern, the exceptional yield of the crop and some special features in its value chain. By the end of the section, the readers should have a clear understanding on what palm oil is, what are its ecological footprints, why it is at the same time popular and controversial, and why this industry has a regulatory complex that requires special research focus.

2.1 What is palm oil?

Palm oil and palm oil derivatives are a kind of edible vegetable oil derived from the fruits of an oil palm. When talking about the oil palm, it refers to the *Elaeis* guineensis Jacq., the primary species cultivated nowadays.[121] Oil palm generates two distinct oils, palm oil and palm kernel oil. The palm oil refers more specifically to the edible oil extracted from its fruit/mesocarp/pulp.[122] It is a traditional perennial crop pervasively involved in the daily lives and various household items in Western and Central African countries, where it originates. With its great economic importance and inexpensive price, palm oil is now one of the leading vegetable oil ingredients used ubiquitously in an immeasurable number of everyday manufactured products on the global market. It is contained in around 40 to 50 percent of daily household goods in most of the developed countries, such as the United States, United Kingdom and Australia (Rautner et al., 2013; Schouten & Glasbergen, 2011). Due to its reported nutritional features, versatility and better shelf stability compared to other vegetable oils, palm oil started to gain its rapid popularity from around the 1990s as a substitute to replace hydrogenated oils that produce trans fatty acids[123] (D. Boucher et al., 2011; WWF, 2012). Today the majority (80%) of the palm oil is used in the agri-food processing industry, such as frying oil (and as cooking oil in the India, Indonesia and a majority of African countries), margarines, baked goods, confectionery, cereals and as a

[121] There are also hybrid plantations of *Elaeis guineensis* and *Elaeis oleifera* (American origin) in Latin America (Rival & Levang, 2014).

[122] The kernel/almond/nut of the palm fruit generates (palm) kernel oil, also often called palm oil derivatives, which is not equivalent to and chemically different from palm oil. Kernel oil is more saturated than palm oil. Its chemical composition and uses are more similar to coconut oil and is mostly utilized in the oleochemical industry. This kind of oil accounts for around 10 percent of oil palm yield so hence it is not being viewed as a by-product (Rival & Levang, 2014). In addition, another by-product is produced during the crushing process, called palm kernel meal or palm kernel cake. It is normally utilized in the animal feed and livestock industry (Rautner et al., 2013).

[123] The semi-solid state and the higher melting point of palm oil by nature provide the adequate consistency for the agri-food industry without having to undergo the chemical process of hydrogenation (in order to solidify liquid oils), which creates trans fatty acid (D. Boucher et al., 2011; WWF, 2012).

substitute for butter in various kinds of food preparations. The remaining share of the palm oil (19%) is utilized as oleochemicals in personal care products (soaps, cosmetics, shampoo, toothpastes, etc.), while pharmaceutical products, lubricants, cleaning agents, paints, and biofuel account for 1% of the palm oil usage (Potts et al., 2014; Rival & Levang, 2014).

2.2 The environmental impacts of the palm oil industry

Similar to other intensive monoculture crop production systems, such as cotton, corn and soy production, oil palm plantations also generate adverse ecological effects, such as high water consumption, increasing acidification, low biodiversity sustainment, high agro-toxic chemical inputs, high susceptibility to pests and outbreaks of disease, lower carbon storage, loss of habitat, altering soil and water quality, etc. (Jacques & Jacques, 2012). However, aside from these shared concerns with monocropping, the distribution of oil palm plantations, by its biological requirements, is unfortunately restricted to tropical zones, which also happen to be one of the most biodiversity-rich and carbon-rich areas on the planet.[124] Hence the expansion of the monoculture palm oil, compared with other monocropping, comes with even more costs of biodiversity, ecosystems and the depletion of tropical natural and secondary forests or peat lands, which are not suitable for food crops in their original state. Incidentally, just like other types of monoculture, oil palm cultivation also is associated with social issues, such as labour, and indigenous and human rights violation.[125] These social aspects are often also covered in the sustainable

[124] Other cash crops that grow in forests with similar climate, such as cocoa, rubber, coffee, might have similar ecological impacts. However, their scales are much smaller compared to oil palm development, which is the reason why this research mainly focuses on the palm oil industry.

[125] Although some opportunities and benefits are brought by palm oil expansion for rural development for certain group of people (such as migrants from other densely populated areas in the country) (Hamilton-Hart, 2015b), numerous studies and NGOs have also reported that indigenous peoples or traditional land owners have experienced loss of lands and land-use rights. They were repeatedly not notified or consulted prior to the deforestation and plantation (Colchester et al., 2006; Colchester, Pang, Chuo, & Jalong, 2007; Marti, 2008; Norwana et al., 2011; Obidzinski, Andriani, Komarudin, & Andrianto, 2012). This has led to serious conflicts between palm oil companies and other groups of people, such as indigenous communities. Moreover, it very often also deepens the disparity between the rich and the poor. Examples of observed grievances include that companies withhold the promised benefits/compensations and burden smallholders with unjustified excessive debts, miscommunications over expenses charged to local communities, increasing poverty of indigenous groups (e.g. forced lifestyle modification, dispossession), concerns over human rights violation (such as child labour, enforced displacement, violence, intimidation,

production standards and criteria. Nevertheless, the social issues are not within the scope of this research project. Hence they are excluded from the discussions.

2.2.1 Deforestation and forest degradation

Indonesia and Malaysia together produce more than 80 percent of the palm oil globally. However, they also account for more than 80% of remaining primary forests in Southeast Asia. The initial land clearing for palm plantation is usually carried out through fire and killing of seeds and sedentary animals (Fitzherbert et al., 2008). It is estimated that around 270.000 hectares of tropical forests were cleared annually between 2000-2011 for palm oil plantations in primary producing countries (Vijay, Pimm, Jenkins, & Smith, 2016). The study by (Koh & Wilcove, 2008) finds that palm oil expansion in 2005 was responsible for more than half of the deliberate deforestation of areas that were forested in 1990 in Malaysia and Indonesia. Another study by Gunarso, Hartoyo, Agus, & Killeen (2013) estimates that between 1990-2010, 62.6 percent and 65.3 percent of the new plantations in Indonesia and Malaysia respectively were installed on non-agricultural lands, such as swamp forest, and disturbed and undisturbed upland forest.[126] In other words, palm oil plantations in South East Asia have currently been expanding by about half a million hectares per year and about half of those are on forest land (Cramb & McCarthy, 2016). Consequently, this conversion of tropical forests and peat lands into oil palm cultivation, not only threatens the resilience and provision of vital forest ecosystem services, the survival of endemic animal and plants but also affects local livelihoods with a high degree of uncertainty (Carlson et al., 2012).

Aside from direct forest clearing for palm expansion, oil palm plantation is also indirectly linked with deforestation through other pathways. For example, instead of being left to regenerate and recover, some ecologically stable degraded forests (by logging or fire) are prevented from such processes due to their replacement by palm plantations. In addition, a palm plantation is sometimes established as a joint economic venture, in which the primary forests are first cleared for timber harvest or paper pulp as capital to offset the later palm instalment. The oil palm expansion also simultaneously causes displacement of food crops into forests and increases access to more remote forests through the development of road infrastructure (Petrenko, Paltseva, & Searle, 2016). Moreover, a study by Luskin, Brashares, et al. (2017) finds that a protected primary rainforest around palm oil

harmful/poor working environment), inadequate income, depletion of clean water and land resources, and so on (Colchester et al., 2006; Rival & Levang, 2014; Sheil et al., 2009).

[126] Upland forests are forests locating at an altitude of 800 meters or above. They are sometimes also referred to as hill and montane forests. Their characteristics vary considerably depending on altitude, temperature, rainfall and other factors (FAO, 1993).

plantation in Malaysia had been heavily degraded. The amount of understory[127] vegetation decreased by more than half during the study period, due to the "hyper-abundance" of wild boar drawn to the oil palm fruits. The study discovered the strong indirect edge effects over decades in forests to be more than a kilometre from oil palm plantations (Luskin, Brashares, et al., 2017). Similar effects are also observed across Sumatra (Luskin, Albert, & Tobler, 2017). This has showed that the negative impacts of palm oil plantation on forests are not only limited to direct deforestation but degradation within seemingly "pristine" forest encroached upon by plantations (Sheil et al., 2009), which is rather hard to detect.

2.2.2 Climate change

The carbon emitted from gross tropical deforestation accounts for over 10% of the global anthropogenic greenhouse gas (GHG) emissions (estimated at 2.270 Gt CO_2 per year between 2001-2013)(Carlson & Curran, 2013; Carlson et al., 2012; Zarin et al., 2016). In Indonesia, more than 75% of the GHG emissions come from land-use change and peat land destruction, which meanwhile makes Indonesia one of the top 5 carbon emitting countries in the world (Petrenko et al., 2016). In 2015, (Global Fire Emissions Database, 2015) estimated that the daily carbon emissions from peat fire caused by oil palm development in Indonesia during the fire season on many days, exceeded the daily carbon emission from the burning of fossil fuel in the entire United States (approximately 15 million tonnes CO_2 per day). That year approximately one million hectares of peat lands in Indonesia went up in flames (J. F. McCarthy & Cramb, 2016).

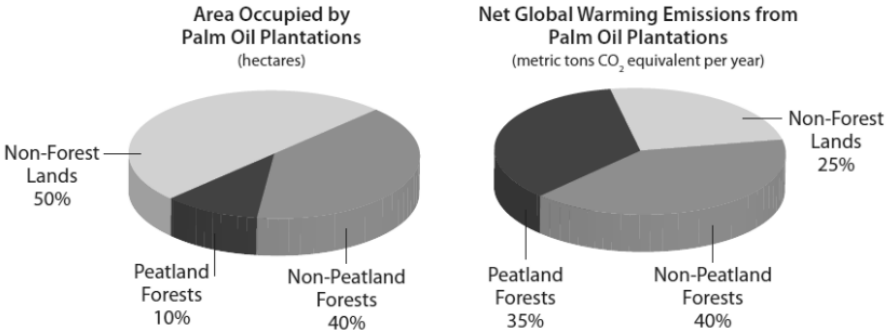
Within the palm oil industry, deforestation and land use conversion account for its largest source of GHG emissions, including biomass removal, the release of the carbon stored in the forests and in peat soils (through production process and fire) and forgone carbon sequestration. The second biggest GHG source in the palm oil industry comes from methane effluent from the mills and nitrous oxide from the use of fertilizers (Chase & Henson, 2010). In addition, during the 25 years of palm trees' temporary productive lifetime, it is calculated that even fully grown, they store less than 20 percent of the aboveground biomass compared to that of the natural tropical forests (D. Boucher et al., 2011). However, it is important to point out that in some cases when plantation does not replace natural forests or peatlands, oil palm plantation might store more carbon than, for instance, annual crop, fallow land[128] or grassland (Ruysschaert, Darsoyo, Zen, Gea, & Singleton, 2011).

[127] Understory vegetation is a layer of vegetation growing between the main canopy of a forest and forest floor (OxfordDictionaries, 2018b).

[128] Fallow land is "unused land that has been left to its own natural growth, and not planted with seeds or saplings" (Ruysschaert et al., 2011, p.5).

Among all oil palm plantations in Indonesia and Malaysia, around one fifth (about 2.4 million hectares) of them is grown on peat soils (Huan, Lim, Parish, & Suharto, 2016). This is of particular importance due to its significant GHG emissions. Tropical peat lands are estimated to store 18 to 28 times more carbon than tropical forest itself (Page et al., 2002). The carbon rich peat soils in Indonesia store an amount of carbon that is similar to the carbon sequestrated in the surface vegetation in the Amazon forests (van der Werf et al., 2008). Peatlands in Indonesia cover around 20.2 Mha spread across Sumatra, Kalimantan and Papua and they are estimated to store over 30 billion tonnes of carbon (Daniel Murdiyarso, Dewi, Lawrence, & Seymour, 2011). In order to plant oil palms, the water in peat swamp has to be drained repeatedly throughout the plantation cycle, in which the preserved organic matter in peat decomposes and decays, releasing high rates of GHG (including methane) during the process, and it becomes highly susceptible to fire (Union of Concerned Scientists, 2013). Moreover, the GHG emissions from peatland land use changes continue for years (Daniel Murdiyarso et al., 2011; Sheil et al., 2009). Figure 9 demonstrates the disproportionate GHG emissions from deforestation on peatlands and forests compare to non-forest lands. As shown, the peatland forests occupied by palm plantation account for 10% of the total plantation areas but account for 35% of all the GHG emissions. Axiomatically, these intact peat soils in Southeast Asia are critical for a stable climate that is closely linked with the global carbon cycle.

Figure 9: Area and emission of oil palm plantations in Malaysia and Indonesia by land type



Source: (D. Boucher et al., 2011, p.56)

2.2.3 Biodiversity loss

Southeast Asia's lowland forests are among the Earth's most species-rich terrestrial habitats. Its biodiversity conservation value is exceptional (Sheil et al., 2009). Aside from the affecting global carbon balance, deforestation for palm oil plantation is estimated to cause up to 42% of the biodiversity loss, both in terms of population density and species richness, in Southeast Asia (Sodhi, Koh, Brook,

& Ng, 2004), and leads to a biological species-poor community that is dominated by generalist, non-forest and invasive species (such as oil palm itself, rats, wild pigs and certain ants). A hector of tropical forest in Indonesia contains over 200 species and 500 stalks of plants (Uryu et al., 2008). Moreover among these species, more than 60% of them are endemic to the rainforests in the region (Sodhi et al., 2004). Emblematic species such as the Sumatran tiger, Sumatran Rhinoceros, Sumatran elephant, Sun Bear, the orangutan as well as other species are declining at a rapid speed due to habitat loss, increasing accessibility to poachers and smugglers and other human-wildlife conflicts (Petrenko et al., 2016). The population of Sumatran tigers has decreased by 70 percent and Sumatran elephants' population has declined by 84 percent (Uryu et al., 2008).Thus the demolition of tropical rainforests is not only a conservation crisis but also a serious animal welfare/rights issue.

In comparison with native forests, an oil palm plantation is structurally much simpler than natural forests with single crop species, homogeneous tree age, dispersed undergrowth, a lower canopy, relatively unpredictable and unstable microclimate[129] and more human disturbance (Fitzherbert et al., 2008). A newly planted palm plantation in Indonesia typically has 130 to 148 palm trees per hectare (Sheil et al., 2009). As the plantation matures, the number of trees per hectare can reduce to approximately 100 (USDA, 2009). The plantations also cause forest fragmentation that inhibits animal movement and increases harmful edge effects.[130] These isolated forest fragments consequently have lower species diversity and richness. After deforestation, very few native species can survive in the monoculture palm plantations. Almost all vertebrate and invertebrate species decline greatly in number, such as birds, lizards, mammals, butterflies, ants and beetles. As for flora, the oil palm plantations are monoculture and hence lack forest tree species, lianas, epiphytic plants and many other native plants. Moreover, the declined animals also vastly reduce the abundance and variety of plants due to the disappearance of animal dispersal and pollination activities. Palm plantations are estimated to support only 15% to 23% of the species compared to primary forests (Petrenko et al., 2016). As a result, the loss of biodiversity could affect the vital functioning of ecosystems, including nutrient cycling, water purification and regulating function (which results in floods), pollination, carbon

[129] Converting forests to oil palm plantations drastically alters habitat features. During the plantations' 25-30 years lifecycle, the conditions and environment are constantly changing and being disturbed. For instance, high solar radiation and wind exposure are present in the small tree phase and plantations are periodically rotated and clear-cut when yield diminishes. Moreover, the size, shape, pattern and management of plantations can all determine the important ecological processes, such as connectivity, edge effects and permeability (Luskin & Potts, 2011). Thus the constant anthropogenic management and alteration of plantations result in a unpredictable and unstable microclimate.

[130] Harmful edge effects include elevated vulnerability to wind, desiccation, fire and tree sapling mortality, etc. (Fitzherbert et al., 2008).

storage and so on, and hence inhibits natural resource availability and human welfare. Oil palm plantation is therefore also termed as "green desert" due to its low level of biodiversity and severe loss of ecosystem functions (Acosta, 2011). To sum up, even though any conversion of intact forests is inevitably harmful to biodiversity, oil palm is in particular inadequate as a substitute for primary or degraded forests, for the reason that its plantation supports even fewer forest species than the majority of other tropical agricultural practices (Fitzherbert et al., 2008).

2.2.4 Other impacts

Other pollution and impacts include wildfire haze, water and soil pollution, solid waste and soil erosion. During land clearance and preparation, the fire which occurs on drained peat lands both intentionally and accidentally is very destructive. It could last for extended weeks or months and emit carbon stored and accumulated for centuries as well as toxic pollutants into the atmosphere that are severely harmful (Petrenko et al., 2016). Wildfire caused by palm plantation and deforestation produces toxic smoke and haze pollutions that are detrimental (and even fatal) to human health throughout Southeast Asia (Finlay et al., 2012). This harmful haze usually brings the regional economies to a halt due to closed business, cancelled flights, transportation and schools, and thus results in adverse economic impacts (L. K. Goodman & Mulik, 2015). In addition, due to the excessive acidity of the peat lands, normally additional chemicals are added to soils so the oil palm trees can grow (Union of Concerned Scientists, 2013). Generally, similar to other intensive monoculture, following the installation of a plantation, the pollutants from nitrogen fertilizer and agrochemicals used in oil palm plantations, such as fertilizers, pesticides, insecticides and herbicides, along with palm oil mill effluent which contains heavy metals, bring adverse impacts on both terrestrial and aquatic ecosystems as well as on public health (Petrenko et al., 2016).

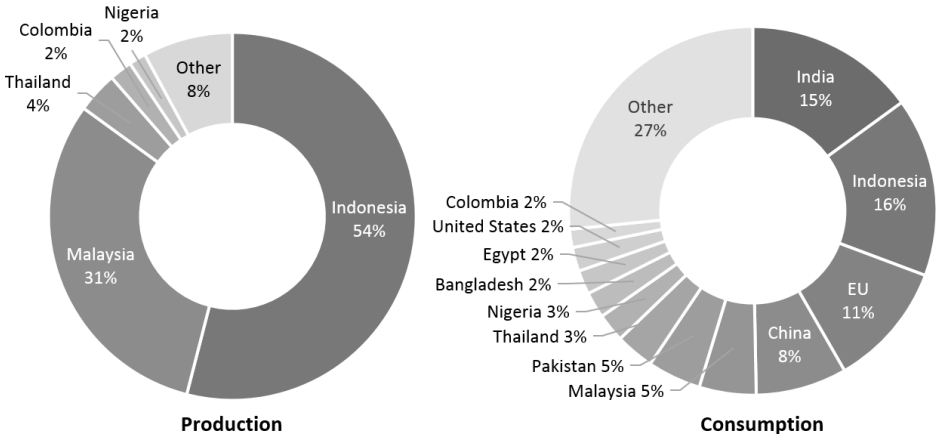
2.3 Characteristics of the palm oil industry

2.3.1 Global production and consumption

Every year approximately one third of the vegetable oil produced worldwide is palm oil. In 2014, the plantation of oil palm produced more than 57.2 million tonnes of palm oil. It is more than tripled since the 1990s. Palm oil production uses 18.7 million hectares globally. Moreover, being cultivated solely in humid tropical areas, among these productions, the mass majority (85 percent) comes from Indonesia and Malaysia (FAO, 2017). The oil palm was introduced to South-East Asia in the early 20th century for big scale industrial production. Prior to oil palm production, both countries had a relatively large scale of natural rubber plantations. By converting old rubber plantations to a more productive type of oil

palm hybrid, Malaysia replaced Africa and became the biggest palm oil producer in 1966. Following the successful development of the palm oil sector in the neighbouring country, the Indonesian government started actively investing in the industry in the 1980s and overtook Malaysia as the leading producer in 2006 (D. Boucher et al., 2011; Rival & Levang, 2014). The cultivations of the two main producer states within in Malaysia, Sabah and Sarawak, account for around 13% of the country's land (UNDP, 2010). In Indonesia, the majority of the plantation expansion (i.e. deforestation) occurs in Central Kalimantan, Riau (Sumatra), and West Kalimantan (Greenpeace, 2013). Figure 10 below shows both the main palm oil production and consumption countries.

Figure 10: Shares of production and consumption of palm oil by country, 2015-2016



Source: (USDA, 2017)

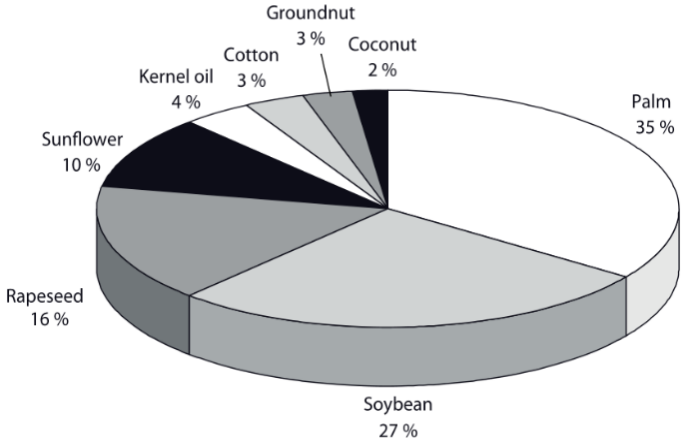
The increasing global market demand is mainly driven by Asian countries (such as India, China and Indonesia)(Rival & Levang, 2014), and partly driven by the EU biofuel market demand (D. Boucher et al., 2011) as well as the growing demand from other western countries in recent decades. This has resulted in rapid expansion of oil palm plantations in the past decades, from 1.55 million hectares in 1980 (IFC, 2011) to over 18 million hectares in 2014. Furthermore, the overall global production is expected to grow in the future --- a prediction of 65% growth by 2020 over 2010 baselines (Sung, 2016; Wicke, Sikkema, Dornburg, & Faaij, 2011; WWF, 2012). In the meantime, Indonesia plans to increase its palm oil production to reach 40 million tonnes by 2020 (which is double the amount compared to the 2009 level), while Malaysia aims at raising its production to 25 million tonnes by 2035 (Gan & Li, 2012; World Economic Forum, 2013).

2.3.2 High production efficiency

An oil palm can grow to over 20 meters high on the lowland in a stable temperature not below 15 degrees Celsius with high and year-round rainfall. Although this oil palm species is native to West Africa, the quality and yield of the oil are superior when produced in the South East Asia (Verheye, 2010). A mature tree palm normally starts producing approximately three years after planting (but the mature phase of full production with steady high yield starts after seven years) and it is usually replaced after 20 to 30 years due to the dropping yield and height that cause difficulties to harvest (Rival & Levang, 2014; Verheye, 2010). The oil palm is a rather resilient plant that can adapt to a diversified range of cultivation systems from a few hectares of small-scale family plots up to a hundred thousand hectares of agro-industrial scale of plantation. The oil yields differ considerably depending on various factors such as plantation density, irrigation system, use of fertilizer, inter-cropping practice, cultivar and geography, etc. (Rival & Levang, 2014).

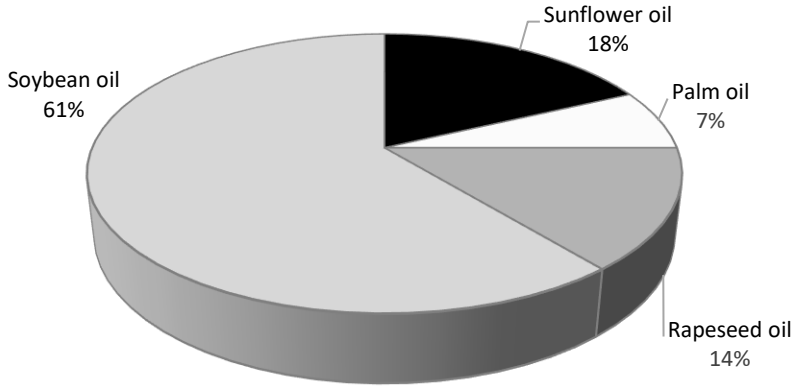
In comparison with other oil crops, the exceptional production efficiency of oil palm is one of the key features that contributes to its accelerated popularity and expansion during the last decades. The oil palm produces a global average of 3.8 tonnes per hectare and can reach up to 6 tonnes per hectare in the most outstanding plantations in South East Asia (Rival & Levang, 2014). This average number is 10 times more oil produced compared to soybean oil (average 0.4 tonnes per hectare) and 5 times more than rapeseed oil (average 0.8 tonnes per hectare) on an equivalent field size. Moreover, the numbers are especially remarkable when comparing the amount of land used worldwide. The oil palm accounts for more than one third of global vegetable oil produce but occupies merely 7% of the total agricultural land devoted to oil plants while soybean, rapeseed and sunflower share 61%, 18% and 14% of the total land used respectively (Caliman, 2011). Figure 2 and Figure 3 below illustrate the disproportionate share of oil produce and the amount of land used between the main oil producing plants. In addition, the production costs of palm oil, the need for fertilizer and pesticide input per one ton of palm oil are the lowest among vegetable oils (Rautner et al., 2013; Rival & Levang, 2014). The costs of palm oil per ton could be up to US$ 200 cheaper than rapeseed oil and 20% lower than the production costs of soy oil (K. T. Tan, Lee, Mohamed, & Bhatia, 2009; Thoenes, 2006). Thus understandably, it makes 'economic' sense that oil palm has become the leading industrial oil crop.

Figure 11: Global shares of vegetable oil production by main oil crops



Source: (Rival & Levang, 2014, p.8)

Figure 12: Shares of global agricultural land used for vegetable oil by main oil crops



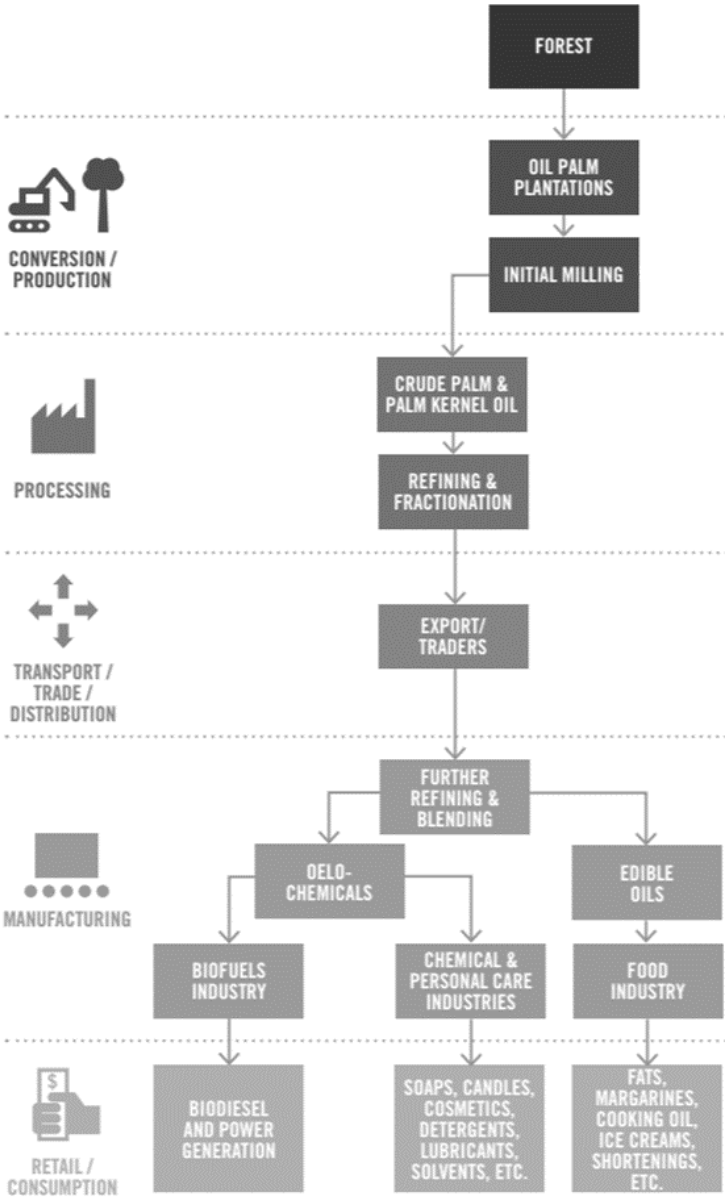
Source: (Caliman, 2011, p.124)

2.3.3 Palm oil value chain

The palm oil supply value chain is an extremely complex network from production to consumption. Figure 13 illustrates the major nodes and actors involved from converting forests to mills, crushing facilities, refiners (foreign or domestic), traders, manufacturers and to retailer and consumers. Due to the vast expanse of plantation areas, numerous steps and actors engaged, and its various invisible usage in end products, traceability is in particularly difficult in the palm

oil value chain. The primary regulatory bodies along the supply chain include producer and end consumer countries, the private sector itself, and third parties, such as certification agencies or NGOs.

Figure 13: Illustration of the palm oil supply chain



Source: (Rautner et al., 2013, p.67)

Palm oil production is a vital source of fiscal, foreign exchange and cash income for primary production areas regarding both exports and local industry. The sector represents 6 to 7% of GDP in Indonesia and 3.2 % of GDP in Malaysia (WWF, 2012). Palm oil farm operations are labour intensive, demanding an average of 5 workers per hectare whereas other oil crops generally require only one worker for 200 hectares (WWF, 2012). It is estimated that in Indonesia, 2.5 million people are directly living off the palm oil cultivation and more than 3.7 million people are engaged in the production chain (Rival & Levang, 2014; WWF, 2012). Globally, small farm holdings[131] are essential in the palm oil industry for the reason that they account for around half of the production, which has contributed to poverty alleviation and the rise of rural middle class (J. F. McCarthy, 2010). Production from small-holders (both independent and associated with bigger agro-industrial companies) are either consumed in the household, sold in local market or there is a sale of the fruits to factories/mills. Nonetheless, the significance of small holders differs from country to country. For instance, in Indonesia and Malaysia, 40-45% and 35% of the production is derived from small holders respectively while in Ghana and Thailand, the numbers go up to 90% (J. F. McCarthy, 2010; Rival & Levang, 2014; WWF, 2012).

In general, the palm oil supply chain is shaped like an hourglass with thousands of upstream plantations and millers to a small number of refiners and aggregators that process crude palm oil into basic ingredients or aggregate the oil for shipment to foreign refineries (TFT, 2015). A refinery is normally supplied by 50 to 200 mills. Thus this relative handful of refineries play critical roles in the commencement work on traceability that further expands to entire supply chains.

International traders play an essential role in this palm oil commodity market. They determine the financial value and its derivatives, adjust demand and supply, and manage its trade flow. The dominant transnational corporations in the palm oil industry are also the overwhelmingly biggest agricultural processors and food ingredient providers in the world that stay at the heart of the entire modern agri-food system. These corporations are Archer Daniels Midland (ADM), Bunge, Cargill and Louis Dreyfus, which act as third-party suppliers to companies like Nestlé, Kraft, General Mill and Unilever. These international traders very often operate themselves horizontally and vertically along the supply chain as input suppliers (e.g. agro-chemicals, fertilizers), land owners, financiers, transporters

[131] Smallholdings, or smallholder oil palm plantations, are on average 2 hectares but can reach up to 50 hectares in Indonesia (Lee et al., 2014). Roundtable on Sustainable Palm Oil (RSPO) defines smallholders as farmers who cultivate palm oil less than 50 hectares along with subsistence crops, where the primary labour comes from family. They further distinguish smallholders into independent smallholders and schemed or associated smallholders that are often in contractual relationships with specific mills and are not able to freely choose the type of crops and management techniques. The definition can be found on the RSPO website at https://www.rspo.org/smallholders/rspo-smallholders-definition.

and other related industrial product producers (e.g. paints, plant-based plastics), etc. (Murphy, Burch, & Clapp, 2012). In addition, they are also closely involved with other actors, for instance, Archer Daniels Midland (ADM)'s ownership interest in the Wilmart group;[132] Cargill's cooperation with Monsanto and its direct ownership of oil palm plantations and crushing facilities in Indonesia that accounts for 11% of the country's palm oil exports value (Murphy et al., 2012; Rautner et al., 2013). These large-scale transnational corporations are very often heavily pressured by environmental and social development groups to take responsibility for their involvement in tropical deforestation and palm oil production by increasing their reputational risks.

2.4 Summary: policy implications

Although here in sub section 2.2, the environmental impacts are discussed in separate categories, including deforestation, global warming, biodiversity loss and other pollutions, these externalities are in fact intertwined and jointly reinforced without clear boundaries to separate them completely. For example, the primary direct effect of palm oil plantation is deforestation and land conversion, which then leads to global atmospheric carbon imbalance and biodiversity loss. These impacts together with other pollution and ecological impacts (e.g. soil erosion) then result in a loss of ecosystem services, such as disruption of the climate, water and disease regulating functions, nutrient cycle disturbance and other irreversible unexpected effects. Therefore, it is difficult to distinguish different policy instruments targeting different impacts. A more feasible approach is to focus on halting or reversing the tropical deforestation rate all together, thus to prevent GHG emissions, pollution, loss of biodiversity and ecosystem services.

Notwithstanding these negative observations and impacts, oil palm plantations continue to expand through the archipelago of Indonesia. Depending on the groups of people focused on (for instance, migrants are often observed to benefit more from palm oil development than indigenous people, see footnote 125), palm oil plantation has brought both negative and positive influences. As the oil palm expansion in Southeast Asia is ultimately limited due to pressure on the ecosystems and geo-physical capacity (Pirker, Mosnier, Kraxner, Havlík, & Obersteiner, 2016), some countries in Africa and Latin America have experienced higher growth rates of palm oil plantations in the past decade compared to Indonesia and Malaysia. Therefore the large forested areas in Africa,[133] Latin

[132] The Wilmar Group is a Singapore-based conglomerate that has one of the largest palm oil plantations of more than 235.000 hectares in Indonesia and Malaysia, as well as fertilizer and shipping interests. ADM has around 16.4% of ownership interest in this company.

[133] Palm oil is regarded as a potential key driver of economic development in Africa. Nearly two third of the total forest areas in the Congo Basin, 115 million hectares, are suitable for growing oil palms (RFUK, 2013). The expected expansions of oil palm plantations in West and Central Africa is estimated to be up to 22 million hectares for the coming five years (Hoyle, 2016).For example,

America[134] and Papua New Guinea[135] are expected to be the frontier affected by palm oil development (Rautner et al., 2013; Vijay et al., 2016). The study of the environmental impacts of the palm oil industry is therefore particularly important in this context as global demand continues to increase.

As stated at the very beginning of Section 2, there exist demonized misconceptions about palm oil which suggest that the use of palm oil should be banned altogether due to the associated environmental disaster. However, as also shown in this Section, palm oil has the highest yield per hectare among all vegetable oil crops and it is one of the most economical options for people in burgeoning countries. In addition, palm oil also brings significant rural development in the producer states. Nevertheless, this research does not claim that the production of palm oil should be encouraged more than other vegetable oils or that palm oil is a "good" oil. Instead, the research focus here is that just like all other commodities and goods used in our daily life, palm oil has its ecological footprints and perhaps more than some other commodities due to the current production practices. So the problem lies at the way humans choose to utilize it. Since the global demand and supply of palm oil is projected to keep increasing considerably, it is critical to minimize its environmental impacts in every aspect throughout the supply value chains. A complete ban of the developed countries will not solve the issue on tropical deforestation nor improve the palm oil production towards more sustainable practices. On the contrary, a switch to other types of vegetable oils could bring unintended leakage or displacement, for

Gabon plans to reach 200.000 hectares of plantation by 2017; the Republic of Congo targets one million hectares of new plantation and Cameroon wants to double its production by 2020 (RFUK, 2013). The Governments of the Central African Republic, Côte d'Ivoire, the Democratic Republic of Congo, Ghana, Liberia, the Republic of Congo and Sierra Leone signed a joint declaration in 2016, the Marrakesh Declaration for the Sustainable Development of the Oil Palm Sector in Africa. This regional and public approach signals that the coming palm oil investment into the region has to comply with the principles set out in the declaration including principles of sustainability, transparency and the protection of human rights (TFA2020, 2016) in order to avoid repeating the environmental destruction caused by palm oil industry in South East Asia.

[134] In Latin America, an estimation of 29.6 million hectares of land (excluding forestlands) are suitable for palm oil plantation in Brazil. In Colombia, 2 million hectares are designed by the Plan for Biodiesel Development for palm plantations (Pacheco, 2012). Since 2001, the land areas for palm plantation in Latin America has doubled. However, a study by (Furumo & Aide, 2017) finds that the majority (79%) of these lands actually replaced previously cleared/degraded areas or lands from other agricultural uses, particularly in the Amazon and the north of Guatemala. This trend of expanding palm oil plantation without deforestation provides Latin America with an opportunity for more sustainable development and production in the palm oil sector.

[135] In Papua New Guinea (PNG), most of the proposals for palm oil plantations expansion are affiliated with the government's special agricultural and business leases. Between 2003 and 2011, the areas of land under this kind of lease added up to a total of nearly 5.6 million hectares, which account for 12% of the country's land. However, a study by (Nelson et al., 2014) discovered that the majority of these proposals are in fact intended for logging under the disguise of palm development. The growth rate of palm oil expansion is expected to remain low in the country.

instance converting eight times more forests for soybean and sunflower oil productions (Rival & Levang, 2014). Moreover, a ban in the western world not only let companies in these countries lose their power of leverage in the palm oil industry but would simply shift the entire industry demand to the developing world, which poses more difficulties and even higher barriers for possible production practice improvements.

The determining challenge here is to shift away from deforestation to the sustainable production of palm oil (WWF, 2011). While the social-economic impacts of palm oil are mixed with positive and negative observations, the environmental impacts of the plantation expansion are overwhelmingly catastrophic. The core of the problem is therefore the conversion of biodiversity- and carbon-rich tropical forests to monospecific palm oil production. As discussed in the previous section concerning the ecological impacts of palm oil production, general literature has shown that the current overall policy interventions and responses both at international and national levels have appeared to be insufficient to reduce the large scale environmental costs (Bregman, 2015; Hamilton-Hart, 2015a; Peters-Stanley et al., 2015; Petrenko et al., 2016; Rautner et al., 2013; WWF, 2016c). The losses of tropical forests cover and depletion of peat lands may be limited to the local/regional scale but they have substantial global ecological and social-economic consequences. The policy interventions whether taken at international, national or local levels, by public or private actors should therefore aim at diverting palm oil production from clearing tropical forests and peatlands, optimizing degraded lands and over-mature plantations, increasing yield efficiency, preventing/minimizing fires, reviewing the permit/licence allocation process with caution (Ardiansyah, 2007) as well as reducing global demand for vegetable oils.

3 Problem definition and policy goals

3.1 Problem definition

We have identified a few key specific characters of the palm oil industry. This industry has brought significant economic and social development in producer countries and the global demand of palm oil is projected to increase up to 65% by 2020 over 2010 baselines (Sung, 2016; Wicke et al., 2011; WWF, 2012). However, as one of the cheapest available vegetable oils, large ecological externalities of palm oil persist. The beneficiaries along the value chain from producers to end consumers do not directly pay for these environmental costs. These hard-to-quantify environmental costs are partially borne by the producer countries and local populations and partially borne by the countries that are most vulnerable to climate change. In addition, the global communities also bear the uncompensated transboundary effects of global warming and the loss of world's biodiversity heritage.

The characteristics of the palm oil governance regime complex serve to address the constraints of single instrument approaches, for example multiple externalities, administrative capacity constraints, nonpoint source, point source and non-uniformly mixed pollution, etc. Thus multiple policy instruments are in use to address the environmental degradation caused by palm oil production as discussed in this chapter. Nevertheless, if palm oil plantation does not cause tropical deforestation and peat destruction, then in fact it would not generate these particular environmental impacts (comparing to other intensive monoculture that does not cause deforestation). Hence the issue at stake here is not only to internalize these environmental costs but to minimize and remove them ultimately, which leads to the research question of this Chapter:

"How can policy mixes strengthen the current instruments in use and/or new instruments to minimize or remove the external environmental costs caused by global palm oil production?

The necessity for palm oil in the global market and the current tropical deforestation associated production practice in South East Asia make palm oil a highly considerable policy challenge. This hence raises the question of how palm oil can be produced sustainably. The remainder of this section discusses what constitutes sustainable palm oil and what are the final goals that we want to achieve with our policy interventions.

3.2 Environmentally sustainable palm oil as policy goal

The palm oil value chain can be improved through policy interventions from both supply and demand side approaches. From the demand side, the first logical measure is to reduce the overall demand of vegetable oil and palm oil, and second is to eliminate the use of unsustainably produced palm oil. From the supply side, the priority is to decouple palm oil production and tropical deforestation/peat destruction, and then to increase production efficiency and minimize ecological harms through innovative agro-ecological farming practices. Before entering the discussions on supply and demand policy goals, the next paragraph first outlines the criteria for sustainable palm oil and answers the question 'what kind of operation practices constitute sustainable palm oil production?'

3.2.1 Defining the criteria for environmentally sustainable palm oil

Currently there is no universally accepted definition for sustainable palm oil. The existing voluntary and mandatory criteria and standards for palm oil, although they cover similar dimensions of social and environmental issues, they do differ greatly in their details of 'sustainability'. In general, sustainability encompasses achievements in social, environmental and economic aspects. Actors engaged in

the palm oil industry, such as civil groups, governments and private sectors, have varied objectives and therefore take different actions in pursuit of 'sustainability', depending on their organizational priorities. This Chapter, as mentioned earlier in the beginning of Section 2, emphasizes merely the environmental aspects as well as the economic viability of sustainability. As such, the sustainability used here refers to those standards set by the leading environmental groups and proactive producers in this area. Within these groups, there are two primary approaches to the sustainability of palm oil. They are explained in the following two paragraphs: one is based on certification standards and another alternative approach focuses on transforming supply chains with individually tailored corporate policy in collaboration with an international NGO.

One of the foremost initiatives striving for a responsible palm oil supply chain is the Palm Oil Innovation Group (POIG), which is built upon the Roundtable on Sustainable Palm Oil (RSPO) certification standards.[136] The POIG is a multi-stakeholder body developed by leading non-governmental groups and proactive producers, such as Greenpeace, Worldwide Fund for Nature (WWF), Ferrero (producer of the biggest chocolate and confectionery goods in the world, including Nutella and Kinder) and L'Oreal, aiming to go beyond RSPO existing standards. Table 14 below lists the environmental responsibility requirements outlined by RSPO and POIG. The POIG Charter lays out clearer requirements for members on the protection of peat lands, High Conservation Value and High Carbon Stock forests. In addition, POIG also demands more information transparency and reporting requirements.

[136] To become a POIG member, palm oil growers need to have more than 50 percent of RSPO certified plantations and further commit to have all plantation certified by RSPO. Additional requirements from the Charter will be verified through third-party certification audits (POIG, 2013).

Table 14: Environmental responsibilities specified in the RSPO principle and POIG Charter

RSPO Principle 5: Environmental responsibility and conservation of natural resources and biodiversity	POIG Charter: 1. Environmental Responsibility
▪ Identify and mitigate negative environmental impacts on plantation and mill management, and demonstrate continuous improvement. ▪ Identify the status of rare, threatened or endangered species and high conservation value habitats in plantation and mill management and take their conservation plan into account. ▪ Minimize waste, including recycle and reuse, in an environmentally and socially responsible manner. ▪ Maximize energy efficiency and use of renewable energy. ▪ Avoid use of fire for waste disposal and for preparing land except in specific situations. ▪ Develop plans to reduce pollution and emissions, including greenhouse gases.	▪ Breaking the link between Palm Oil Expansion and Deforestation: Forest protection through conserving and restoring High Conservation Value (HCV) and High Carbon Stock (HCS) areas ▪ No peat clearance and maintenance of peat lands ▪ Greenhouse gas (GHG) accountability ▪ Pesticides use minimization ▪ Chemical fertilizer minimization ▪ Genetically modified organism prohibition ▪ Water accountability ▪ Protect and conserve wildlife

Source: (POIG, 2013; RSPO, 2015)

Instead of going for certification, another alternative approach is a collaboration between NGOs and corporate agencies, which is different from the usual antagonistic relationship between these two groups of actors. Within this type of partnership, the NGO acts as a consultant with expertise to assist retailers or producers in solving complex issues in their supply chains, which are outside the scope of retailers' knowledge and hence hard to be addressed by companies on their own. The NGO then further helps developing supply chain policy, mapping and traceability solutions in terms of that particular company's leverage in the supply chain. The deliverables or outcomes of this approach is normally as straight foreword as certifications but depend on each partnership and can be rather qualitative. Cases as such can be exemplified by the forerunner collaboration between Nestlé and the Forest Trust since 2010. Later on this approach was also taken by a number of large-scale key producers and manufacturers in the palm oil industry, such as the Wilmar Group, Hershey's, Golden Agri-Resources, Ferrero, Cargill, Bunge and ADM. Here I list an example of the world's largest palm oil trader, Wilmar's sustainable policy and Nestlé responsible sourcing requirements for palm oil in Table 15 to show how proactive corporates and NGOs perceive 'sustainability'.

Table 15: Sustainable palm oil sourcing guidelines from Wilmar and Nestlé

Wilmar's "No Deforestation, No Peat, No Exploitation Policy"	Nestlé's responsible sourcing requirements for palm oil
No deforestation ▪ No development of High Carbon Stock (HCS) forests ▪ No development of High Conservation Value (HCV) Areas ▪ No burning **No development on peat** ▪ Progressively reduce greenhouse gas (GHG) emissions on existing plantations ▪ Best Management Practices for existing plantations on peat ▪ Where feasible, explore options for peat restoration by working with expert stakeholders and communities **No exploitation of people and local communities**[137]	▪ Comply with local laws and regulations ▪ Do not come from areas cleared of natural forest after November 2005 ▪ Respect the Free, Prior and Informed Consent (FPIC) of local and indigenous communities ▪ Protect high-carbon-value forests ▪ Protect peatlands ▪ Comply with the principles and criteria of the Roundtable on Sustainable Palm Oil (RSPO), the industry-wide certification body that promotes the growth and use of sustainable palm oil products.

Source: (Nestlé, 2016; Wilmar International Limited, 2015)

We can see from the above that some key issues overlap in the two tables. The rigorous guideline for environmental sustainability of palm oil foremost appears to cover explicit policy on no deforestation of High Carbon Stock (HCS) and High Conservation Value (HCV) forests and no peat land development, as well as other best management practices to minimize ecological impacts. Hence the crucial question here is how to define HCS and HCV forests.

The HCS approach was initially established by palm oil company Golden-Agri Resources Limited (GAR), Greenpeace and the Forest Trust in 2013 as a practical tool to implement Zero Deforestation Commitments in oil palm and pulp and paper industries (Proforest, 2014). Now it also engages rubber, cocoa and other sectors. In 2014, the High Carbon Stock Approach Steering Group was created with a broad membership among leading NGOs, commodity producers and users, as well as technical organizations. It provides overall governance of the HCS approach and methodology (Rosoman, Sheun, Opal, Anderson, & Trapshah, 2017). As for the HCV approach, it was first developed by the Forest Stewardship Council (FSC) in the late 1990s, and it is now applied by a range of other certification schemes, private sector organizations and financial institutions. The

[137] Details are not listed here given that the scope of this research excludes social aspects.

multi-stakeholder HCV Resource Network was established in 2006 by actors from non-profit organizations, producer/supply chain companies and standards/service providers[138] to promote the consistent use of HCV approach across different sectors and geographic areas. Since then, the Network has served as the main provider of tools and guidance for HCV assessors (Proforest, 2014). These two approaches are mainly used by stakeholders involved in the palm oil supply chains as part of the sustainability criteria. The end consumers are not likely to see them directly on the products, but would have to look into, for example, the details of certification standards or company's sustainable procurement/sourcing policies.

The HCS approach classifies forest areas into six categories ranging from high-density forest, to degraded former forest areas of scrub and open land based on the level of biomass, vegetation composition and structure and satellite data. It further advices that the zero-deforestation cultivation should only be established on scrub and open land (Rosoman et al., 2017). Table 16 below exemplifies the biometric measurements from field plot data in Indonesia, which shows that the palm oil plantation should be restricted to degraded lands with ground carbon stock lower than 35 Ct/ha. This number is in consistent with a study by Ruysschaert et al. (2011), which indicates that the time-averaged above ground carbon stock of an palm plantation is about 40 Ct/ha. Thus conversion of land below this number can actually lead to carbon stock gain. As for identifying HCV forests, here I cite the guidelines by The Consortium for Revision of the HCV Toolkit Indonesia (2009). In the guidelines, 6 high conservation values and 13 sub-values are defined, as shown in Table 17. However, the actual on the ground implementation of these approaches is still challenging as currently there exists no method to combine the HCV and HCS approaches, no standardization between companies and poor monitoring and auditing (Bregman, 2015).

[138] The non-profit organizations include, for example, the World Resource Institute, the Forest People Programme and the World Wide Fund for Nature International. The supply chain company can be exemplified by the participation of the Golden Agri Resources. Standards/service providers are those such as the FSC and the RSPO. For more details please visit the HCV Resource Network website: https://www.hcvnetwork.org/.

Table 16: The biometric measurements from field plot data in Indonesia based on the HCS approach

Vegetation Stratification		Trees with DBH[139] > 30cm	Canopy closure	Estimated molecular Ct/ha
High Carbon Stock Forest	High Density Forest (HDF)	>50	>50%	> 150
	Medium Density Forest (MDF)	40-50 / ha		90-150
	Low Density Forest (LDF)	30-40 / ha		75-90
	Young Regenerating Forest (YRF)	15-30 / ha	30-40%	35-75
Degraded lands (Former Forest)	Scrub (S)	5-15	<20%	15-35
	Open Land (OL)	0-5	0%	0-15

Source: (Rosoman et al., 2017, Module 4, p.23)

Table 17: HCVs defined in the Toolkit for Indonesia

HCV 1: Areas with Important Levels of Biodiversity - Areas that Contain or Provide Biodiversity Support Function to Protection or Conservation Areas - Critically Endangered Species - Areas that Contain Habitat for Viable Populations of Endangered, Restricted Range or Protected Species - Areas that Contain Habitat of Temporary Use by Species or Congregations of Species
HCV 2: Natural Landscapes and Dynamics - Large Natural Landscapes with Capacity to Maintain Natural Ecological Processes and Dynamics - Areas that Contain Two or More Contiguous Ecosystems - Areas that Contain Representative Populations of Most Naturally Occurring Species
HCV 3: Rare or Endangered Ecosystems
HCV 4: Environmental Services - Areas or Ecosystems Important for the Provision of Water and Prevention of Floods for Downstream communities - Areas Important for the Prevention of Erosion and Sedimentation

[139] DBH refers to the tree diameter at breast height (4.5 feet or 1.37 meter from the ground). DBH measurements are used to estimate the biomass, volume, and carbon storage of trees in a local ecosystem (Ravindranath & Ostwald, 2008).

- Areas that Function as Natural Barriers to the Spread of Forest or Ground Fire
HCV 5: Natural Areas Critical for Meeting the Basic Needs of Local People
HCV 6: Areas Critical for Maintaining the Cultural Identity of Local Communities

Source: (The Consortium for Revision of the HCV Toolkit Indonesia, 2009, p.14)

Although the environmental 'sustainability' of palm oil is determined at the production sites, the global market demand is actually the major force to drive this supply chain transformation back to its source. Thus with the above more clearly understood 'sustainability' from the supply side of palm oil production, together with the demand side approach, three main policy goals are set out in the remaining section for designing environmentally sustainable palm oil policy.

3.2.2 Policy goals

The three main identified policy goals are:

1.) Restrict the use of unsustainably produced palm oil and increase demand for sustainable palm oil
2.) Decouple palm oil production and deforestation
3.) Increase production efficiency and reduce ecological harm

These three categories of goals in fact consist of five type of policies. However, the reason why the first two and last two are group together is because supply side and demand side measures, as well as intensification and measures to reduce ecological harms have to be considered simultaneously to avoid displacement or further deforestation caused by rebound effects (similar to Jevon's paradox) (Alcott, 2005).

It might appear to some environmentalists that the first obvious solution is to reduce the overall consumption of palm oil (and other vegetable oils) especially in the use of confectionery and ultra-process food.[140] Nearly all of these products are unhealthy, not compulsory and in fact very harmful to human health that also cause negative social, economic, cultural and other impacts (Monteiro, Levy, Claro, Castro, & Cannon, 2010; Moubarac et al., 2013; UNSCN, 2010). Nevertheless, as crucial as this approach is, a discussion on such topic is outside of the scope of this research since it falls more likely within disciplines such as health and nutritional science, neuroscience (in terms of food addiction),

[140] The majority of ultra-processed food products are also termed as 'fast' foods or 'convenience' foods with the characteristic of long shelf-lives. Examples include biscuits (cookies), cakes and pastries; ice cream; confectionery (candies), cereal bars, breakfast cereals with added sugar; chips, crisps; savoury and sweet snack products; vegetable and other 'recipe' dishes; stews and pot noodle, etc. (Monteiro et al., 2010).

behavioural psychology, sociology, industry rent-seeking and the policy instruments used on public health and dietary choices in general. Thus an investigation into an overall reduction in the use of palm oil in ultra-processed food is although important, very often ignored and typically not within the direct focus of environmental groups. However, in order to fundamentally achieve the goal of minimizing the ecological impacts of palm oil, more attention and further research addressing the collaboration or linkage between these disciplines are desired.

A more direct environmentally relevant approach is to lower the demand for unsustainably produced palm oil and create more incentives for producing sustainable palm oil, for example taxing uncertified palm oil in developed countries. Recognizing that the demand and production for palm oil will increase considerably worldwide, the question hence is not to ban the use of palm oil and replace it with others but to transform the palm oil industry, taking into account its high yield efficiency and its social benefits. Currently, the demand for sustainable palm oil is primary driven by pressures from environmental NGOs, consumers in developed countries and increasingly by more and more private companies (Bregman, 2015; Hamilton-Hart, 2015b). Due to the lack of environmental awareness and the prioritized economic development in the top palm oil consumption countries, it is relatively difficult to directly advocate the importance of palm oil sustainability to the end consumers in these markets. A more feasible approach is to pressure and transform those supply chains targeting at developed countries. Because of the complexity and the numbers of actors engaged, a thorough transformation in these supply chains can already make a significant difference and covers a large overlapped part of the supply chain nodes destined for developed countries. For instance, multinational corporates with zero deforestation commitment for oil palm control more than 96 percent of all the internationally traded palm oil (Austin, Lee, et al., 2017). These corporates are either under periodic scrutiny of numerous environmental groups or in collaboration with NGOs, which signals continuous incentives for sustainable palm oil demand and the unfavourable circumstances for unsustainably produced palm oil to producer countries and markets in developing countries.

The second policy goal is the one being addressed intensely by almost all environmental groups: to break the link between palm oil production and tropical deforestation, peat destruction and to cultivate on already deforested and degraded lands. This is also the primary emphasis in the zero-deforestation commitments by multinational corporations and the reason why HCV and HCS approaches were developed. In general, this is primarily done by land use planning and mapping and accompanied with issues of tenure, degraded lands fragmentation and smallholder engagement. In Indonesia, it is estimated that there are around 7 Mha potential areas containing degraded lands in West and Central Kalimantan can be used for palm oil cultivation (Miettinen, Hooijer,

Tollenaar, Page, & Malins, 2012; Ruysschaert et al., 2011). However, these degraded lands tend to be fragmented and patchy, consisting of land areas possible claimed ownership, ranging from 50 to 500 hectares or more (Ruysschaert et al., 2011), which are hard for large scale business-as-usual palm plantation and thus requires smallholder engagement. On the other hand, there is also research suggesting that degraded lands will not be able to satisfy the rapidly growing demand for all the tropical forest commodities (palm oil, pulp wood, rubber and timber, etc.) (Van der Laan, Wicke, Verweij, & Faaij, 2017). Hence it is still critical to bring down global consumption of palm oil and meanwhile fully utilize oil palm's potential as a high-productive oil crop, which leads us to the third policy goal.

The third goal is to increase production efficiency and to reduce ecological harms through for example, optimal collaboration between big agri-business and smallholders, agro-forestry techniques, patchwork developments, and ecological intensification. Existing palm oil plantations often do not reach their expected oil yield. Research has demonstrated that there exists substantial potential for increased palm oil yields (Molenaar, Persch-Orth, Lord, Taylor, & Harms, 2013). The global average is 3.7 tonnes per hectare while under optimum ecological circumstances, selected plant material at commercial scale produces around 10 tonnes per hectare per year. It is also observed that oil yields from industrial big scale plantations and mills are 50 percent higher on average than those from traditional pressing facilities (Rival & Levang, 2014). In general, the productivity of smallholders is consistently underperformed compared to large scale plantations (e.g. 11 to 14 percent lower than average large private plantation yields in Indonesia) (Molenaar et al., 2013). Although it is unrealistic to expect smallholders to obtain the same yields as commercial plantation, the potential for yield improvement is still at any rate considerable.

The next Section assesses the current policy instrument choices that are used to achieve the above stated policy goals.

4 Assessing instrument choices

Environmental policy instruments can be broadly grouped into command and control regulation and incentive-based instruments (Tol, 2014, p.44). These instruments attempt to enhance or modify the incentives held by resource managers in order to motivate the conservation and restoration of tropical forests, while fulfilling broader socially desired objectives, such as production and allocation. In the case of palm oil cultivation, as mentioned in the previous section, the incentive design should aim to reduce or stabilize market demand, restructure the food system, transform business-as-usual practice, divert production from

primary/secondary forests along with peatlands, [141] improve forest management,[142] systematically strengthen governance, and increase production efficiency (D. Boucher et al., 2011; Kissinger et al., 2012), etc. This Section discusses a number of main policy instruments taken to internalize or remove the external costs of the palm oil industry and to achieve the above objectives.

In the international arena, there is no universal forest agreement or forest treaty to govern sustainable forest management. There are a few international treaties ruling other environmental regimes that partially cover certain aspects of forests ecosystems. For example, the United Nations Framework Convention on Climate Change (UNFCCC) focuses on the carbon sequestration aspect of the forests, the Convention on Biological Diversity conserves forest and forest-related resources to ensure sustained biodiversity, and the United Nations Convention to Combat Desertification promotes the prevention and restoration of forest degradation and deforestation to avert desertification (Gupta et al., 2013). Furthermore, even though the palm oil industry is primarily a regional industry with production in South East Asia,[143] there exists no authoritative regional institution governing investment, labour standards and production.[144] However, there is a patchwork of public and private, formal and informal institutions across multiple governing levels supporting the industry, which are the main discussions in this Section. The first two sub-sections discuss policy measures taken by producer and consumer countries, covering mostly command and control instruments, taxation and other extra-territorial impacts. Notably, in the environmental governance of the global palm oil industry, the most prominent actors are the private sector and voluntary standards. Due to the increasing awareness and global pressures from consumers and environmental non-governmental organizations of the disastrous environmental impacts of palm oil production, the industry has responded to this demand with the creation of a certification scheme as well as the zero deforestation commitments.

Additionally, because of the immense climate footprint of palm oil production, it has drawn considerable attention from the international climate change regime.

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[141] In other words, to decouple the demand for deforestation and the demand for economic growth and food.

[142] It is in fact hard to separate forestry governance between adjacent sectors such as policies for agriculture, timber and timber products. A well designed sustainable forest management can, for example, provide better incentives and motivations for keeping forest standing rather than converting forest lands to agricultural uses.

[143] For example with major consumption in Asia and with dominant Malaysian and Singaporean ownership of transnational firms (Hamilton-Hart, 2015b).

[144] Interestingly, there is a treaty by the Association of Southeast Asian Nations (ASEAN) on trans-boundary haze pollution, which is a serious issue caused by the land clearance for palm oil plantation. Nevertheless, the term "palm oil" and the industry is rarely mentioned in the relevant communiqués and documents.

However, although the carbon mechanism Reducing Emissions from Deforestation and Forest Degradation (REDD+) under the UNFCCC is an ongoing measure that once brought a lot of excitement, so far it has made little direct progress on diverting palm plantations away from deforestation. Therefore this mechanism is discussed after the private initiatives. More specifically, Indonesia is one of the countries that has the most carbon projects labelled with REDD+. Hence sub-section 4.4 looks into how these REDD+ projects in Indonesia interact with palm oil plantations and whether they assist in reducing the GHG emissions from palm oil production. Lastly, this Section finishes with a summary.

4.1 Regulations in producer countries

In theory, the regulations in the producer countries are the fairly direct measures to tackle environmental sustainability issues of palm oil. Direct command and control regulation used to prohibit or restrict harmful environmental activities followed with subsequent penalties, has been the dominant government response to the rise of ecological degradation and pollution since the 1970s (Gunningham et al., 1998, p.38). For example, these direct regulations in the palm oil industry in Indonesia take place in the legal form of various law bodies, such as spatial planning law, plantation law, forestry law, mandatory national certification standards, concession permit/licences mechanisms and environmental covenants, etc. However, as palm oil is a vital sector in Indonesia's and Malaysia's economies and development strategies, these governments have both played critical roles in facilitating the expansion of the palm oil industry through a range of institutional innovations and policy initiatives since the 1970s (Hamilton-Hart, 2015b). Traditionally, government regulations of agriculture have aimed at promoting and developing the industry rather than at regulatory control. This kind of support model is normally hard to be altered with rising environmental concerns (Gunningham et al., 1998, p.278), especially when it is dominantly influenced by producer interests. It is not until recent years that the Indonesian and Malaysian governments have increasingly recognized the need to mitigate the negative environmental impacts associated with palm oil (Aurora, Palmer, Paoli, Prasodjo, & Schweithelm, 2015). For instance, as political leadership, the Indonesian national government has set a GHG mitigation target: reducing 26%-41% of GHG emissions (while maintaining a 7% annual economic growth) by 2020 (Vision 7-26)(G. D. Paoli et al., 2013). This target required the rate of conversion of forests and peatlands to plantations and other uses to be dramatically reduced.

Even though the global private sector takes a major part in the palm oil governance in terms of mitigating negative externalities from palm oil production, the industry business actors alone have their limits in transforming the sector even with their most desirable intentions. Strong legal frameworks and national laws with forceful and consistent enforcement need to remain as the foundation of all

the international efforts, in particular to regulate the resistant elite groups, numerous independent smallholders and mid-sized producers and companies (M. Williams, 2003, p.498). On top of that, integrating forests conservation, the national development plan and the establishment of policies that incentivize sustainable production in the country are equally important.

In addition, tropical forest countries can also facilitate and implement international bilateral agreements with the consumer end market in the developed countries. Thus the cooperation of producer governments is also at the core of the global policy interventions in the palm oil industry. In the next subsection (4.2), the role of importing countries at domestic level will be discussed. This sub-section focuses on the role of producer countries and discusses a number of policy measures taken at national levels. The following paragraph gives a brief description of the general regulatory environment in Indonesia and Malaysia regarding palm oil governance. Then a few key policy measures in use are discussed in the remaining subsection, such as land use planning, moratoria, mandatory national certification schemes and other combined public and private partnerships.

The governance of palm oil is institutionally and legally intricate. It involves multiple government agencies and laws encompassing forests, land, spatial planning, plantations, environmental management, and regional administration. The Indonesian laws and regulations governing palm oil are comprehensive but also contradictory and confusing in terms of environmental management. The realization of the need to halt or to slow down deforestation from palm oil expansion is growing among political leaders in order to re-brand Indonesian palm oil. Government policies and regulations have emerged to reduce the negative environmental and social impacts of agricultural commodities, but currently the majority of palm oil producers are not even meeting the minimum legal standards (Aurora et al., 2015). One major concern is that there is no over-arching national policy in Indonesia that regulates deforestation reversion and the development of palm oil (G. D. Paoli et al., 2013). This has led to a lack of coordination of law provisions, and government levels and officials in adjacent sectors and their variable impacts on oil palm development. Thus the efficiency and effectiveness of regulation need to be improved considerably by, for example, consolidating related legal requirements, especially regarding palm oil plantation licensing, environmental impact assessment and management requirements. Similarly, Malaysian authorities have been sending conflicting messages. The palm oil industry in Malaysia is governed by numerous bodies of laws concerning land, wildlife and environmental matters. It also launched its national certification scheme building on legal compliance. Nevertheless, meanwhile Malaysian officials

block the transparency work of RSPO to publicize land bank[145] maps under large industry's control in the country (WWF, 2016a). In addition, there is a general lack of enforcement and observed systematic governance weaknesses. Let us now turn to some of the most important policy instruments taken by the producer countries.

4.1.1 Land use planning and national coordination

Among all the carbon footprints from palm oil production, emissions from deforestation are in fact the part that can be greatly avoided by advisedly selecting the land for plantations. In other words, if new plantations are to replace the old ones or are established on degraded or non-forest grassland, then there will be no additional emissions (or it may even become a net carbon sink) from land use change. However when new plantations replace forests on mineral or peat soils, the emissions are significant. Hence effective land-use planning and zoning are in fact not only the bedrock of successful palm oil cultivation strategies but also the key to solve land tenure conflicts and other social impacts. For instance, when the moratorium was about to be carried out under the Letter of Intent between the government of Norway and Indonesia, the important issue came in to focus that different sectors in the Indonesian authorities use their own maps. These maps are inconsistent with each other and therefore lead to confusion and uncertainty that pose tremendous difficulties in planning and implementing any land-based policy, such as the REDD+ (Sills et al., 2014). There are also times when different government agencies issue rights to operate to competing businesses in overlapping jurisdictions (MacDonald, 2017). Indonesia thus initiated a national 'One Map' policy to develop, re-zone and consolidate a central geospatial database and permit the process across sectors (Seymour, Birdsall, & Savedoff, 2015). The mapping and reclassification process based on carbon and biodiversity richness is also important to facilitate programs such as "land swaps" to ensure that intact forests are managed as forest and to identify suitable deforested lands for oil palm development despite their original classification (G. D. Paoli et al., 2013). Ultimately, the policy for better spatial planning not only aims to reduce deforestation, but also to clarify administrative boundaries, resolve land disputes, improve disaster management and conservation.

The permit and licensing systems for oil palm cultivation are closely linked with land use planning. In Indonesia, the national spatial planning differentiates land zones into permanent forests and lands for agricultural use. Paradoxically, within the defined Forest Zones, there are large deforested areas prohibited from agricultural conversion while large intact forest areas outside of Forest Zones are legally available for conversion. Those lands zoned for agricultural use are

[145] Land bank is "a large area of land held by a public or private organization for future development or disposal" (OxfordDictionaries, 2018a).

Cultivation Areas for Non-forestry (outside Forest Zones) and Production Forest for Conversion (inside Forest Zones). It is legal to issue a palm oil development licence on lands zoned under these two categories with required conditional local impact assessments. The further licensing decisions are made at district or a more local level by government authorities with mandated impact assessment. The authority or company would first offer or request proposed licences. Then a suitability evaluation on sensitive ecosystems and other factors (such as community opposition, moratorium) will be carried out before the licences are issued (G. D. Paoli et al., 2013). The licence does not only give out a land clearing permit, it also comes with numerous local decisions concerning the specific location and method of plantation development and mill operation. However, the post-licensing decisions made by companies are equally significant, because companies determine to what extent the legal requirements would guide their decisions, which depends on public enforcement and perceived penalty risks for breaching (G. D. Paoli et al., 2013).

To establish nation-wide consistent forest land use planning and mapping can be a very lengthy and arduous process due to competing interests among government agencies and bureaucratic and technical complexities (Pacheco, Schoneveld, Dermawan, Komarudin, & Djama, 2017a). In particular, while striving for a consistent mapping across nation and to map out HCV, HCS forests and degraded lands for zero deforestation commitment, the long-lasting tenure issues and land conflicts appear to be the major complication. Not to mention that in many cases this HCV and HCS mapping is done by companies rather than by government authorities and thus leads to uncoordinated, unilateral, inconsistent or contradictory mapping results. Reluctance to cooperate is observed among government agencies, not only because concession permits are a part of the government revenue, but also because some agencies that control permit issuance gain their potential illicit financial benefits through contradictory, unclear and inconsistent regulations (Kurniawan, 2016; Pacheco, 2016). Thus land mapping is not only a technical challenge but also an underlying political and social power dynamic complex. Though difficult, some lessons can be drawn from the successful case of Brazil.

In 2013, Brazil has reduced its deforestation rate drastically by 70 percent in comparison with its 1996–2005 average rate through various policy measures while soybean production increased. Among which, land use planning and national coordination contribute significantly to reduce deforestation by expanding and legally recognizing indigenous land reserves and protected areas to more than 50 percent of the Brazilian Amazon. Moreover, the federal government and several Amazon states have determined and acted vigorously to push for harder anti-deforestation policies (D. Boucher et al., 2014). In addition, Brazil has been implementing the Cadastro Ambiental Rural (the Rural Environmental Registry – CAR) mechanism since 2012 to register all rural properties. The CAR

registry system contains geo-referenced land property information to help refining tenure, map out permanently preserved areas and cap allowable proportions to clear natural vegetation on rural property. States are compelled to assist smallholder farmers to comply. A side-by-side cross-compliance measure is the federal municipal embargo blacklist policy, based on government resolution 3.545 published in 2008 by the Brazilian Monetary Council and Presidential Decree 6.321 issued in 2007. Together these regulations blacklist municipalities with a high deforestation rate. Being blacklisted leads to sanctions and restricted access to subsidized credits for farmers, such as limited licence issuing, constant land-use inspection and monitoring, and intensified enforcement. In order to be removed from the blacklist, the municipality has to bring down its deforestation rate and enrole 80 per cent of private properties in the national government CAR registry system (Cisneros, Zhou, & Börner, 2015; Duchelle, Greenleaf, Mello, Tadeu, & Gebara, 2014). These measures are expected to provide environmental benefits such as more ecosystem services and prepare farmers for increasing sustainable market demand (Jung, Rasmussen, Watkins, Newton, & Agrawal, 2017). To sum up, even though nationally coordinated land use strategy and tenure clarification are difficult, time-consuming and politically demanding, they are the prerequisite foundation not only for reducing tropical deforestation but for better economic development. Hence these relevant land planning regulations should be prioritized in the producer countries.

4.1.2 Moratoria

A moratorium is a temporary delay or suspension of activities. A moratorium taken by a tropical forest country is normally used as a policy instrument to halt illegal or unsustainable deforestation, such as the ones in Indonesia (for concessions in primary forest and peatland), Papua New Guinea (for agriculture leases), Nigeria (for logging in Cross River State) and Brazil (for soy and cattle)(Rautner et al., 2013). Moratoria can be initiated and enforced by the public sector or through voluntary agreements among private companies. When a moratorium is carried out by the public sector, governments can review legislation, improve enforcement or establish Monitoring, Reporting and Verification (MRV) protocols. Private voluntary moratoria usually are collaborations led by companies with time-bound targets to exclude purchasing products or raw materials from certain specific deforested areas. This kind of measure is preferable for supply chains concentrating on a limited number of companies on a single process stage with a significant market share. The other important function of developing and enhancing a moratorium is its potential to reduce and prevent leakage and displacement across ecosystems and jurisdictions. In theory, by eliminating the risks of deforestation throughout a country or a sub-national jurisdiction, the tracking and ascertaining of the certain deforestation-free commodity from that source of region would be less complicated (Bregman, 2015). Nevertheless,

moratoria are inherently temporary per se and therefore not a resilient policy options in the long run. While moratoria can be renewed or expanded, they should act as a bridge to facilitate permanent legislative or policy reform.

Indonesia implemented a forest moratorium in 2011 in the form of Presidential Instruction (Inpres No.10/2011) in order to fulfil the Letter of Intent on REDD+ with Norway. The moratorium was first signed for two years and later extended to 2017. Inpres No.10/2011 suspended issuing new concession licences for forest land conversions (including primary forests and peatlands) and logging (Government of Indonesia, 2011). However, the loss of forest cover in Indonesia remained high in 2015. Experts in the field have suggested that the moratorium has had minor effects on forest protection so far for a number of reasons (Arief Wijaya, Juliane, Firmansyah, & Payne, 2017). One reason is that the moratorium was issued as presidential instructions to ministries and government agencies in concern, which is a non-legislative document. Therefore there would be no legal consequence for non-compliance. Second, the moratorium only includes primary forests, which are already protected by existing laws whereas secondary, logged-over and disturbed forests are excluded. These non-primary forests are also rich in carbon and biodiversity. Third, the moratorium does not affect a large number of existing permits for concession that were issued prior to the Inpres (Daniel Murdiyarso et al., 2011; Seymour et al., 2015). The moratorium is thus contested in several aspects. In order to strengthen the effectiveness of the moratorium, it is suggested that the review of existing licences and their renewal can expand and secure areas high in carbon and diversity under the moratorium (Busch et al., 2015; Daniel Murdiyarso et al., 2011). Along with other more detailed scope expansion, the moratorium in fact has a great potential to facilitate transformation in forest governance. Currently, aside from the extended Inpres No.10/2011 moratorium, in late 2015, after the severe forest fire and haze pollution, President Joko Widodo announced a five-year moratorium on any further development in peat areas regardless of issued permits. Next year the Government Regulation No. 57/2016 (the revision to No.71/2014) was issued to strengthen the peat moratorium by permanently banning any new peatlands development and setting aside at least 30 percent more conservation peat areas (foresthints.news, 2016; Setiawan & Faroby, 2017). In July 2016, President Joko Widodo also announced his intention to impose a moratorium that bans all the new palm oil permits, which will indicate that the government plans to grow its palm oil industry by enhancing production efficiency rather than expanding plantation areas (G. Paoli, Palme, Schweithelm, Limberg, & Green, 2016). This palm oil moratorium remains under development.

The successful case of the soy moratorium in Brazil has been well documented (D. Boucher et al., 2014; Rudorff et al., 2011). The moratorium was declared in 2006 by two main private trade associations of the soy commodity in response to high reputational risks posted by environmental groups. The private sector together pledged not to purchase any soybean produced on Amazon areas that

were deforested after 24th of June, 2006. After six years, research has shown that not only were the deforestation rate and soybean production decoupled in Mato Grosso but the expected leakage to adjacent biome (*Cerrado*) did not take place (Macedo et al., 2012). The soybean industry keeps thriving without deforestation in the Amazon (Lathuillière, Johnson, Galford, & Couto, 2014a). This is mainly done by increasing yields,[146] multiple cropping and advanced use of remote sensing data and tenure clarification (D. Boucher et al., 2014). Although situations in the soybean industry and in the Brazilian Amazon differ from the palm oil industry in Indonesia and Malaysia, the case demonstrates how moratoria can provide a window of opportunity for other policy measures to come into place.

4.1.3 Mandatory national certifications

The Indonesian government and the Malaysian government launched their state certification schemes in 2011 and 2013 respectively: the mandatory Indonesia Sustainable Palm Oil (ISPO) and the voluntary Malaysian Sustainable Palm Oil (MSPO)[147] (EFECA, 2016; Giessen, Burns, Sahide, & Wibowo, 2016). These national certification schemes are built on legal compliance and aim at eradicating the worst practices within the palm oil industry (WWF, 2016c). This trend has shifted the certification from an internationally voluntary nature to compulsory national rules. During the early development of private certification, namely the Roundtable on Sustainable Palm Oil (RSPO), the participation of producer associations and public authorities in the producer countries was limited for the reason that the RSPO did not want to evolve into an intergovernmental institution. However, the producer governments have gradually become more present and vocal in the sustainable palm oil debates and furthermore decided to establish national standards in parallel with the private partnership, even though the current structure of ISPO resembles RSPO to a high degree. The large producers association in Indonesia (GAPKI) was concerned with the situation that the European driven RSPO has marginalized producers/growers in the decision making process and therefore resigned from the membership of RSPO in order to support their national standards (Hospes, 2014). The ISPO was launched in the form of ministerial decree (MoA Regulation 19 of 2011) and is mandatory to all plantation actors in Indonesia. It was argued by the Indonesian Ministry of Agriculture and the Indonesian Palm Oil Commission that the voluntary RSPO is inadequate to realize sustainable palm oil and GHG reduction in Indonesia, especially when the amount of plantation companies exceeds 2000 and involves a great number of heterogeneous smallholders (Ernah, 2015;

[146] While deforestation and carbon footprint of soybean industry decreased by 70 percent, the associated land, water, and nutrient footprints increased nearly 30 percent (Lathuillière, Johnson, Galford, & Couto, 2014b).

[147] In February 2017, the Malaysian government announced a timeline for compulsory implementation of MSPO by 2019 (Pacheco, Schoneveld, et al., 2017b).

Suharto, 2010). To implement ISPO across dispersed and vast plantation areas in the country is practically and logistically challenging. As of April 2017, 12 percent of oil palm plantations in Indonesia are ISPO certified, consisting of 266 institutions (Ribka, 2017). The number of ISPO certified companies is expected to increase, yet the ISPO certification still requires better international recognition, in particular in the European market.

The main difference between ISPO and RSPO is that the former is established by the government alone and is obligatory while RSPO is built by global market players with a multi-stakeholder consultation process and is voluntary. In other words, the ISPO is observed, measured and regulated from within the nation while the RSPO involves agents beyond the jurisdictional limits. In addition, the ISPO principles do not cover "responsible development of new plantings" and "commitment to transparency" as the RSPO does (Hospes, 2014). The ISPO views dissemination of information as part of plantation management rather than as a transparency tool to hold plantations accountable. It also emphasizes the palm grower's relationship with public authorities instead of its relationship with local communities. Regarding environmental criteria, the ISPO does not specify any cut-off date for deforestation practice and it does not define any HCV or HCS forest areas. It refers to only business licences and official site permits to operate in Conversion Production Forest. In other words, the ISPO allows deforestation and production on peatlands in certain areas under the Indonesian law (Hospes, 2014; Yaap & Paoli, 2014).

The particular feature of the national standard is that it emphasizes the sustainability defined by state's law, policies and agencies but not by the private multi-stakeholder partnership, meaning that the extent to which deforestation and carbon emissions on its territory are within the 'sustainable' boundary should be decided by its political authority. Currently, the ISPO in addition does not promote further environmental sustainability than the RSPO but to the contrary, it grants more room for plantation expansion in comparison with the RSPO, which sends out the underlying message of economic development before environment (Hospes, 2014). For instance, producers who sell into the domestic biodiesel supply chain are exempted from the ISPO certification (G. Paoli et al., 2016). The ISPO appears to serve more the interests of producers while the RSPO seems to be more inclined to consumer interests (Sahide, Burns, Wibowo, Nurrochmat, & Giessen, 2015). The above discrepancies indicate that the launch of national standards by the government and producer associations is more of a rival than a complement to private standards (Hamilton-Hart, 2015b). The establishment of ISPO by public authorities challenges the private coalition of NGOs and international companies in the discursive control over defining and promoting sustainable palm oil in Indonesia (Giessen et al., 2016; Hospes & Kentin, 2014). Nevertheless, the ISPO in some ways is viewed as minimum sustainability requirements or an intermediate step to RSPO certification (Ivancic

& Koh, 2016a). The Indonesian government has also stated that, similar to the EU timber regulation and its affiliated Voluntary Partnership Agreements, the ISPO might be used in future bilateral trade agreement with palm oil importing countries (Hospes & Kentin, 2014). However, the ISPO holds great potential to enhance the sustainability production of palm oil in Indonesia since it is mandatory and can be strengthened incrementally over time with more stringent provisions.

4.2 Regulations in importing countries

4.2.1 Import restrictions

Between 2006 and 2014, the global aggregate pledges and investments for REDD+ that were raised from the donor/developed countries amounted to more than US$9.8 billion, from both public and private sectors (Norman & Nakhooda, 2015). This number can be compared with the annual export value of US$ 135 billion of the deforestation-driven commodities (Bregman, 2015). Thus besides providing financial support to the REDD+ scheme (as well as other international environment-related funds) to mitigate tropical deforestation and GHG emissions, there are other measures to approach zero deforestation targets, for instance, introducing a public procurement policy to prioritize the sourcing of sustainable products. Governments play a determining role to create demand by meeting their existing policies, such as the EU's Green Procurement Policy (Potts et al., 2014). In the case of palm oil, for example, food and catering services in the public sector (e.g. hospital, school, and prison) account for large volumes of food every year. Along with other ingredients, governments can specify the requirements of certification or minimum percentage of sustainably/organically produced products and encourage going beyond that target (European Commission, 2016). By setting clear policy signals, such as excluding products containing uncertified palm oil, the government can create market demand for sustainable forest risk commodities. Examples like this can be found in a number of European countries.

The Dutch palm oil traders and users formed the Dutch Task Force Sustainable Palm Oil, an industry-led initiative in 2010 and were the first to make such commitment. They pledged 100% RSPO-certified sustainable palm oil by 2015 for both palm oil processed in the Netherlands and destined for the Dutch market. In the meantime, they also facilitated the transition to physical certified sustainable palm oil and supported the improvement of the standards. In 2015, sustainable palm oil accounted for 84% of the palm oil in the Dutch food industry, among which 19% was from the Book and Claim system. The remaining 16% of non-certified palm oil use is linked to companies that are not members of the Task Force and they mostly export to foreign markets which lack a demand for sustainable palm oil (Task Force Sustainable Palm Oil, 2015). In 2015, the

governments of Denmark, France, Germany, the Netherlands, Norway and the United Kingdom and their national sector organizations engaged with the palm oil supply chain, together to sign the Amsterdam Declaration in Support of a Fully Sustainable Palm Oil Supply Chain by 2020.[148] Other countries, such as Belgium, Italy, Sweden have not signed the declaration yet, but are also committed to 100% certified palm oil (or even beyond RSPO criteria) by 2015 or by 2020 (RSPO, 2017). The majority of the above mentioned committed countries have established their national industry-led initiatives and reached a high percentage (80%-100%) of national sustainable palm oil uptake by 2015 (Sijses, 2016). In 2016, the Norwegian government went further and announced its zero tropical deforestation commitment in its public procurement policy (Gaworecki, 2016). The European Parliament issued a resolution on 4th of April 2017 to only import certified sustainable palm oil after 2020 and called for an international/EU-wide common sustainable palm oil standard, which concerns the governments of Malaysia and Indonesia (European Parliament, 2017; Sipalan, 2017).

Another issue that is particularly important concerning the procurement policy is the EU's biofuel policy under the Renewable Energy Directive. The EU aims at sourcing 10% of its transport fuel and at least 20% of its total energy needs from renewable sources by 2020 (EU, 2015a). Some sources pointed out that between 2010 and 2014, the use of palm oil for biodiesel in Europe increased five-folds (Gerasimchuk & Koh, 2013a; Neslen, 2016b). However, this need for biofuel production can lead to more deforestation and GHG emissions, in particular in the case of the use of first generation biodiesel made from palm oil, which actually emits far more GHG than the use of fossil fuel (Valin et al., 2015), even with RSPO-certified sources. The EU has considered a ban on certain crops derived from forests and peatlands, such as oil palm (UNDP, 2010). Nonetheless, as an alternative the EU has set a cap of 7% from food crops' biofuel contribution into the renewable energy target and has defined a set of sustainable criteria to exclude biofuel and its raw material grown in areas that are converted from high carbon stock or biodiversity-rich areas (EU, 2015b). Experts anyway have suggested that the EU biofuel policy should phase out first generation food-crop based biodiesel considering its effects on the climate, the environment and food prices and switch to biofuels that have high GHG saving and low land-use change impacts (Gerasimchuk & Koh, 2013b; Neslen, 2016a).

Aside from the EU, India and China are the top two palm oil importers. Regrettably, to this date the presence of sustainable palm oil in these two countries is still nascent (MacFarquhar, Ward, Bregman, & Lake, 2016) but the efforts for

[148] The Amsterdam Declaration in Support of a Fully Sustainable Palm Oil Supply Chain by 2020. Accessed on 20 February 2017 at http://www.fediol.be/data/Amsterdam%2BDeclaration%2BFully%2BSustainable%2BPalm%2BOil.pdf.

RSPO membership campaign have been intensified (Hospes & Kentin, 2014). In India, the awareness about the unsustainable practice of palm oil is increasing at the corporate level. The RSPO membership of Indian companies has grown from 8 in 2011 to 46 in 2015 and so far, there are 10 companies holding RSPO supply chain certificates. In China there has also been a growth in awareness in recent years and a few main domestic palm oil buyers have joined the RSPO membership (52 companies as of May 2016)(WWF, 2016c). Good progress with small steps towards sustainable palm oil is observed in the last few years. Nonetheless, there is no doubt that urgent efforts to advance commitments and involvement by companies and public are needed to drastically increase the market demand for sustainably certified palm oil in these two major importers. The situation at the consumer end in Indonesia faces similar problems. As the top palm oil consumption country, the consumer awareness towards sustainably produced palm oil is very low and uneven (RSPO, 2016a). However, based on a consumer study conducted by (Daemeter & TNS, 2015) and the RSPO, there is a promising potential for a shift in sustainable palm oil. More constructive consumer communication and outreach are needed as well as continuous support for smallholders to obtain certification. In the meantime, the expansion of the sustainable palm oil production chain driven by the western companies is essential to support and sustain the forthcoming market demand in the developing countries. Along with promoting activities and campaigns, the RSPO is aiming to achieve 10% of certified palm oil uptake in China and 30% in India by 2020 (RSPO, 2016a).

4.2.2 "Nutella Tax"

Taxation is an approach to internalize the environmental externalities through pricing of consumption or production and to shift incentives away from the business-as-usual deforestation associated production practice of palm oil. The most well-known case of palm oil taxation in a consumer country is in France. In 2016, a surcharge on imported palm oil tax was proposed as part of France's new biodiversity bill to tax palm oil without sustainability certification up to €90 per ton by 2020. The proposal sparked objections among major producer countries and in the end did not pass through the Senate. However, a proposed new scheme was then brought under review with an alternative tax system on all vegetable oils used in food (Michail, 2016). This was not the first attempt by the French government to impose a palm oil tax. Back in 2012, an amendment to a draft social security finance law introduced a tax of €300 per ton on palm oil in an effort to reduce obesity, dubbed as the "Nutella tax", was also dropped eventually (Rival & Levang, 2014). An attempt to tax palm oil as such in France shows tremendous controversies as well as political and diplomatic difficulties between consumer and producer countries. A unilateral policy measure taken by developed countries might draw more opposition compared with a bilateral policy collaboration such

as the joint certification scheme for Indonesia's domestic timber legality system (SVLK) under the European Union's Forest Law Enforcement, Governance and Trade Voluntary Partnership Agreement (FLEGT VPA) framework.

4.2.3 Extra-territorial measure

Apart from taking trade related measures for certified palm oil, another example of action which a country can take using a controversial extra-territorial reach is shown in the case of Singapore government. Due to the severe negative impacts brought by the toxic haze caused by forest and peat burning in Indonesia, the country passed the Transboundary Haze Pollution Act[149] in 2014 to financially penalize liable local or foreign companies that are engaged in the burning activities up to $US 1.6 million. As one can imagine, there exist substantial challenges for its implementation and in reality, it is limited to companies with a presence in Singapore. The prosecution and enforcement of this Act requires cooperation from foreign authorities, for example, to present indisputable evidence of burning activities , identify fire initiators and deal with entrenched political and economic hurdles (Lee et al., 2016). However, an unprecedented measure like this provides an additional option and tool for governments to take stronger actions against companies or financial institutions that are involved with tropical forest and peat destructions. For instance, the EU Timber Regulation and the Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan can potentially be expanded to include not only timber but also other tropical deforestation-driven commodities.

4.3 Private governance

The international private market-driven non-state governance concerning the sustainability of palm oil has been more dominant compared to public governance. This section discusses voluntary commitments, certification schemes, NGO-business partnerships and measures on yield improvement and cultivation practice development. These policy approaches are not arranged in chronological order but start with the more over-arching deforestation-free commitments by private sectors on all tropical forest commodities. Then it is followed with the most prominent private voluntary certification scheme, the RSPO, established earliest in this palm oil sustainability governance regime. Finally, a rather recent approach introduces collaboration between environmental NGOs and big multinational enterprises, which has a growing influence on the market.

[149] Transboundary Haze Pollution Act 2014, Singaporean Ministry for the Environment and Water Resources, assessed on 2 March 2017 from http://www.parliament.gov.sg/sites/default/files/Transboundary%20Haze%20Pollution%20Bill%2018-2014.pdf.

4.3.1 Private voluntary zero (net) deforestation commitments

Aside from palm oil, most of the leading market influential actors are also involved with other commodities that are associated with tropical deforestation, such as timber and paper products, soy (as feed, oil and food ingredients etc.) and beef. As a result of strong public campaigns by the environmental groups and rising pressure from civil society, these global companies in recent years have become much more aware of the reputational, operational and legal risks they face when being affiliated with tropical deforestation. They are in particular concerned about the materials and commodities in their supply chains that are responsible for the majority of the negative impacts on the environment. Thus more private governance arrangements focusing on sustainability have developed in various global commodity chains. Since around 2009, a small number of companies have been making commitments to eliminate commodity-driven deforestation from their supply chains. In 2010, the Consumer Goods Forum (CGF)[150], representing its more than 400 global members across supply chains, during the Cancun climate change conference announced its resolution to achieve zero net deforestation by 2020 (Bregman, McCoy, Servent, & MacFarquhar, 2016). In the following years in 2013 and 2014, an unprecedented wave of major companies of producers, traders and retailers joined the ambitious time-bound targets of zero (net) deforestation along with the launch of the Tropical Forest Alliance and the New York Declaration on Forests. The New York Declaration on Forests has a target of halving the loss of natural forests globally by 2020 and ending natural forest deforestation by 2030. The non-binding agreement was endorsed by more than 36 national governments, 50 private companies, and many other non-profit organizations and indigenous groups (UN, 2014).

This swiftly emerging momentum of deforestation free commitments shows a strong trend for private corporate governance and their takes on corporate social and sustainable responsibility driven by internal economic drivers that are believed to improve and protect growth and profits in the long run. These drivers include reputation and brand protection, increasing concerns and demand from consumers and civil society, pressure from investors and lenders, mitigated liability, reduced operational risk, insurance expenses and availability, licence from the community to operate, government and public relationships, better resilience towards future regulatory changes, enhanced market access and operational efficiency (Paddock, 2016). The transnational corporations influence the international agenda through a self-regulatory and market-oriented governance model that could mobilize incentives to internalize the external environmental

[150] The Consumer Goods Forum is a global industry network, one of the largest trade association, consisted of CEOs and senior management of around 400 retailers, service providers, manufacturers, and other stakeholders from 70 countries. Some well-known companies include Unilever, Nestle, Wal-Mart, TESCO, Pepsico, The Coca-Cola Company, 3M, Henkel, Mitsubishi, etc. For more information see: http://www.theconsumergoodsforum.com/

and social costs with, in theory, state control to a lesser extent and minimum transaction costs (J. F. McCarthy, 2012). As of 2016, nearly 400 companies worldwide have made public commitments related to zero deforestation by 2020. The majority of these companies are based in North America and Europe with a relatively larger size and they operate downstream close to the consumer end of the supply chains. However, commitments made by upstream companies (producers, processors, traders) are likely to have more impact and thus it is important for the downstream companies to put more pressure directly on their upstream suppliers (Bregman, 2015). Among the commitments made, companies that are active in the palm oil supply chain have made 61% of the pledges, and the second largest group of companies that have adopted pledges are timber and pulp. Companies active in the cattle business on the other hand have the lowest engagement rate (15%) (B. McCarthy, 2016).

In this "zero" movement, the terms used are not always consistent and therefore occasionally cause confusion. "Zero deforestation" is also used as "no deforestation" or "zero/no gross deforestation". In some cases, the target specifies "zero net deforestation". "Zero/no deforestation" or "deforestation-free" are normally viewed as more general and ambiguous, but also sometimes are assumed as equivalent to zero gross deforestation (Bregman, 2015; Fishman, 2014; Paddock, 2016). The difference between "zero (gross) deforestation" and "zero net deforestation" lies in the essential accounting practice. Zero (gross) deforestation refers to no loss of existing forest areas from land use conversion whereas zero net deforestation also takes into account the gains from tree plantations and/or forest regeneration, which allows forest clearance on the condition that an equal size of area of forest is planted elsewhere. The major issue here is that the net deforestation targets are mostly hard to measure when it comes to biodiversity and ecosystem services, including carbon sequestration, water regulation and pest control, etc., since the loss of native/primary forests cannot be offset with young secondary forests or tree plantations (Brown & Zarin, 2013). It is thus critical to look into the exact contents of companies' "zero deforestation" and "zero net deforestation" policies and other added elements that go beyond banning forest clearance. In addition, there is still inconsistency concerning baselines/benchmarks and the definitions used for forests.

For instance, since 2008, the WWF is very clear about their stance on promoting Zero Net Deforestation and Degradation by 2020, rather than merely no deforestation in any place. They maintain that there is flexibility in some circumstances to offset forest loss (for the purpose of wider sustainable development and conservation goals) by forest restoration on the condition that the net quality, quantity and carbon density of the forests is retained. Moreover, the conversion of natural or primary forests or forests with high conservation value and/or critical carbon storage is not allowed under the target (WWF, 2008). On the other hand, Greenpeace advocates a "deforestation-free" target without

specifying whether it is gross or net deforestation.[151] However, Greenpeace does promote the High Carbon Stock (HCS) Approach actively along with many other organizations and corporates as a methodology to identify viable areas for forest restoration and plantation development and to protect natural tropical forests with high carbon stock while securing traditional communities' land use rights and livelihoods. The high carbon stock forests are also integrated with High Conservation Value (HCV) areas and peat land (Greenpeace, 2014). The majority of the companies share the above views concerning some widely accepted principles, such as no clearing on carbon-rich peat and on high conservation value and high carbon stock forest areas, no use of fires for clearing, respect for indigenous land right and obtaining free, prior and informed consent from local communities, only use legal lands for production, no use of forced or slaved labour and committing for transparency along the supply chains (Lake & Baer, 2015). Table 18 summarizes some key corporates' voluntary zero deforestation commitments. Among the companies described, only Cargill's commitments are time-bound.

Table 18: An overview of global major powerbrokers' zero deforestation commitments related to palm oil production

Company name	**Company description**	**Commitments**
Archer Daniels Midland	One of the world's biggest food processing and commodities trading company, based in Chicago.	- No deforestation of HCV and/or HCS forests - No development on peatlands - No exploitation of people and local communities - Require suppliers to submit compliance plan by the end of 2015
Asia Pulp and Paper	An Indonesian company that sells tissue, packaging, and paper worldwide.	- Protecting natural forests, with HCV and HCS forests - Improving peatland management - Social and community engagement - Ceasing to cut and mill mixed tropical hardwoods - Assuring its suppliers support responsible forest management

[151] Some authors refer Greenpeace's zero deforestation target as zero gross deforestation, see for example (Paddock, 2016).

Cargill	A leading multi-national grain trading and agri-business company based largely in the US.	- Halving deforestation resulting from its activities by 2020 and ending it completely by 2030 across its entire agricultural supply chain. - No deforestation of HCV lands or HCS areas - No development on peat - No exploitation of rights of indigenous peoples and local communities - Establishment of a traceable and transparent palm oil supply chain
Colgate-Palmolive	An American multi-national company that sells household, health care, and personal care products.	- Obtaining verification for pulp and paper material to safeguard the possible contribution to deforestation. - Increasing the purchase of physical RSPO certified oil - Requiring independent verification to exclude palm oil supply from HCS and HCV forest and peat.
Nestle	A leading multi-national food and beverage company based in Switzerland.	- No deforestation and no loss of HCV forests - Creating shared value for society and local communities - Complying with the Nestlé Corporate Business Principles and the Nestlé Supplier Code - Requiring suppliers to show material progress and to demonstrate compliance in a specific timeline with periodical independent third party verification
Wilmar International	The Wilmar International is a Singapore-based conglomerate that is one of the biggest agri-business groups with the world's largest palm oil plantations.	- No deforestation, no exploitation, no peatland development and zero burning - No engagement in the development of HCS and HCV forest and peat - Respecting the rights of communities by adopting the 'free, prior and informed consent' principle - The above policies apply to new areas developed post 5 December 2013

Source: (Paddock, 2016)

Another important actor is the financial sector, more specifically on its responsible investments and financing as capital providers. Although a few of both international and domestic institutional investors and banks have not yet started to make deforestation free commitments, some of them have begun to address this issue in their investment, lending, client relationships and advisory decision-making process (Stampe & McCarron, 2015). However, by carefully

examining their investments and clients, banks can, for example, differentiate their interests and charges to support sustainable palm oil production (Bregman, 2015). These banks and financial institutions are also becoming the focusing subjects whose disclosure and environmental, social and governance policy integration is investigated strictly by non-profit organizations and civil society.[152]

This high-profile cross-commodity zero (net) deforestation private movement represents the significant role these drivers and incentives of behaviour play beyond regulations and enforcement. Understandably, although these time-bound commitments are impressive, they would be impractical if national governments and corporates are not held accountable for their targets. At the moment there is no standardized or uniform way for companies to report/disclose their progress that can contribute to the transparency of supply chain practices. The follow-up monitoring, reporting and compliance are challenging. A great number of non-profit activist groups are engaging and involved in this process diversely. They are critical about the commitments made by corporations while they are simultaneously very active in collaborations with developing and promoting the standards and targets. Moreover, they also act as monitors, auditors and watchdogs.

The two main projects established by non-profit groups that are independently assessing, tracking, and publicly ranking the commitments of the companies (as well as governments and investors) on a periodical basis are the Forest 500 and the Supply Change,[153] which can keep the commitment implementation under scrutiny and maintain the risks of companies' reputation and brand integrity. Currently, more than three quarters of the palm oil industry is subject to deforestation free commitments and these actions in palm have also raised the awareness of agricultural commodity-driven deforestation. Two years remain until 2020. While 2020 is the most common target year, the commitments without a time-bound target are increasing. A report by the Forest 500 indicates that although there are improvements among leading companies, the rate of general progress is inadequate for the majority of the companies to meet the 2020 targets. Substantial actions and improvements from governments, companies and the financial sector are still needed (MacFarquhar et al., 2016).

4.3.2 Roundtable on Sustainable Palm Oil (RSPO)

International, private voluntary certification schemes developed through multi-stakeholder processes have emerged as one of the most popular mechanisms for

[152] In 2017, Greenpeace launched a campaign against HSBC and revealed its funding for numerous destructive palm oil companies. In response to the public pressure brought by the campaign, HSBC has then committed to provide no funding anymore to companies linked with deforestation or peatland clearance (Rahmawati, 2017).

[153] Visit their official websites at http://forest500.org/ and http://supply-change.org/.

creating market demand and preference for (socially and environmentally) sustainable goods. Building on the economic literature concerning the relevance of information,[154] standards, certification and labelling are designed with the intention to modify the market failure resulting from information asymmetry (OECD, 2011), in particular for credence goods.[155] Building on this concept, the growing concerns over the environmental impacts of palm oil production initiated the establishment of the Roundtable on Sustainable Palm Oil (RSPO) in 2003 (and legally registered in 2004 under the Swiss Civil Code)(Schouten & Glasbergen, 2011) and the first Certified Sustainable Palm Oil was available and sold at the end of 2008.[156] RSPO is a non-profit, international business-to-business private arrangement that advocates the production and consumption of voluntarily certified sustainable palm oil to the market with transparency and clarity (Laurance et al., 2010). The creation of RSPO was driven by the World Wide Fund for Nature (WWF)-Switzerland and Unilever. The initiative connects the consumption in the North and the production in the South, and it is normally considered as the pioneer of the roundtable initiation for other commodity chains (Schouten & Glasbergen, 2011).

The certification scheme, as implied by the term "roundtable", takes a multi-stakeholder approach that involves planters, processors and traders, manufacturers, retailers, banks and investors, environmental/natural conservation NGOs and social/development NGOs (Bessou et al., 2014). It had a total membership of 2941 by the end of June 2016. Among this, consumer goods manufacturers and palm oil processors and/or traders account for almost 80 percent of ordinary membership that has the ability to vote (RSPO, 2016a). The RSPO defines its "sustainability" with 8 principles[157] and 43 criteria (RSPO, 2015). Accordingly, responsible national or regional groups interpret these principles and criteria and further integrate them into the national or regional context. In addition, the RSPO has also set up the Supply Chain Certification Standard to control the material flow and associated claims of certified palm oil and oil derivatives along the supply chain. Based on the degrees of traceability and costs, the RSPO has identified four differentiated models that are explained in more detail in the next paragraph and are illustrated in Table 19. The four models

[154] In particular referring to the work of Akerlof, Stigler and Stiglitz. See for instance (Stigler, 1961), (Akerlof, 1970), (Stiglitz, 2002) and (Nobel Prize Committee, 2001).

[155] Credence goods are those whose product attributes cannot be observed or evaluated by the consumers even after purchasing (Dulleck et al., 2011).

[156] RSPO also certifies palm kernel oil and fresh fruit bunch (FFB).

[157] These 8 principles are: 1). Commitment to transparency, 2.) Compliance with applicable laws and regulations, 3.) Commitment to long-term economic and financial viability, 4.) Use of appropriate best practices by growers and millers, 5.) Environmental responsibility and conservation of natural resources and biodiversity, 6.) Responsible consideration of employees, and of individuals and communities affected by growers and mills, 7.) Responsible development of new plantings, 8.) Commitment to continuous improvement in key areas of activity.

are Identity Preserved (IP), Segregated (SG), Mass Balance (MB) and RSPO Credits/Book & Claim (B&C). Downstream processors or users can then be licensed and communicate their use (or support) of one of the above standards-compliant certification on the end products with consumers based on whichever model they are certified.

The first model, Identity Preserved (IP) (as shown in Table 19) can be fully traceable to a specific identifiable certified origin. It is the most expensive and resource-intensive certification scheme in terms of costs, logistic challenges and maintenance. The internationally transported and traded palm oil products and its supply chain (from plantations to mills and to domestic or foreign refineries) inherently make its traceability arduous. Thus this scheme is quite challenging for the majority of the industrial actors to adopt. The second model, Segregated (SG), although it does not allow palm oil to be traced back to a specific plantation (only to the mill), guarantees that the end products contains complete certified sustainable palm oil. It is however also logistically demanding and costly since this part of the supply chain has not yet realised any economies of scale. The Mass Balance (MB) system mixes, for example, 100 ton of certified palm oil with other conventional palm oil in the supply chain and when this palm oil reaches end processors or users, only 100 ton of them will be labelled as "MIXED". In other words, the label does not assure that the end product contains sustainable palm oil. This is however an interim system designed to encourage and facilitate industry to gradually build up Segregated or Identity Preserved supply chain until sustainable palm oil trade becomes primary (RSPO, 2013).

Table 19: RSPO Supply Chain Certification Systems

System	Description	Level of traceability, costs and claim	Trademark, tag and statement
Identity Preserved (IP)	'Sustainable palm oil from a single identifiable certified source is kept separately from ordinary palm oil throughout supply chain.'	Highest	 'This product contains certified sustainable palm oil'
Segregated (SG)	'Sustainable palm oil from different certified sources is kept separate from ordinary palm oil throughout supply chain.'		(same as above)
Mass Balance (MB)	'Sustainable palm oil from certified sources is mixed with ordinary palm oil throughout supply chain.'		 '**Contributes** to the production of certified sustainable palm oil'
RSPO Credits/ Book & Claim (B&C)	'The supply chain is not monitored for the presence of sustainable palm oil. Manufacturers and retailers can buy Credits from RSPO-certified growers, crushers and independent smallholders.'	Lowest	 '**Supports** the production of sustainable palm oil'

Source: (RSPO, 2016d)

The B&C system allows actors along the palm oil supply chain to trade RSPO certificates in the GreenPalm Market. Thus the trademark used on the end product is also called GreenPalm certificates. Retailers and manufactures who use palm oil or other palm derivative in products can pay a premium to purchase the certificates offered by RSPO-certified growers or mills to offset their physical oil use with the equal amount of certificates. Once the certificate is sold, the certified oil would be treated as conventional palm oil. The B&C system was important at the beginning to bring organizational benefits for smallholders when the RSPO just started (Rival & Levang, 2014). However, the fact that the actual product with this trademark contains no sustainable palm oil has attracted

criticisms, such as the low premium (L. Goodman, 2014; Potts et al., 2014) and the lacking of incentives to establish a separate supply system for sustainable palm oil. Therefore with the increasing production of certified palm oil, the RSPO and other non-profit organizations strongly urged companies to shift from B&C/GreenPalm certificates to 100 percent certified physical palm oil (i.e. IP, SG, MB) (RSPO, 2016a).

As of June 2016, RSPO had more than 3000 members. Its certified plantations cover 2.83 million hectares (out of total 18.7 million hectares of palm plantations globally, see Sub-section 2.3.1) across 14 producer countries and account for almost 19 percent (10.8 million tonnes) of the global palm oil production. Indonesia and Malaysia together account for 81 percent of the total certified areas (RSPO, 2016a). Regrettably, the supply of the RSPO certified palm oil exceeds demand as only western businesses purchase the certified palm oil and the majority of buyers in the developing world are still unwilling to pay premiums (Arcus Foundation, 2015). About half of the certified oil on the market is not bought up. This is because of the extreme complexity of the supply network which results in a lack of progressive commitments and actions from companies (Ivancic & Koh, 2016b; Rival & Levang, 2014; RSPO, 2016a).

In addition, the cost of certification and corrective measures is estimated at US$ 20 to 40 per hectare, which is in fact rather prohibitive for smallholdings (Rival & Levang, 2014). Besides costs, smallholders in general face more uncertainty as well as informational, technological, legal barriers and organizational difficulties than large commercial plantations. RSPO has continued to develop and improve its numerous standards and guidelines to help smallholders to meet RSPO requirements and obtain certification (Brandi et al., 2015). Many national interpretation standards and companies also put special emphasis, on and take into account, the positions and conditions of smallholders (Opijnen, Brinkmann, & Meekers, 2013). In 2015/2016, smallholders produced 9 percent of the total RSPO certified palm oil (RSPO, 2016a).

Many global manufacturers of consumer goods sourcing palm oil in their production process are involved and committed with the RSPO. Among them, Unilever and Nestlé are the world largest buyers of palm oil and the largest food and beverage producer corporates respectively. Unilever alone purchases about 3% (approx. 1.5 million tonnes) of the global production of palm oil and its derivatives each year (Unilever, 2016a). The company has committed to source 100% physically traceable[158] sustainably certified palm oil by 2020 (thus not including RSPO credits or book and claim system) together with their principles of no deforestation, no peatland development, no labour/community

[158] Traceability means the ability to identify a catchment area that is associated with a mill, dedicated plantations, or smallholders(Unilever, 2016a).

exploitation, special focus on smallholders and women, as well as transparency (Unilever, 2016b). However, as of 2016 Unilever is still largely (75%) relying on book and claim (WWF, 2016c). Nestlé bought around 1% of the total global palm oil production in 2015. The company on the other hand phased out the use of GreenPalm in 2015 and afterwards chose a slightly different approach than Unilever and RSPO (WWF, 2016c). In 2010, Nestlé is in partnership with a specialized global non-profit organization - the Forest Trust, and has started developing and relying on its own sourcing guidelines, determined to remove the link between deforestation and palm oil production. The Forest Trust is in charge of inspecting plantations and mills, assisting the suppliers for improvement and verifying whether the suppliers of Nestlé meet the guidelines and Nestlé's procurement requirements for both palm oil and pulp and paper (Nestlé, 2015). These differences between the two largest agri-food companies not only show that the credibility of RSPO standards is often equivocal but also the complexity of tracking and comparing various supply chains' performances from different companies is very difficult.

Similar to other certification schemes for sustainable products, the RSPO is subject to constant and substantial criticism. First of all, its principles and criteria are built on voluntary acceptance and consensus by all stakeholders and members and is therefore regarded as less rigorous and lacking in control (Bregman, 2015; EIA, 2015). Moreover, even though there are national interpretation groups, the rather general and universal principles and criteria are still hard to apply and have their limitations when it comes to complex local contexts (Rival & Levang, 2014). In particular, the RSPO has become known for its insufficiency in protecting the land rights of indigenous groups and failure to respect their customary law and to compensate them for land acquisition. This can result from the fact that, for example in Indonesia, most of the land conflict cases are resolved at the district level where local authorities are less aware of the sustainability issues but are pressured with economic development. Hence this often puts the negotiation process of certification in a precarious and unbalanced setting (J. F. McCarthy, 2012).

The other major criticism of the RSPO is that it does not prohibit forest conversion or prevent forest and peatland fires. In its Principles and Criteria (P&C) 7.3 and 7.8.2, the RSPO requires members to ensure that no new plantings have replaced primary forest and before new plantings, forests should be assessed for high conservation value. Once identified, the forests need to be maintained and/or enhanced. In addition, the plan should take "into account avoidance of land areas with high carbon stocks and/or sequestration options" (RSPO, 2015). Nonetheless, the abundant remaining rainforests in Sumatra and Kalimantan available to the industry are either degraded or secondary forests which is not likely to be identified as primary forests or forests with a high conservation value. Hence deforestation continues. Moreover, since the guidelines concerning GHG

emissions reporting are only voluntary (P&C 5.6), plantations established on cleared peatland forests can still be RSPO-certified. Even though deliberate use of fire for land preparation is banned under the RSPO (P&C 7.7), drainage and clearance of peatlands, which is allowed by RSPO, results in dry and dense carbon-rich soil that is highly prone to fire (Greenpeace, 2013). The fact that RSPO-certified palm oil is associated with forest fires and deforestation along with the lack of action from RSPO against complaints from NGOs and against breaches of standards from companies have therefore drawn substantial and raging criticisms from environmental groups.

Traceability is another key challenge and criticism which the RSPO faces. The internationally transported and traded palm oil products and its supply chain (from plantations to mills and to domestic or foreign refineries) inherently make its traceability arduous. Even with the supply chain certification standard, palm oil (fresh fruit bunches) which comes from illegal sources or destructive practice is still very often mixed with certified palm oil for the reason that there are no strict rules set by the RSPO regarding third-party supply (EoF, 2014; Greenpeace, 2013). In addition, it has to be addressed again that there is no traceability of physical oil under the RSPO Mass Balance and RSPO credits systems (GreenPalm). They are supposed to be used as temporary transition methods to Segregated and Identity Preserved supply chains. However, many companies have been slow and reluctant to shift away from their majority use of Mass Balance and GreenPalm. This thus hinders the RSPO's progress towards fully clean, audited, and traceable sustainable palm oil supply chains. Furthermore, a report by the Environmental Investigation Agency and Grassroots also discovered systematically widespread collusion and conflicts of interest between auditing firms and palm oil operation companies to disguise breaches of the RSPO Standard (EIA, 2015).

In response to the above-mentioned criticisms, the RSPO has launched a new voluntary standard called the RSPO Next in February 2016. The RSPO Next engages and encourages members to go beyond the current RSPO P&C. The new standard bans planting on peatland and high carbon stock forests, expands the responsibility for fire prevention, requires companies to have a public no deforestation policy and to reduce and report GHG emissions It also demands that companies respect human rights (e.g. banning the use of the herbicide Paraquat, paying decent living wages, smallholder capacity building) and full traceability and transparency (RSPO, 2016b). Although the RSPO Next is a significant step forward, at the moment it is still on a voluntary basis to avoid expelling members with these higher and stricter thresholds. However, it is clear that even with more stringent and comprehensive standards, the RSPO should as well drastically strengthen and improve its monitoring, compliance and implementation of existing P&C (EIA, 2015).

Aside from the RSPO, there are a number of other standards that exist for sustainable and responsible palm oil production. These include voluntary initiatives for endorsement such as the Sustainable Palm Oil Manifesto (SPOM) and the Palm Oil Innovation Group (POIG); national standards such as the Indonesian Sustainable Palm Oil (ISPO) and the Malaysian Sustainable Palm Oil (MSPO); biomass and bioenergy related standards such as the International Sustainability and Carbon Certification (ISCC) and the Roundtable on Sustainable Biomaterials (RSB) and other non-profit conservation organizations-led certification standards such as the Rainforest Alliance /Sustainable Agriculture Network (SAN).

The literature shows that the RSPO as the dominant global palm oil certification scheme, is not perfect but has yet to improve standards that aim for better assurance of sustainability, labour standards, human rights and respect for the related national environmental law. Additionally, the oversight provided by the environmental and development groups is constrained since the majority of them operate on limited budgets and can hardly cover millions of hectares of plantations across continents. The WWF as one of the founders of the RSPO has always been a keen and positive promoter of the certification scheme while recognizing and working on continuous improvements. The good intentions of the companies play a vital role in the scheme, and can be facilitated through the RSPO and through pressure from civil society. Despite all complaints and criticisms, the RSPO remains an important inter-sectoral body that establishes a widely accepted sustainability baseline standard in the palm oil network, involving significant membership that strives for better standards and sustainability of the industry. The next section introduces NGO-Corporate partnership which can be viewed as a viable alternative and which rose from long-lasting problems of certification schemes.

4.3.3 NGO-business partnership

The collaboration between NGO and corporations reflects the circumstances that corporate actors turn the risks they face from a negative NGO campaign into potential benefits and a competitive strategy to protect their brand name by engaging with civil society institutions. It aligns two types of non-state actors that are traditionally viewed as firmly antagonistic and further establishes a partnership built on the assumption of mutual trust, shared benefits, and an underlying win-win situation (P. Pattberg, 2004). The major corporate actors in this partnership are retailers and manufacturers, who are relatively vulnerable to negative environmental campaigns along the supply chain. Retailers stand at the vital position linking consumers and the products supply chain, which can influence both consumer behaviour and production practice. Large manufacturing companies like Nestle, P&G and Unilever have greater leverage than their

suppliers due to their significant command of palm oil production volume. Hence, these corporate actors are preferred targets for activist NGO campaigns.

Environmental groups such as WWF, the Forest Trust and Environmental Defence Fund have acted as consultant NGOs and achieve their environmental goals through collaboration with business actors. The primary role that these NGOs play in this partnership is to aid the company with their expertise to investigate its palm oil footprint, sort out the complicated supply network issues in the fields and develop policy goals. Without professional knowledge and skills, these tasks are in general extremely difficult for retailers and manufacturers to handle by themselves due to the fragmented nature of palm oil supply chains and palm oil's common hidden presence in products. The NGO then identifies the most crucial and public environmental matters and provides assistance and solutions for the business actors to act upon. Meanwhile the collaboration with corporate actors provides NGO with increased access to resources and stronger leverage in influencing the palm oil supply chain (Favorini-Csorba, 2014). The main tool used in this collaboration is normally the company's deforestation free sourcing policies and then work with the upstream suppliers and producers accordingly. This type of NGO-business partnership does not have a formalized structure like the RSPO, but is based on contractual agreements and mutual trust that are acceptable to both parties. There is no unified transparent procedural structure about this partnership but a flexible strategy and network building tailored to individual companies. In addition, during the collaboration, it is at times necessary for companies to make full information disclosure on their supply networks and purchasing history to the NGO, which is typically a highly sensitive matter. Likewise, this information if not handled properly, can also hinder the reputation of an NGO. For example, the WWF was accused of "greenwashing" by critics and more activist NGO groups (Paddison, 2013). Another issue with the contractual relationship is that, unlike the RSPO scheme, the companies do not need to be permanently registered as a member in order to be certified and there will not always be a certain amount of costs incurred by certification. With the NGO-business partnership, the company can actually learn from the consultant type specialized NGO on how to improve sustainability in its sourcing and slowly build up the capacity on its own instead of having to rely on the NGO's service perpetually.

The establishment of NGO-business partnerships and the RSPO was triggered by different factors. The RSPO was founded as a round table after inaction by the public sectors and as a result of globalized trade. Companies join the certification scheme as a pre-competitive strategy with standards made by consensus. The outset of the NGO-business partnership was the recognized potential mutual benefits (instead of harms brought by negative environmental campaigns, normally by activist NGOs such as Greenpeace) from two groups of actors. The corporate actor sets its own value and sourcing policy goals with the help of an

NGO. Within this partnership, the NGO is the key orchestrator being at the centre of a broad network and corporates can voice their needs and views directly and more effectively compared with the RSPO. These two approaches result in two sets of systems that involve overlapping actors with different types of interactions. For example, unlike the RSPO's membership system, a NGO-business collaboration works with producers and suppliers in the retailer's network without limits on pre-determined standards. In this way, it can stimulate any possible change in aspects that might not be up to certification requirements and even possibly the worst production practice. However, the other way around, the flexibility provided in this approach also allows and pushes for stricter sustainability criteria than those of the RSPO. In fact, this is one of the reasons why corporations decide to enter the collaboration and aim for long-term and more comprehensive sustainability beyond the RSPO, since many of corporates' commitments on sourcing policies already exceed that required by RSPO certification (Paddock, 2016). Therefore, even though currently it is rather difficult to quantify and evaluate the outcome and performance of NGO-business partnership to compare with that market reach of the RSPO, the strength of the NGO-business partnership lies at its large transparent feedback loops and with its flexibility to act more effectively and swiftly upon both the worst and the most progressive actors.

Here the collaboration between the Forest Trust (TFT) and Nestlé is used to showcase how they work on the company's palm oil sourcing policy. In 2009 and 2010, Greenpeace held campaigns against Nestlé for its connection with a palm oil supplier (which was RSPO certified) in Indonesia causing illegal deforestation (Greenpeace, 2009). Knowing that they do not want to be associated with deforestation but not knowing how, Nestlé then reached out to TFT for its expertise in the deforestation-linked commodity area in 2010 (Poynton, 2015). Their collaboration was deemed unprecedented in the palm oil industry at that time. TFT is a Europe-based non-profit consultancy organization founded in 1999, with offices around the world from Switzerland, the United States to Indonesia, Malaysia, the Ivory Coast, etc. TFT started its collaboration with corporate actors in the wood sector and has extended its scope to other deforestation related risk commodities. TFT uses its Value, Transparency, Transformation, Verification (VT-TV) model to work with its partners. They first assist companies to develop and understand their own sourcing values to set goals that are acceptable to both parties and then translate these values into standards. The second step is to publish and communicate the values and standards internally and externally and to publicly share companies' supplier and sourcing information. Furthermore, the transparency also means that they openly examine and admit whether they meet their own standards and how are they progressing towards their commitments. The third step is to implement the policy statement all through the business and keep adjusting from feedback and emerging

challenges through multi-stakeholder collaboration. Lastly, the companies are encouraged to monitor their own performance and share the result as well as be verified through independent agencies[159] (Poynton, 2015).

After announcing the collaboration with TFT, Nestlé developed its Responsible Sourcing Guidelines in palm oil with the support of TFT. Nestlé operates in 63 countries and directly purchases palm oil from over 120 suppliers. TFT works together with Nestlé's procurement staff and the responsible sourcing team to first map out its supply chain via questionnaires or field visits to almost all actors in their supply chain, including refineries, palm oil mills and plantations. TFT also facilitates the discussions on responsible sourcing between suppliers and procurement staff. When it comes to implementing the sourcing guidelines, TFT works in the field with refineries and mills within these refineries' catchment area to develop their action plans in order to fulfil Nestlé's sourcing policy. TFT then periodically follows up these suppliers to monitor and report their progress. Finally, the communications related to Nestlé's progress on their sourcing policy are likewise partially supported by TFT, for instance, drafting an annual palm oil update report (TFT, 2017; Ware, 2014). After Nestlé's engagement, a number of big enterprises in the palm oil trade also launched collaboration with TFT, including the world's biggest palm oil traders, the Singapore-based Wilmar International, who controls 45 percent of the global palm oil trade and Golden Agri-Resources, etc. to develop their own policies.[160] Many of these companies that work with TFT are in fact vertically integrated, and with each of these big scale traders, there are numerous other suppliers and growers involved . Hence the potential influence of the NGO-corporate partnership in the industry could be immense.

Nonetheless, as mentioned earlier, it is so far difficult to quantitatively evaluate the performance and outcome of the NGO-business partnership. Unlike certification schemes with uniform rules and thresholds for trademarks to communicate with consumers, the NGO-business partnership relies more on qualitative assessments built on a case-by-case basis. Especially in the case of palm oil, where a number of leading global traders undertake this approach aiming at going beyond the common certification scheme in the area (i.e. RSPO). Compared with the RSPO, academic research on the NGO-business partnership is almost non-existent, not to mention comparative study between these two approaches. As more and more business giants in the palm oil industry enter into

[159] 'Independent' agencies proposed by TFT refer to those organizations that are not directly paid by the companies but for example, are paid through a central verification fund. The current certification system requires companies to pay for their verification through accredited certification bodies, which presents a clear conflict of interest.

[160] See the list of actors along the palm oil supply chain that are in collaboration with TFT on: http://www.tft-earth.org/who-we-work-with/members/?filter_by_product_groups=78

collaboration with NGOs that do not focus on certification, there is indeed a great need for the academic society to examine further the result of this type of governing institution.

4.3.4 Yield improvement and cultivation practice development

Yield improvement and cultivation practice development are not exactly policy institutions like those in previous sub-sections but they are critical measures to be taken in order to achieve increased production efficiency; and reduce ecological harm. Most of the research, innovations and field experiments on yield enhancing are currently carried out by private companies. Thus these measures are located in this section. However, these policy measures can be done by both public and private sectors, for example with public nation-wide coordination, planning and regulatory minimum yield standards in combination with incentives that encourage the private sector to go beyond the threshold.

In theory, palm oil yield improvement can considerably reduce the demand for land. The palm oil yield in Indonesia has stagnated during the past three decades at approximately 3.7 tonnes per hectare of crude palm oil (Rival & Levang, 2014, p.38). In Malaysia, the yield improvement increased less than 1 percent during the same time period (Wicke et al., 2011). However, an improvement of 30 to 35 percent to 5.5 tonnes per hectare per year has been demonstrated in commercial plantation even on marginal soils and degraded lands. Although this is still far lower than the best yields (10 tonnes per hectare) achieved through breeding trials, if all existing plantations in Indonesia were to improve their yields to over 5 tonnes, by 2050, 1.6 million hectares of new plantation development could be prevented and still meet the global projected demand. Moreover, the amount of investment (e.g. management costs) in comparison with the high financial returns is relatively small (G. D. Paoli et al., 2013). In order to achieve the desired yield improvement through ecological intensification, agronomic best management practices need to be implemented across existing plantations in both countries. This includes, for example, optimizing the use of fertilizers and agrochemicals through well-planned applications, maintaining tree health, practising good harvesting standards to minimize fruit loss (e.g. alter harvest interval from 12 days to 7 days and collect fallen fruits), improving planting materials, transport fresh fruit bunch to mill promptly, infrastructure development, replanting higher yielding palm trees, turning production by-products into organic fertilizers, capturing biogas by-products, etc (G. D. Paoli et al., 2013; Rival & Levang, 2014, pp. 38-41). For example, a 1 US$ investment into an improved best hybrid seed can provide an income on average of 1300 US$ by the end of its 20 years production cycle. Industrial plantations that recycle and compost by-products from mills and plantations into organic fertilizer can reduce inorganic fertilizer input by 15% (Rival & Levang, 2014, pp.39-40). These best management practices are proven to not only increase yields but also reduce negative climate change and

biodiversity impacts, soil erosion, water pollution, as well as fertilizer and pesticides inputs (G. D. Paoli et al., 2014).

Nonetheless, the best management practices have not yet been widely adopted by commercial plantations since the government has not made a minimal yield standard regulatory and obligatory. The transfer of the yield improvement innovation to smallholders is also challenging. Moreover, in many parts of Indonesia the land costs remain low and the current market pricing and demand has been rather favourable and profitable. Thus there is a lack of incentives to make yield improvement. It is only recently that the production costs have increased to 1 to 2 times higher for average yield plantations and for new plantation development, which then brings financial incentives to implement best management practices to enhance yields in existing plantations (G. D. Paoli et al., 2014). Therefore, there is growing interest among public and private sectors to promote the adoption of best management practices which have great potential to increase companies' profits and reduce their environmental impacts. Governments can facilitate this adoption through regulatory actions or by offering financial, fiscal or administrative catalysts, as well as forming planters associations to assist the progress of knowledge transfer.

In addition to yield improvement, (Rival & Levang, 2014, pp.35-38) suggest several other potential ways to develop oil palm plantations with better sustainability. One way is to apply agro-forestry techniques, which plant oil palm trees in combination with several other cash crops, such as coffee, cocoa and fruit trees on existing agricultural lands. This technique provides higher levels of biodiversity compared with monoculture. The economic profitability of the agro-forestry system depends on the species selected and the plantation design. The adaptation of agro-forestry techniques can also be part of a payment for an ecosystem services mechanism. Another type of arrangement of patchwork can be monospecific plantations placed side by side with agro-forestry systems, food crop plots, fallow lands and even islands of forests. When this kind of patchwork development is designed in a rigidly organized and controlled manner, it is called ecological planning. Ecological planning takes into account the HCV and HCS forest zones, as well as rivers close by, hill tops, steep slopes, etc. Specific attention is paid to the connection of different zones. For instance, agro-forest zones can serve as a buffer between plantation and conservation areas. Nonetheless, ecological planning requires a high level of technical knowledge which is not yet commonly available at the moment. Additionally, even though the application of the above mentioned techniques can provide the underlying economic incentive for the companies to lower risks spurred by ecological movements, the efforts are undermined by the dominant market demand in developing country for cheap palm oil and through weak governance.

4.4 Reducing Emissions from Deforestation and Forest Degradation (REDD+)

The mechanism of Reducing Emissions from Deforestation and Forest Degradation (REDD+)[161] in the developing countries was introduced in 2005 under the UNFCCC as a scheme to provide financial incentives to reduce GHG emissions in the forestry sector. Since then REDD+ has attracted extensive attention from the policy makers, researchers, civil societies, businesses and investors around the world as well as substantial amounts of finance. The initial defining features of REDD+ include first, the use of financial incentives to trigger behavioural changes of forest users as a form of Payment for Ecosystem Services, in which forest conservation along with the ecosystem services provided (i.e. carbon storage and sequestration) was to create more profit than forest clearing. Or in other words, the donor countries from the North pay a development aid to the tropical countries for their forest conservation performances. The second characteristic was the expected scale of funding available from the North, which was estimated to be tens of billions of dollars (Eliasch, 2008; Stern, 2006). Lastly, REDD+ addressed transformational changes and reforms beyond the forestry sector, not only related to climate change mitigation but also to economic development. REDD+ was anticipated to bring new resources and upfront costs to halt deforestation and moreover care for the interests of local communities.

Given the significant climate footprint of palm oil production in Indonesia and the fact that, as an early mover, Indonesia is the country with the second largest number of REDD+ projects (Simonet et al., 2014), it is worth examining how REDD+ addresses the expansion of oil palm. Similar situations can also be found in the Congo Basin and some Latin American countries where REDD+ projects are involved with commodity-driven deforestation. However, owing to the topic of this chapter and the scale of industry and REDD+ projects, this section first focuses on the case of Indonesia and then provides a brief description of the similar REDD+ funding case in Brazil, the biggest REDD+ projects country, as a comparison to add more perspectives.

In 2009, the government of Indonesia voluntarily pledged to reduce its GHG emissions by 26 percent unilaterally and by 41 percent with international assistance and financing by 2020 (McFarland, Whitley, & Kissinger, 2015). With more than 75% of the GHG emissions in Indonesia coming from land-use change and peat land destructions (Petrenko et al., 2016), the forestry sector has to be a key element of the solution. One of the main drivers for deforestation in the

[161] REDD plus refers to five kinds of forestry activities: (a) Reducing emissions from deforestation; (b) Reducing emissions from forest degradation; (c) Conservation of forest carbon stocks; (d) Sustainable management of forests, and (e) Enhancement of forest carbon stocks (UNFCCC, 2009).

country is, as already mentioned, monoculture oil palm plantations.[162] In other words, the success of the REDD+ scheme depends on its economic viability, which has to be a more profitable alternative than palm oil production or other similar economic activities. However, a study by (Butler, Koh, & Ghazoul, 2009) shows that even with selling the carbon credits in compliance markets, REDD+ can only just compete with palm oil agriculture. Not to mention that currently the credits generated can only be sold in voluntary markets (where the market price is only 10 to 20 % of the price in compliance markets) or paid by international funds. Seven years later, the progress of REDD+ to avoid deforestation has so far proven to be very limited (EIA, 2014; Howell & Bastiansen, 2015; Seymour et al., 2015). Nonetheless, the past few years of REDD+ development in Indonesia do bring out and address a number of key fundamental issues, such as problematic land tenure systems, that wouldn't have come to international focus without REDD+.

According to the REDD Desk[163] database and International Database on REDD+ Projects,[164] there are approximately 30 to 40 REDD+ projects in Indonesia, with a few already closed (contractual termination) or abandoned. These projects take place across scales and were initiated and developed either by the government, international organizations, NGOs, research institutes, companies or in collaborations. A few of them are integrated with Indonesian's national REDD+ strategy and a limited number of them are certified in the voluntary carbon market. Despite the abundant number of projects, the more prominent actors/initiatives shaping the REDD+ policy are the Letter of Intent between the government of Norway and Indonesia, and the activities supported by the UN-REDD Programme (established by the UNEP, UNDP and FAO) and the Forest Carbon Partnership Facility (FCPF) (managed by the World Bank). A lot of these activities are at the capacity and readiness preparation level, such as creating, organizing and aligning relevant governmental institutions across sectors, establishing policy strategy, enhancing multi-stakeholder involvement at national and regional levels, preparing monitoring, reporting and verification (MRV) system and establish a reference emission level, communicating with local and indigenous groups, etc.

In 2010, as a support for Indonesia's efforts to reduce GHG emissions, Norway and Indonesia signed a Letter of Intent on their cooperation on REDD+.[165] In

[162] The other important driver is fast-growing timber plantations that are used for the pulp and paper industry and mining (Indrarto et al., 2012; Seymour et al., 2015).

[163] http://theredddesk.org/, accessed on 15 February 2017.

[164] http://ifri.snre.umich.edu/redd/index.html, accessed on 15 February 2017.

[165] Letter of Intent between the government of the Kingdom of Norway and the Government of the Republic of Indonesia on "Cooperation on reducing greenhouse gas emissions from deforestation and forest degradation", accessed on 15 February 2017 from https://www.regjeringen.no/globalassets/upload/smk/vedlegg/2010/indonesia_avtale.pdf.

this agreement, the Norwegian government pledged to provide up to US$ 1 billion as performance-based payments for the deforestation and GHG emissions avoided in Indonesia. Using a phased-approach, these payments were expected to be released at pilot provincial level for verified emission mitigation by 2012 and at national level by 2014. The Letter of Intent has been an important component of the REDD+ development. The implementation of the agreement is 3-phased. The first phase is the preparation on capacity building, strategy and institution development, etc. In phase 2, new policies should be put in place, such as a two-year suspension/moratorium on new forest exploitation licenses, strengthening forest law enforcement and two provincial level pilot programs. The last phase will be annual performance-based payments at the national level.

The two-year moratorium on new concessions for conversion of natural forests and peatlands (excluding secondary and logged-over forests) were the cornerstone of the agreement. It was implemented in May 2011 and later extended twice to May 2017 (Arild Angelsen, 2017). This moratorium also required better transparency and the sharing of land use spatial data across sectoral agencies, which brought out the long-overlooked important issue that Indonesia does not have a single national reference map of forest cover that is referred to by national and local governments across ministries (Sills et al., 2014). This therefore resulted in Indonesia's One Map initiative to establish an official complete map of the country, which is mentioned in Section 4.1. In general, the readiness and preparation processes are much slower than scheduled. For instance, the moratorium was imposed five months later after the promised time with limited and narrow application, and the new REDD+ agency was only formally established in mid-2013 (D. Murdiyarso, Dewi, Lawrence, & Seymour, 2011). In the meantime the loss of forest was still increasing (M. C. Hansen et al., 2013). By the end of 2014, there were no operational financial mechanism or result-based payments to transfer since there was no performance and the aggregated finance received from Norway was in total only around US$62 million (Arild Angelsen, 2017).

In addition to the lack of finance and certainties of REDD+ at the international regime, another challenging context was that while Indonesia strives for GHG mitigation, the country also targets an annual economic growth of 7 percent, which unavoidably comes from expansion of palm oil plantations and fast-growing timber on a commercial scale (Seymour et al., 2015). Moreover, the moratorium under the Letter of Intent allowed plenty of existing permits to continue to operate. Although the progress of avoiding forest conversion to palm plantations under REDD+ falls far short, the fundamental issues exposed during the policy development process are inevitable. These issues include transparency, political space for indigenous rights, forest-related crime, and the common corrupt practices and enforcement failures in the forestry sector. Without these necessary changes, for example, in legislation, principles of good governance,

aligning national and regional authorities, and bureaucratic reform and so on, attempts to reduce deforestation and forest degradation are restricted. Not to mention other co-benefits from REDD+, such as biodiversity preservation, additional income for the locals and other ecosystem services. The cooperation between Norway and Indonesia continued after 2015 (Parlina, 2015). Nonetheless, the future of the REDD+ policy in Indonesia is not quite certain since the majority of previous policy decisions relied on presidential instructions. However, important changes and aspects are brought into the picture to kick start necessary changes.

The REDD+ contract between Norway and Brazil is quite different from the one negotiated with Indonesia. The Indonesian Letter of Intent is more developed and follows the logic of phased-approach with details[166] and numerous other performance indicators (some are vague and ill-defined), while Norway and Brazil agreed on a straightforward memorandum of understanding in 2008 with clearly defined criteria for payments. In this system, Brazil receives US$5 per ton of CO_2 mitigated in the Amazon Biome and each hectare of tropical forest is estimated to emit 367 tons of CO_2 when being cleared, resulting in a payment of US$1833/ha for avoided deforestation. The decreased deforestation area is calculated against the 1996-2005 average historical reference level, which was 19,500 km^2 per year in the Brazilian Amazon (D. Boucher, 2014a).[167] The US$1 billion pledge from Norway to Brazil was completed in 2015 (Butler, 2015). However, this REDD+ conditional result-based payment is in fact not an offset-based carbon-market financing as initially envisioned but rather more of a result-based aid (Arild Angelsen, 2017). Namely Norway does not receive any right to emit the amount of carbon reduced in Brazil. Despite the very different contracts between the two countries and Norway, compared with Indonesia, Brazil was well-prepared to receive the REDD+ payment from Norway due to its leading governmental and social efforts in combating deforestation and its strong willingness to policy reforms.

4.5 Summary

In Section 4, we grouped policy instruments governing palm oil production and consumption into four sub-sections: those taken by producer countries, by importing countries, by private sectors (including multinational cooperation, NGOs and certification agencies) and by international actors as part of the UN climate change regime. The regulations taken by producer countries are mostly

[166] Specifications such as "completing a national REDD + strategy," "establishment of a special REDD + agency reporting directly to the president," "selecting a province-wide REDD+ pilot," "creating an independent MRV institution" in Phase 1 and the implementation of moratoria in Phase 2. See the link in footnote 165.

[167] The reference level was changed to the 2001-2010 average in 2011 (Arild Angelsen, 2017).

command-and-control measures, including binding forest rules, spatial planning, law enforcement, moratoria, etc. The more interesting one is the establishment of national mandatory certification schemes. These schemes are a combination of command-and-control and informational policy instruments. They have the potential to encourage beyond-compliance performances. However, the interactions between national mandatory schemes and private certification schemes are still unclear. The regulations taken by importing countries, more specifically the EU, are also mostly command-and-control, i.e. import restrictions, which could be used in combination with certification schemes (whether private or national mandatory). The idea of "Nutella Tax" is an incentive-based instrument, nonetheless with great controversy. It attempts to impose a surcharge on imported palm oil based on its effects on obesity as well as its contribution to the loss of biodiversity.

The private sectors are currently the most proactive actor group with regard to the sustainability of palm oil production. This largely stems from the campaigns carried out by environmental NGOs and the immense resulting consumer pressure. The sub-section on private governance first started with the voluntary zero deforestation/deforestation-free supply chains commitments made by corporations. Subsequently, it led to the introduction on two approaches to achieve this goal: by obtaining RSPO certification or by developing sustainable sourcing policies tailored to the company (often in collaboration with NGOs). Lastly, the private governance sub-section also introduced the importance of investing in yield improving techniques in private cultivations so as to reduce the need for expanding the amount of oil palm plantations. The last type of instrument related to the governance of palm oil production is the REDD+ mechanism, which can be viewed as an incentive-based instrument. It is included in this research due to its popularity on the international climate change agenda. However, the REDD+ in fact covers the already existing, fundamental issues in tropical forest governance and the financial incentives provided from the donor countries are not sufficient to replace the profits from agribusiness activities. Moreover, the success of REDD+ necessitates reforming tropical forest governance practices in developing countries, which is a lengthy and expensive process. Its long-term effectiveness still requires more research and follow-up.

After the abundant information provided on policy governing palm oil production, the next Section discusses interactions between these instruments/actors involved and it further shows how the current palm oil governing structure results in barriers to effective sustainable palm oil solutions.

5 Discussion: barriers to effective sustainable palm oil solutions

5.1 A regime complex: disagreeing stakeholders

The above wide range of policy measures and institutions taken by state and non-state actors at various scales to govern the sustainability of palm oil comprise a governance regime complex that has implications for its supply chain and landscape where the crop is produced (Pacheco, Schoneveld, Dermawan, Komarudin, & Djama, 2017b; Rayner, Buck, & Katila, 2010). This oil palm transnational regime complex reflects the complexity that involves a growing number of stakeholders with diversified interests and perspectives from an intra- and extra-chain across levels. These actors range from growers, millers, refiners, manufacturers, retailers, governments, banks, civil society groups, and technical and certification agencies (Cramb & McCarthy, 2016). Together they promote sector standards through certification, corporate voluntary initiatives, sourcing code of conducts, public policies and regulations, which interact in unanimity or dissension. There are disagreements among stakeholders about the development of sustainability priorities in the palm industry and about which mechanisms are more adequate to address them. This results in competing, parallel or overlapping regulatory institutions and instruments (Pacheco, Schoneveld, et al., 2017b). The lack of a coherent governing structure is likely to increase compliance costs along the supply chain.

The majority of the discussed policy instruments in use or under development within this regime complex aim at decoupling palm oil production and deforestation (i.e. transforming the business-as-usual production practice in the supply chain), which is then followed by a focus on increasing production efficiency and reducing further ecological harms. Measures to restrict the use of unsustainably produced palm oil are taken mainly by palm oil importing countries in Europe. Least attention is directly paid to increasing demand for sustainable palm oil in major consumption markets. Table 20 briefly lists the policy instruments assessed in the last section. Among these policy instruments, it is not difficult to observe that there is a discrepancy concerning the definition of "sustainability" between public governance in producer countries and global private governing institutions. In addition, most of these instruments also act in isolation with weak alignment and without coherence, which tend to increase compliance costs for actors in the supply chain. There are also implementation difficulties on the ground in the producer countries, such as corruption and potent business-as-usual industry interests. The aforementioned issues all contribute to current policy barriers affecting the environmental sustainability of the global palm oil industry.

Table 20: A list of assessed policy options in Section 4

Public regulations	Private driven processes

• Spatial planning, land zoning and mapping, land and tenure allocation
• Moratoria
• Export tariffs and levies
  - Crude Palm Oil Fund in Indonesia[168]
• Mandatory palm oil production regulations
  - ISPO, MSPO
	• Zero deforestation pledges/commitments and companies sustainable sourcing policies
	  - Consumer Goods Forum
	  - The New York Declaration on Forests
	• Principles for responsible investments
	• Certification systems
	  - RSPO, ISCC
	• NGO-business partnership

• Import regulations
  - Amsterdam Declaration
  - EU-Renewable Energy Directive
  - "Nutella tax"
• Extra-territorial measure
  - Transboundary Haze Pollution Act in Singapore
  - REDD+	

5.2 Examples of discrepancies

The governments of producer countries should set policies and regulations to control the industry's sustainable practice. However, due to the extremely complicated political and economic dynamics and conflicts of interests producer countries often send out mixed signals and messages that can hold back private sectors. For instance, although Indonesia extended its moratorium and established a special peatland restoration agency, the discrepancies between public and private governance of palm oil can be seen in a number of examples. One example will be the establishment of the national certification schemes in Indonesia and Malaysia, which are viewed as the states' movement to reclaim the power of discourse over the 'sustainability' of palm oil industry from the private sector's standard setting (Hamilton-Hart, 2015b). The conflicts can also be found with the RSPO implementation. When a company applies the HCV standard of the RSPO scheme, the Indonesian Ministry of Forestry and local government has rights to classify the forests preserved in this particular palm oil concession area as wasteland. Having wasteland in a permitted concession area is in fact against Government Regulation 11 of 2010 on Controlling and Using Waste Land. As a

[168] The Indonesian government the Crude Palm Oil Fund financed by a US$50 levy per ton from palm oil exports. The fund is set up mainly for biodiesel subsidies particularly in the domestic market. However it also can be used for related activities that support sustainable oil palm plantation development, improve production efficiency, strengthen smallholder capacity and augment downstream processing industry (Pacheco, 2016).

consequence, the concession right would be withdrawn or issued to other companies (G. Paoli et al., 2016; Sahide et al., 2015). Furthermore, the RSPO Criterion 7.3 has prohibited new conversion for plantations from natural forests and HCV areas since November 2005 (RSPO, 2016d), which is inconsistent with the 'regular' release of state forest lands for plantation purposes by the Indonesian Ministry of Forestry (Sahide et al., 2015). In Malaysia, the authorities are unwilling to have their maps of landbanks managed by large industry actors to be collected and published by the RSPO. This undermines the important sustainability principle of transparency (WWF, 2016c). Another headlining incident is about how the Indonesian government pressured a group of the world's largest palm oil companies with a zero deforestation and exploitation pledge to disband in 2016 (see next sub-section) (WWF, 2016c).

5.3 Industry racing to the top?

In 2014, the six largest palm oil trading multinationals[169] signed an agreement to end deforestation, peat development and exploitation of locals, known as the Indonesian Palm Oil Pledge (IPOP), which was deemed by environmental NGOs as a dramatic breakthrough in the protection of tropical forests. However, this strong zero deforestation commitment by the private sector is opposed by the producer governments (Nugraha & Saturi, 2015). For the government of Indonesia, deforestation is legal, allowed and adequate in forest areas classified for conversion. This zero deforestation pledge was meanwhile viewed by the medium-sized palm oil companies as a hindrance to their business. These six major multinational palm oil traders were accused by the Indonesian government for their "cartel practice" in attempting to coordinate their no deforestation, no peat and no exploitation standards (Pacheco, Schoneveld, et al., 2017b).

Around the same period, the Indonesian and Malaysian governments established the intergovernmental Council of Palm Oil Producer Countries (CPOPC) in November 2015. The CPOPC aims at harmonizing national palm oil sustainability standards with the hope to further popularize the CPOPC standards in major purchasing countries such as China and India so as to regain and control their sovereignty in regulating the industry (Pacheco, 2016). Finally, under the pressure of Indonesian government's displeasure, possible anti-monopoly investigation and the risks of losing concessions, the IPOP was disbanded in mid-2016. The disbandment of the IPOP can be interpreted as Indonesian government's strategy to challenge the legitimacy of private sector firms which undermine its national rights over the control of its palm oil industry. In addition, the opposition to the no deforestation, no peat and no exploitation standard from the government also

[169] The original signatories included Asian Agri, Cargill, Golden Agri-Resources and Wilmar in 2014, and with, Musim Mas and Astra Agro Lestari joined later in 2015 and 2016, which in total covers around 60 percent of Indonesia's palm oil output (Innovation Forum, 2016).

raises questions to environmental NGOs regarding who should be their campaign target and what the influence levers are for them towards the producer governments. Nevertheless, despite the IPOP event, corporate actors announced that along with the policy developments in Indonesia, they will continue to pursue their commitments independently.

This incident has shown that the difficulties in regulating trade in the North-South relationship, in which private governance in the North wish to go beyond public regulations, whereas the public authorities in the South strongly oppose it. It also shows the competition between private and public sectors, between different types of sustainability standards and between certification and other forms of sustainable supply chain measures. It is not certain whether this leads to industry racing to the top but it demonstrates the dynamics and interactions among actors and the competing use of policy instruments.

5.4 Countered by (some) governments

There are some reasons behind producer countries' unfriendly position towards the private sector's standard setting. On the one hand, it is very difficult for the Indonesian and Malaysian governments to overcome their mass domestic producer interests. On the other hand, it is also clear that the governments struggle with their legitimate development needs and raised environmental concerns. This debate over development and environment is sometimes further amplified by the fragmented governance nature of the palm oil sector in Indonesia among ministries. In other words, the existence of one institution, policy or regulation might hinder the success of another, making the government "trip over its own feet" due to contravention of the national regulatory environment (Pacheco, 2016). Moreover, the widespread corruption and illegality in the forestry sector (EIA, 2014) and the decentralized political system in Indonesia make it tougher for policies to be passed and enforced. Improper issuance of permits occurs in Indonesia, for instance, when explicit allowances are given to local communities to clear land with fire under the 'zero burning' legislation (J. A. K. Tan, 2015). It is also prohibited to use fire in or develop peat lands that are over 3 meters deep. Illegal forest fire or peat development can lead to 5 to 15 years prison time and up to 5 billion Rupiah (around US$ 374,100 as of August 2017) (Lee et al., 2016). Nevertheless, the complex political and economic dynamics in Indonesia lead to ineffective compliance with and enforcement of the laws. Hence the main question is how to create strong incentives for producer countries to alter their business-as-usual production practices.

5.5 Further discrepancies

The discrepancy between public and private governance in the palm oil industry also partially lead to the situation in which the policy measure discussed in Section 4 acts in isolation. For instance, the national certification scheme, the RSPO and the NGO-business partnership are in fact three separated institutions working on overlapping issues without coordination. The government regulations normally are in parallel with the voluntary standards, meaning they don't work together in cooperation nor are they mutually supportive. Some scholars suggest that effective engagement or collaboration with the public authorities is necessary for the RSPO to overcome its limited potential to address tenure issue (J. F. McCarthy, 2012; Schouten, Leroy, & Glasbergen, 2012). However, the willingness of producer states to collaborate with global non-state private partnership is often in doubt (Hospes, 2014). The NGO-business partnership has its own agenda that does not necessarily follow the RSPO standards. Companies in an NGO-business partnership might choose not to be certified even if they meet the RSPO requirements. The RSPO also currently does not have a system to certify firms that skip normal RSPO standards and directly go for higher standards (RSPO Next).[170] These weak alignments between the various regulatory institutions thus intensify the struggles for a more effective structural performance faced by the palm oil transnational regime complex (Pacheco, Schoneveld, et al., 2017b).

5.6 The need for effective orchestration

Therefore, enhancing the links between public and private governance appears to be a necessary step toward a more sustainable palm oil sector, even though it is still unclear what public sustainability rules and standards are applied by the governments of Indonesia and Malaysia. The reason is that the intergovernmental Council of Palm Oil Producer Countries (CPOPC) established by these two governments are still developing their harmonized sustainability standards for palm oil. However ultimately, the enforcement will and capacity of producer governments are crucial for the alignment of various policy instruments. Building on the policy instruments assessment in Section 4 and the successful case from Brazil, a collaborative approach that integrates public, private initiatives and financing mechanisms (such as REDD+) provides a potential solution to mitigate the current ecological externalities generated by global palm oil industry. For instance, some sub-national governments in Indonesia see the potential for better opportunity, more investment and green economic growth. Hence they actively

[170] In other words, a company has to obtain a normal RSPO certification before being certified as RSPO Next. RSPO Next requires absolute zero HCV/HCS deforestation and no peat development. However, a company without the normal RSPO certification is not eligible for RSPO Next certification, which would double the certification costs for the companies that directly implement more stringent environmentally sustainable production practices.

engage in "No Deforestation" commitments and turn their attention on policies to improve land-use planning, tenure clarification, and smallholder incorporation and production practice with possible collaboration with and assistance from the private sector. This proposed policy mix approach of public, private initiatives and financing mechanism is introduced in the next section with a particular focus on the sub-national/jurisdictional public actor and its interaction with private governance, showing how the many challenges faced by both the state and private sectors can also bring positive opportunities for change and transformation.

5.7 Incentive-based instruments work

In the case of Brazil's success in reducing its deforestation rate by 70 percent (while maintaining a rapid rate of economic growth) in 2013, compared with the 1996–2005 average, there are a few factors contributing to this noteworthy result. The determinants for this achievement include the change of political dynamic from Brazil's social and environmental movements in the last two decades,[171] government policies, strong enforcement actions by federal and state public prosecutors,[172] advance use of satellite technology, concerted pressure from NGOs, positive response from the soy and beef industries and the result-based conditional payment up to US$1 billion provided by Norwegian government through the REDD+ programme (D. Boucher et al., 2014). The success of Brazil shows that government actions (both federal and state) are a substantial part contributing to the reduced deforestation rate. The change of politics in Brazil which was pushed by civil society (labour organizers, environmentalists, indigenous peoples, rubber tappers, etc.) is the key that has generated progress (D. Boucher et al., 2014).

6 Conclusion

This chapter uses the palm oil industry as an in-depth case study to examine the policy instruments used to prevent tropical deforestation and forest degradation. Palm oil is also a controversial tropical forest risk commodity. It is one of the most efficient vegetable oils that enhances rural development and economic growth. Nonetheless, the production of palm oil has significant ecological

[171] For example, in 2002, when Luis Inácio Lula da Silva (known as Lula to Brazilians) from the new Workers' Party was elected as president, deforestation in the Brazilian Amazon was reconstructed from a sovereignty and economic development issue between the North and the South to a wasteful action by soybean farmers and cattle ranchers who exploit resources that are rightfully owned by all Brazilians (D. Boucher, 2014b).

[172] Enforcement actions taken involve closing down illegal operations and jailing perpetrators, which include corrupted government authorities and other actors along the supply chain, such as financing banks, supermarkets, the intermediaries, exporters, soybean processors and slaughterhouses. Although these enforcement campaigns are often episodic and carried out in response to media exposure, generated cumulative effects have altered the business-as-usual deforestation practice into risky activities (D. Boucher, 2014b).

externalities, due to its severe contribution to tropical deforestation and forest degradation, in particular in South-east Asia (around 85 percent of the global production comes from Indonesia and Malaysia). For this reason, the consumer markets in developed countries increasingly demand sustainably produced palm oil.

The two main criteria for environmentally sustainable palm oil are no deforestation and no plantation development on peatlands, in other words, to decouple palm oil production and deforestation. At the international level, there is no global agreement specifically negotiated for palm oil. Nevertheless, due to its negative environmental impacts, some international agreements, for instance, the UN Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), the Ramsar Convention on wetlands and the ASEAN Agreement on Transboundary Haze Pollution, do govern (although in a limited way) and influence certain aspects of the palm oil production. A number of policy instruments are already applied in the producer countries as well as by private sectors and importing countries, in order to shift oil palm plantations development away from existing tropical forests. However, the tropical deforestation and forest degradation caused by oil palm plantations persist. Hence this case study in Chapters 4 and 5 tries to answer the question "how policy mixes can strengthen the current instruments in use and/or new instruments to minimize or remove the external environmental costs caused by global palm oil production?" The question is further broken down into two parts. It first identified current policy gap and then suggested a solution proposal. This chapter answered the first half of the research question.

The palm oil regulatory complex is constantly evolving through new international declarations, private commitments and the use of other policy instruments. After examining a series of policy instruments taken by actors along palm oil supply chains, the main policy barriers discovered are the discrepancy between public and private governance in the palm oil industry and the circumstances in which the policy measures act in isolation. As we can see from the discussions in Section 5, the mixes of policy instruments are not always effective. More instruments can also lead to a mess that includes conflicting and overlapping situations, if there is a lack of coordination. This can be linked back to the discussions on policy integration in Chapter 2 (Sub-section 4.2). Policy integration was proposed by Briassoulis (2005) as a solution to reconcile and modify conflicts and duplications among policy components. The palm oil regulatory complex needs orchestration, in particular between the private sectors and public authorities. In the next chapter, such policy integration and policy instrument mixes will be presented as a proposed solution to address the current policy barriers.

Chapter 5: Towards Jurisdictional Policy Mixes

1 Introduction

Deforestation, especially tropical deforestation started to attract global attention and emerged as a global forest discourse in the 1980s (Humphreys, 2004; Nagtzaam, 2009). The major causes of change in tropical forest cover are agricultural expansion (including soy, cattle, palm oil) and timber extraction, both legal and illegal. The palm oil industry, being one of the main global deforestation drivers, has been chosen as the study subject of this research in order to examine various policy instruments used to prevent tropical deforestation and forest degradation. As discussed in Chapter 2, global forest governance is a dynamic, heterogeneous, hybrid mixed "regime complex" that is comprised of various cross-sectoral and cross-cutting issues. In Chapter 3, the theoretical framework grouped various policy instruments that are used or can be taken to govern forests into three main categories: command-and-control, private and self-regulations, and incentive-based instruments. It also showed why is there a need for a policy of instruments mix, and it presented some broad policy design principles.

In the previous Chapter (Chapter 4), we introduced in detail the characteristics of the global palm oil industry, its environmental impacts and what constitutes sustainable palm oil. We also discussed several policy options taken by producer countries, importing countries and private sectors. The chapter ended with a discussion on the interactions among these actors and the resulting policy barriers. After identifying these policy gaps, Chapter 5 here further applies the theoretical framework in Chapter 3 on policy instruments in the forest governance and a mix of policy measures to the global palm oil industry and tropical deforestation. It provides the integrated analysis and answer to the research question raised in Chapter 4: "How can policy mixes strengthen the current instruments in use and/or new instruments, in order to minimize or remove the external environmental costs caused by global palm oil production?" and then using the lessons learned from the in-depth palm oil case study to further address the research question raised in Chapter 1.

The characteristics of the palm oil governance regime complex serve to address the constraints of single instrument approaches, for example multiple externalities, administrative capacity constraints, non-point source, point source and non-uniformly mixed pollution, etc. Thus multiple policy instruments are in use to address the environmental degradation caused by palm oil production as discussed in the last chapter. However, Section 5 of Chapter 4 has demonstrated that the ability of the private sector alone to implement their sustainability commitments has its limitations. There are gaps between public and private sectors regarding the "sustainability rules" applied in the industry. The private sector's voluntary actions on promoting sustainable palm oil production are more

stringent due to severe reputational and operational risks imposed by the civil society. The public sector in the producer countries on the other hand to some degree considers that it is legitimate to legally convert their forests for economic growth[173] and is trying to regain its control over standard setting in the industry.

This discrepancy consequently also results in instruments used in isolation without coordination, which therefore increases compliance costs for actors in the supply chain as well as being a waste of institutions' resources on overlapping issues. Hence pro-active engagement with the public authority across levels is necessary to resolve governance challenges and stimulate new development and transformation models for the palm oil industry. A so-called jurisdictional approach is considered a potential mechanism (G. Paoli et al., 2016) to facilitate such collaboration between sub-national government authorities (public sector) and private sectors to act in a coordinated fashion at regional level in order to reduce the conversion of tropical forests and peatlands to agriculture.

This so-called 'jurisdictional' approach is in fact used to address the policy focus on sub-national and provincial level. It fits into the growing need for the integration of a multi-level/polycentric governance structure in the environmental policy making. In Chapter 2, sub-section 4.2 on policy integration, it is mentioned that the way to remedy a fragmented global governance arrangement is to build more coherence and congruence via regional, national or local coordination efforts rather than continuing forming a top-down treaty (Howlett et al., 2010, pp. 96-97). In other words, to build an integrated multi-level governance framework. As discussed in Chapter 2, although there is no one universal global forest agreement, there are several other agreements with forest-related mandates that contribute to global forest governance at the international level. At the national level, as seen in Chapter 3, countries undertake various policy measures to implement their obligations towards international agreements as well as manage their own forest resources. In recent year, the sub-national governments have increasingly become active with influential roles to address global environmental problems (Setzer, 2017). This is exactly what the proposal in Chapter 5 focuses on – the sub-national jurisdiction policy integration.

This chapter introduces an integrated jurisdictional policy mix approach as a proposed response to the palm oil governance regime complex. It combines the

[173] In general, Indonesian political parties and politicians in the national parliament support palm oil expansion instead of showing sustained or consistent interest in regulating the ecological footprint of the palm oil industry (G. Paoli et al., 2016). However, President Joko Widodo's administration is currently developing a palm oil moratorium to ban all the new palm oil concessions. It is still unclear in what form the moratorium will be announced (e.g. Presidential Instruction or regulation) and its other details, hence the determination of the Indonesian government to halt new palm oil plantation expansion is yet to be discovered.

broader landscape approach[174] and the concept of policy mix discussed in the previous Chapters. Our main purpose is to examine this promising approach applied to reduce palm oil driven deforestation, aiming at reviewing its theoretical relevance and its incentive value propositions for the actors engaged. Following this introduction, Section 2 first defines the jurisdictional approach, its characteristics and the theoretical relevance and explains the reasons why it is a promising systematic approach for policy mixes to improve the environmental sustainability of the palm oil industry. Section 3 then further discusses in detail the buy-in mechanisms that convince various stakeholders to participate in such schemes. The main groups of actors we focus on here include subnational public authorities, multinational palm oil conglomerates, international public initiatives and importing countries. These sub-sections are further broken down into the rationale and incentives for those particular actor groups and the policy measures for them to take.

The subsequent Section 4 then reviews the synergies of the three primary important stakeholders concerning the challenges and opportunities of the jurisdictional approach when applying it to the palm oil industry. These stakeholders provide for example, strong political leadership and involvement, commitments and incentives contributed from the private sector and international supports, such as the REDD+ mechanism. Two brief examples of the jurisdictional policy mix approaches from the state of Mato Grosso in Brazil and the province of Central Kalimantan in Indonesia are provided in Section 5. Section 6 thereupon expands the discussions and policy implications on the broader policy trends in tropical deforestation risk commodities, more specifically the changing roles of public and private sectors. The discussions include the interaction dynamics between public and private sectors, the development and trade-off between deepening and widening practice standards (e.g. legality vs. sustainability) and the policy implications for commodities other than palm oil. Section 6 concludes.

[174] The landscape approach is defined as "a conceptual framework whereby stakeholders in a landscape aim to reconcile competing social, economic and environmental objectives." It seeks to shift away from the sectoral approach to land management. The former often operates in silo and the latter takes a more holistic approach to "ensure the realization of local level needs and action, while also considering goals and outcomes important to stakeholders outside the landscape, such as national governments or the international community." (Denier et al., 2015, p. 10) The landscape approach can be undertaken by one or multiple stakeholders who act independently or collectively (through a multi-stakeholder process).

2 Characterizing jurisdictional approaches

In recent years, a rising potential mode of collaboration between government, companies and other stakeholders is described as jurisdictional approaches at sub-national level. The use of the term "jurisdictional" was coined during the development of Reducing Deforestation and Forest Degradation (REDD+). A jurisdictional approach focuses on the authoritative political level at which land use and sustainable rural development decisions are made and enforced (Earth Innovation Institute, 2017). It seeks "to align governments, businesses, NGOs, and other stakeholders around shared goals of conservation, supply chain sustainability, and green economic development" (Fishman, Oliveira, & Gamble, 2017, p.i). This coordinated action among groups provides the possibility to reconcile competing land use objectives at different scales and address the complexity of factors across sectors and stakeholders (Denier et al., 2015). Jurisdictional approaches are also sometimes termed as territorial approaches or landscape approaches (Pacheco, Luttrell, & Komarudin, 2017). However, in most cases, these two terms do not explicitly emphasise the importance of sub-national/local authorities and the relevant policy administrative boundary. Thus in this chapter, the use of the term 'jurisdictional' is preferred to emphasize not only the alignment of stakeholders' interests but also the level at which it takes place, namely the sub-national government administrative areas, such as states, provinces or districts. This Section first discusses jurisdictional approaches from a theoretical perspective (2.1) and subsequently examines its potential advantages when combined with the use of policy mixes (2.2).

2.1 Theoretical relevance

Traditionally since the 1970s, transboundary environmental problems addressed at the international level focus on the interactions among inter-governmental organizations and states, such as ocean and watershed pollution, air pollution, ozone depletion, climate change, biodiversity loss and desertification (Andonova & Mitchell, 2010). However, addressing global transboundary environmental problems (such as climate change and biodiversity, which are closely linked with the palm oil industry) requires institutions and processes functioning at/between multiple levels of governance as well as actors with varying levels of authority. Similar to the relationship between an international treaty and Parties to the agreement, the fulfilment of a national goal, for instance in reducing greenhouse gas emissions, also depends on regional/local governments' policy actions and implementations. In the early 2000s, international environmental governance was rescaled to pay greater attention to domestic political and institutional influence (Andonova & Mitchell, 2010). Particularly, in the issue areas of climate change,

biodiversity or ecosystem conservation, the rescaling process of governance[175] is often observed as a shift towards localized decision-making, which identifies that sub-national entities are crucial actors in global governance (E. Ostrom, 2010; Setzer, 2017). This creation or re-orientation of new levels of governance also better aligns the properties of bio-geophysical systems and attributes of institutions between levels of government and environmental scales (O. R. Young, 2002).

Increasingly, the important roles sub-national governments play in a multi-level governance framework for environmental issues has gained greater recognition. For instance, in the United States and Canada, many states and provinces adopted climate change mitigation and adaptation policies beyond what is mandated by federal authorities (Rabe, 2010; Selin & VanDeveer, 2009). Worldwide, more and more sub-national governments aim to contribute to the governance of global environmental problems. The sub-national governments are not only involved in the vertical linkage of rescaling (between States/foreign States and local governments) but also horizontal linkages between local governments. The emerging of the sub-national jurisdictional approaches to tackle tropical deforestation is part of this wave of rescaling of environmental governance. Deforestation, biodiversity loss and greenhouse gas emissions although with significant global implications, originate from processes embedded in specific areas. Thus it is argued that the focus on regional/sub-national scope is a more coherent political jurisdiction (or territorial entity) to undertake necessary policy measures with authoritative decision-making (Marks, Hooghe, & Schakel, 2008). Many sub-national governments have substantial authority over land use planning, and moreover, they do not merely act in response to pre-defined international or national policy goals but take initiatives in their own right (Betsill & Bulkeley, 2006). However, this thread of research on sustainability issues remains generally neglected (Bruyninckx, Happaerts, & Van den Brande, 2012).

Here let us link back to the discussion at the end of Chapter 2 (Subsection 4.2) on the multi-level nested/polycentric forest governance architecture as a form of policy integration. In this regard, the jurisdictional approaches contribute exactly to building a polycentric forest resources governance system, particularly in view of the theoretical relevance and the consistency between the links of these two concepts. V. Ostrom (1999) defined the institutional theory of polycentricity as "one where many elements are capable of making mutual adjustments for ordering their relationships with one another within a general system of rules where each element acts independently of other elements (p.57)." Furthermore, E. Ostrom (2012) described the results of actions taken at multiple scales as nested externalities, which "occur when actions taken within one decision-making

[175] Rescaling of environmental governance is defined as a shift in the locus, agency and scope of global environmental politics and governance (Andonova & Mitchell, 2010; O. R. Young, 2002).

unit simultaneously generate costs or benefits for other units organized at different scales (p.356)." Thus a polycentric system exists when various public and private institutions across scales jointly alter collective benefits and costs. For instance, a focus on palm oil producing sub-national jurisdictions embedded in a multi-level governance system enables us to examine carefully the costs or benefits result from this decision-making unit and how it will influence or be influenced by other actors across scales.

By way of explanation, in contrast to a single level of governance, a polycentric/multi-tier governance of the forests landscape is an approach used to address the multiscale and multifunctional aspects of natural resources and regime complex (McGinnis, 1999), such as palm oil industry and tropical forests. Palm oil and other tropical forest commodities are not only integral parts of international trade, government decisions, policy and infrastructure across levels, but are also the contributors of transboundary global environmental harms. Likewise, when properly managed, the affected beneficiaries of positive externalities across scales from reduced risk of severe climate change cannot be excluded. Major actors (including politicians, forest cooperatives, farmers and conservation NGOs, etc.) in this regime complex confront diversified incentives which challenge and shape collective efforts, institutional arrangement and subsequent outcomes. Thus a fundamental element to effective governance arrangement is situated in the linkages among influential actors at diverse levels but not at a mere single layer of governance (E. Ostrom & Ahn, 2009).

For instance, a polycentric approach holds great scope for tracking forest change through a combination of local efforts, with national and regional inputs by government. Local users can provide accurate information on forest area changes to augment and validate satellite monitoring and assessment. However, it is much harder for local communities to deal with forest degradation and deforestation in larger forests with multiple user groups. A community can protect their forests effectively but cause leakage to adjacent forests. Hence in order to adequately monitor the potential leakage, a broader spatial scale to complement local scale monitoring is needed (Nagendra & Ostrom, 2012).

Nonetheless, jurisdictional and polycentric governance are not equivalent to and should not be confused with decentralization. Jurisdictional and polycentric governance are part of the multi-level governance framework. Actions taken at each level should all be taken into account. For example, meaningful climate actions cannot be achieved without both proper national framework and sub-national implementation efforts. Sub-national levels should not only be integrated into national policies but contribute to the co-development of policy and a multi-level governance process, in which actors and institutions mutually designate their respective roles. The multi-level governance perspective does not automatically indicate a weakening of the national government but rather a redefinition of the

scale and scope of state governance activities (Betsill & Bulkeley, 2006). On the other hand, decentralization is the process of transferring and relinquishing decision-making powers or responsibilities from a central government to regional, municipal and local leaders and institutions. These processes involve different types of administrative and political powers, such as regulatory, fiscal, enforcement or judiciary powers. The decentralization policy has become an essential component of natural resource management programs in more than sixty countries around the world since the 1990s (Andersson & Ostrom, 2008; WRI, 2003). A decentralized natural resource governance arrangement does not necessarily recognize the importance of a complex polycentric arrangement. However, research shows that strong institutional capacity and polycentricity can facilitate more effective decentralization (Nagendra & Ostrom, 2012) and in turn a decentralized governance structure provides more favourable conditions for policy innovation of a jurisdictional approach that engages multi-level actors[176](e.g. provinces, municipalities, districts and villages, etc.) (G. Paoli et al., 2016).

In the palm oil industry, the rationale for applying a jurisdictional approach can be explained by looking into the exact palm oil production areas and remaining tropical forests regions. For instance, in Indonesia, more than 50 percent of the palm oil production is concentrated in three provinces: Riau, North Sumatra and Central Kalimantan. Other significant oil palm plantation expansions also exist in provinces of West and East Kalimantan, South Sumatra and Jambi. Among these provinces, Riau, East, West, Central and North Kalimantan have substantial areas of remaining tropical forests and peat lands. Hence Riau, the majority of provinces in Kalimantan and provinces of Papua and West Papua (highest remaining forests) are the prioritized jurisdictions for integrated sustainable palm oil management (G. Paoli et al., 2016). The actors involved along the palm oil supply chain within these jurisdictions, such as communities, companies, local governments and other stakeholders can work together and drive coordinated transformation across the sector in a wide geographic area.

Other than the theoretical review of multi-level environment governance framework, another body of economic literature on the impacts of environmental regulation on competitiveness is also relevant to the jurisdictional approaches. By strengthening the environmental protection and reinforcing the environmental regulations on the sustainability criteria of palm oil production in these particular sub-national provinces, it might create a win-win situation between the tropical forests and the competitiveness of sustainable palm oil industry. Aside from the immense public interest pressure faced by major international palm oil

[176] For instance, in the peat regulation in Indonesia (Government Regulation No. 71/2014 and its revision No. 56/2016), the local authorities can determine the allocation of peatland protection. This granting of rights encourages sub-national leadership in peat rich regencies in Riau, West and Central Kalimantan (G. Paoli et al., 2016).

conglomerates and investment banks, the EU consumer market also gradually applies stricter production standards and aims at denying market access to those products below certain standards. Consequently, the international manufacturers, retailers and suppliers in the producer countries have to comply with the official standards set at the European level. Economic literature indicates that when major markets impose more stringent environmental product standards and when major direct investment comes from higher regulating economies, the benefits for corporate actors of strengthening environmental standards outweigh the costs (Perkins & Neumayer, 2012; Prakash & Potoski, 2006; Vogel, 1995, 1997). It therefore creates incentives for these parties to campaign for upwards harmonization. In other words, the EU as the second-largest export destination requires standard conformity from producers and the transnational conglomerates that hold significant control over palm oil production practice. This could potentially have a direct effect on the trade flows disrupted by the standards. Especially when Indonesia "will not let go of even one tonne of trade contract or potential demand palm [it] has globally (Munthe, Nangoy, & Chow, 2017)." The palm oil producer countries likely will have to alter their production practice for the European markets and for transnational conglomerates committed to a deforestation free supply chain.

In addition, the Porter hypothesis posits that stricter environmental policy can strengthen the competitiveness of firms and sectors (Porter, 1998; Porter & van der Linde, 1995b). This hypothesis has been supported by evidence from policy science research, showing the economically favoured positions of ambitious environmental policy (Andersen & Liefferink, 2000; Jänicke & Weidner, 1997; Wallace, 1995; Weidner & Jänicke, 2002). Taking into account that provinces and districts are in fact effectively competing for palm oil investments, Jänicke & Jacob (2004) indicate that the demand creation by ambitious environmental policy can potentially attract foreign investments in the development of environmental innovations and create first mover advantages. These innovations can be stimulated by special regulatory or political measures and interventions. In these circumstances, it makes economic sense for the producer countries to exploit and take the advantage of economies of scale (such as, cost reduction and sharing resources and incentives) via a jurisdictional approach in principal production districts to ensure overall standard compliance instead of maintaining numerous scattered segregate sustainable production lines across countries for exports to different markets.

To sum up, the theoretical relevance to the jurisdictional approaches we examined here are mainly from the perspectives of multi-level environmental governance and the impacts of environmental regulation on industry competitiveness. The jurisdictional approaches centre on the sub-national decision-making unit and the alignment of stakeholders' interests, which in fact already imply mixes of policy instruments across governance scales and various actors. The next Subsection

provides more concrete characteristics of this jurisdictional policy mix approach when applied to tackle palm oil driven tropical deforestation.

2.2 Key features and potential advantages

The jurisdictional approaches originate in the context of landscape management (or landscape approaches). Landscape approaches are one of the central concepts which has been used in ecosystem management and in the field of conservation and development since the late 20th century.[177] The landscape approaches provide "tools and concepts for allocating and managing land to achieve social, economic, and environmental objectives in areas where agriculture, mining, and other productive land uses compete with environmental and biodiversity goals" (Sayer et al., 2013, p.1). The jurisdictional approaches share the same emphasis on multi-stakeholder engagement but moreover explicitly focus on the political level where land use decisions are made and enforced (Fishman et al., 2017). The jurisdictional approaches have emerged as a means to scale up positive results for conservation and responsible production and also served as a response to the need of converging major public and private commitments to end tropical deforestation. Table 21 summarizes the main characteristics of jurisdictional approaches defined by Fishman et al. (2017, p.2).

Table 21: Key features of jurisdictional approaches

Jurisdictional Approaches
▪ Seek to align governments, businesses, NGOs, local communities, and other stakeholders around common interests in conservation, supply chain sustainability, and green economic development
▪ Focus on the political level at which land use decisions get made and enforced
▪ Advance careful land use planning of production areas with geographically tailored policy interventions, market incentives and often climate finance

Source: (Fishman et al. 2017, p.2)

[177] For instance, the World Wide Fund for Nature (WWF) has been promoting forest conservation in a landscape context since 2003 (Sayer et al., 2013); the International Union for Conservation of Nature (IUCN) also launched the "Landscapes and Livelihoods" initiative in 2007 (IUCN, 2012).

In short, the jurisdictional approach is a multi-stakeholder collaborative framework that aims to reconcile competing social, economic and environmental objectives in a given political/jurisdictional boundary. It is important to note that, although a collaborative multi-stakeholder model is not a new concept, it is however a rather novel approach for supply chain environmental sustainability in the tropical developing regions. Especially because it involves the North-South dialogue between the producer country governments and global multinational companies. This type of North-South dialogue and collaboration has come a long way from the traditional North-South divide in international environmental politics and governance (Alam, Atapattu, Gonzalez, & Razzaque, 2015). Hence, the jurisdictional approach for governing tropical forest risk commodities is not entirely a new policy initiative but a recognition of the crucial role that multi-stakeholder collaboration plays for the environment in a multi-level governance system.

A concrete example would be, for instance, the State of Mato Grosso in Brazil, in which the state governor and municipality mayors together work with private sectors (e.g. international buyers, domestic buyers, local producers and processors, etc.) and non-profit organizations (e.g. international environmental organizations, local NGOs representing communities or farmers, etc.) towards the common sustainable goals and targets (including e.g. production, environmental protection and smallholder inclusion) that were developed and agreed upon through a multi-stakeholder process. More detailed descriptions on the specifics and challenges are provided in Section 5 in this Chapter.

The jurisdictional approaches are presumed to pursue objectives that key stakeholders could not seek individually. It is in particular characterized by collectively working within formal governance frameworks and with the strong involvement of local authorities to achieve one or multiple objectives (Earth Innovation Institute, 2017; G. Paoli et al., 2016), for instance a jurisdictional approach to zero deforestation or to a sustainable palm oil supply chain. The reasons are that in many cases, states or provinces retain significant forest governance authority, and that, moreover, they are the major actors responsible for implementing national laws and policies.

Another important aspect of the jurisdictional approach is to ensure that these strategies are not imposed from outside (e.g. from international institutions) but are derived from and owned by the regional society. It is hence a bottom up approach rather than a top down measure. The jurisdictional approach can be a prioritized strategy to consolidate policy measures at the districts or provinces in accordance with the quantity and quality of peat and forest at risk, the characterization and the local political economy of the palm oil industry, and the

potential for existing activities to be enhanced by the government, industry, or civil society.

Currently, an active engagement and communication between local authorities and the transnational palm oil industry regarding the environmental performance of production practice is still lacking. Government and industry actors each decide on matters related to palm oil outcomes and often without substantial participation of other actors that would be affected by these decisions. Hence this is where the emphasis of a jurisdictional approach can contribute significantly: to engage public actors and to enhance joint efforts among authorities, private industry and non-profit environmental organizations. In this way, the jurisdictional approach is expected to build greater domestic constituency for sustainable palm oil instead of imposing sustainability requirements by "outsiders", i.e. multinational palm oil companies and international non-profit organizations. This nascent approach emerged and has gained increasing attention in the climate change regime during the development of the REDD+ in the last five years. Subsequently its application has been extended to other forest resource management policies.

In theory, there are three possible entry points, differing in terms of leading role, to apply a jurisdictional approach focusing on palm oil production. One would be to start with an influential and pro-active transnational company and implement its deforestation-free commitments across a targeted jurisdiction, for instance through pledges to preferential sourcing from provinces or districts that demonstrate improved sustainability. This model delivers powerful demand signals to the market. Another model is to work with local authorities that pursue low emission development goals or jurisdictional wide palm oil certification, which delivers strong supply signals to the market. The third possible way is for efforts lead by civil society in strategic geographic boundaries in collaboration with local communities, both supply and demand side stakeholders, to jointly promote better sustainable forest management and implementation strategies (Fishman et al., 2017; G. Paoli et al., 2016). However, over time, in order to achieve successful and lasting deforestation reduction results, integration of all these efforts and stakeholders is necessary.

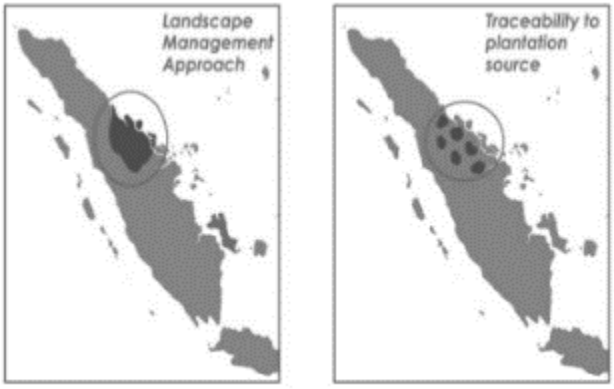
The jurisdictional approach is often compared with a landscape approach, supply chain and supply shed approaches. Some literature categorizes a jurisdictional approach as a subset of landscape approaches (Denier et al., 2015; Stickler et al., 2018), and some see it as a different group of tools (WWF, 2016b). A landscape approach is typically applied in ecologically, geographically or hydrologically defined spatial extents for sustainable agriculture or biodiversity conservation purposes. Moreover, it often involves NGO advocates and stakeholders that do not necessarily contain government or industry representatives (G. Paoli et al., 2016). A supply chain approach is normally carried out by private business, and

is aim at identifying and tracing its raw materials along the supply chain, such as the RSPO certification. With the supply shed approach, the private firm works with a key supply node, such as a palm oil mill, refinery or shipping port, to ensure that the products produced in this region processed by the facility are regulation compliant or sustainably certified (Earth Innovation Institute, 2017). Deforestation free supply chains are hard to achieve and moreover require high maintenance costs to track and ensure that non-compliant inputs are excluded at every single link in the chain. For instance, rigid segregation (between sustainable palm oil and traditional palm oil) should be controlled and traced at major nodes: from fresh palm fruit bunches in certified plantations to the mills; from crude palm oil to refinery, and from refined palm oil to the shipping site.

The supply chain and supply shed approaches are more commonly used at the moment. They primarily involve business, smallholders and government actors in a more dispersed and independent manner with smaller patches of land, as opposed to jurisdictional/landscape approach management across a connected area of land at scale (CPI, IDH, & Unilever, 2015). Figure 14 below briefly illustrates the main difference between jurisdictional/landscape approaches and other plantation-by-plantation traceability approaches (e.g. supply chain and supply shed). Moreover, due to the reasons mentioned in the last paragraph, the supply chain and supply shed approaches face more concerns with respect to leakages, and slow escalation, and they are costlier. Moreover, there are matters such as tenure issues, mapping, aligning land use planning and regulatory procedures, smallholder engagement, and enforcement of laws that are hard to address effectively and inclusively without the involvement of governments. All of which create persistent deforestation-related supply chain risks. The spatial scale of the jurisdictional approach is in theory sufficient enough to reduce the risks of leakages.[178] Meanwhile the major actors and levers in the supply chain of deforestation-driven commodity are more closely engaged. Thus the jurisdictional approach can be an effective way to scale up these measures (i.e. supply chain and supply shed approaches) to achieve more sustainable palm oil production practices.

[178] See the remainder of this Subsection for more explanations on why a jurisdictional approach can reduce the risks of leakages.

Figure 14: Simplified illustration on jurisdictional/landscape approach and plantation-based approach to manage environmental benefits on Sumatra



Source: (CPI et al., 2015)

For the private sector and sustainability professionals, the main reasons for promoting jurisdictional approaches are first, to scale up the sustainability production practices so as to avoid leakages (especially compared with projects) and to reduce costs; second, to bring in (local) governmental engagement. Even though there is an increasing number of companies working towards a zero deforestation supply chain, due to uncertainties in the producer countries, companies are still exposed to risks despite their efforts on certification or deforestation free commitments. Therefore already some companies in the US and Europe are not willing to take the risks of being associated with tropical deforestation and decided to opt out by using other edible oils rather than palm oil (WWF, 2016c). However, dropping palm oil altogether is undesirable because it is important that all actors (public and private) along the supply chains together create their point of leverage to drive out unsustainable practices. On the one hand companies want to reduce the risks of mixes of sustainable and conventional palm oil in a given production area, and on the other hand companies also increasingly realize that government participation is critical to address the sustainability of their supply chains.

In order to address the tenure, smallholder, law enforcement and land use strategy issues, governments should not always be seen as barriers for companies. In particular, a clear jurisdictional boundary is a precondition for improving land use planning, as opposed to dispersed changes made by different groups across a landscape. If economic incentives and market drivers can be brought to bear upon public sectors, they can work in collaboration towards better palm oil sustainability. Typically, the political leaders at the provincial and district level in areas suitable for palm oil cultivation support plantation expansion actively to

drive economic development and generate public revenue as well as personal financial benefits. However, there is a growing trend with numerous civil society organizations to raise public awareness, influence public opinion and demand more transparency and participation in forest resources management (G. Paoli et al., 2016).

In addition, the progressive zero deforestation commitments from the private sector to a certain degree signal to policy makers that lowering the deforestation rate will be beneficial to palm oil development (Fishbein & Lee, 2015). In fact, in the end of 2015, Marks & Spencer and Unilever expressed their intent to collaborate with governments and prioritize their commodity sourcing and purchasing from areas under jurisdictional forest and climate initiatives with the objectives of reducing GHG emissions while increasing agricultural productivity.[179] Other financing and incentives for government involvement include, for example, the REDD+ program, commitments for investments from financial institutions or development banks and guaranteed market access, etc.

To sum up, theoretically, the promising benefits of the jurisdictional approach include the reduction of certification costs, streamlining various processes, simplifying traceability and certification, sharing information and resources, encouraging the wider engagement of smallholders, creating scalable and long term impacts and the avoidance of leakage/displacement (G. Paoli et al., 2016; Proforest, 2016c). In other words, jurisdictional approaches offer buyers a practical way to reduce the risks that their sustainable sourcing commitments are not met by all producers within the landscape. The maintenance and monitoring costs of supply chains can be substantially reduced if, for example, all fresh palm fruit bunches which farmers sell into a supply chain are zero-deforestation compliant. Not to mention, a more inclusive compliant supply shed or jurisdiction would lessen the burden for local producers and suppliers to prove conformity. And in order to establish a complete deforestation free supply shed or jurisdiction, government and large companies must include smallholders in the region in a coordinated manner to obtain the maximum benefits of economies of scale. It is more efficient for big companies to purchase from a refinery that produces a sufficient amount of deforestation-free compliant palm oil rather than making several purchases with multiple investigations up the supply chain.

Furthermore, jurisdictional approaches provide a potential solution to fulfil those commitments that are unattainable by individual producers. For instance, the involvement of local authorities and communities can potentially better resolve conflicts (within and across sectors), tenure issues and ensure Free, Prior and

[179] Statement from Consumer Goods Forum Co-chairs, Acting Individually: Production Protection at http://tfa2020.org/wp-content/uploads/2015/12/01122015-_Produce-Protect-CGF-statement.pdf, accessed on 15 August 2017.

Informed Consent as well as provide improved consistency of the zoning in forests with a high conservation value and high carbon stock (B. McCarthy, 2016). Moreover, by involving subnational/local government institutions, it increases the likelihood for long term policy governing procedures and solutions. Another important factor is that the development and success of an innovative approach such as strategies, institutions or instruments, can enable and stimulate replication and diffusion by other government leaders (Jänicke & Jacob, 2004). The more governors are involved, the more leakage and displacement can be prevented. Before entering into discussions on more detailed catalysts and policy instruments associated with various stakeholders in the next section, Table 22 lastly summarizes the advantages of the jurisdictional approaches to tackle palm oil-driven tropical deforestation.

Table 22: Potential advantages of applying jurisdictional approaches for sustainable palm oil sourcing

Delivering commitments effectively	
Managing supply chain risk	Typically, suppliers are required to provide evidence that individual producers manage their production practice responsibly, which can be difficult and costly. A jurisdiction that successfully reduces its deforestation rate can provide a mechanism to assure buyers of the lower risks associated with deforestation at lower costs for both producers and other supply chain actors.
Addressing complex issues	Certain sustainable sourcing commitments cannot be resolved by individual producer but can only be achieved when engaging multiple stakeholders, such as the long-term protection of conservation areas and social issues. Jurisdictional approaches provide a partnership framework to address these challenges.
Making certification more achievable	
Reducing the gap between normal practices and certification standards	Jurisdictional approaches can raise production standards across the landscape. Therefore it reduces cost differentials between certified and uncertified operations and makes certification more economically feasible.
Simpler auditing	Reliable existing legal, policy or enforcement frameworks can simplify and reduce the costs of certification assessments.
Small producers	Jurisdictional approaches can better help producers to access certified supply chains by supporting organized groups for group certification or providing assurances that minimum standards are met.

Sourcing with positive impact	
Supporting positive change	Most buyers only purchase from producers that meet sustainable sourcing requirements instead of engaging with producers to improve their practices. However, all producers need to be involved for the long term meaningful impacts. Jurisdictional approaches provide such framework, expertise and pooled resources to include more producers for greater changes.
Providing incentives	Jurisdictional approaches can enable more favourable contracts or commitments to buy larger volumes as well as preferentially locate processing facilities. These provide incentives to producers for continued good practice. Furthermore, jurisdictional approaches can also combine the above supply chain incentives with other catalysts such as technical support and financial access.
Achieving scale and permanence	Jurisdictional approaches enable resources to be pooled and aligned with government and civil society resources around common goals to scale up the impacts and potentials for meaningful and permanent transformation, compared to specific supply chains.
Better governance	Governance improves when the private sector and government actively align around the shared goal of effective implementation of the legal framework. Because a universally enforced legal framework is in the interests of all responsible companies and similarly, the private sector can undermine better governance through corruption or by widespread and systematic failure.
Including small producers	Small producers typically lack knowledge and resources to implement good practice. Jurisdictional approaches could provide better support, enforcement and monitoring to include small producers in sustainable supply chains.

Source:(Proforest, 2016a)

3 The buy-in mechanisms

The use of the term "buy-in" refers to the fact of agreeing with and accepting suggestions. In other words, we look into each main actor group and examine what are the incentives and what are their roles exactly in jurisdictional approaches in order to understand the reason for them to participate in such initiatives. One of the major challenges for a jurisdictional approach is to create and maintain compelling incentives and value propositions for key actor groups involved. Sub-sections 2.1 and 2.2 described briefly the theoretical relevance, key features and potential advantages of a jurisdictional approach. This section in furtherance of these aims focuses on three main groups of stakeholders and examines in detail the incentives for them to participate and engage in a

jurisdictional approach. These three groups of actors are sub-national public authorities, multinational palm oil conglomerates and international public initiatives and importing countries. The discussions will contain actions taken by these three groups of actors, the reasons for them to take such actions and the advantages of aligning public and private sectors with the jurisdictional approaches with policy mixes. The non-profit organizations are not separated into a category because they are almost always an important force behind these three groups of actors pushing for better palm oil production practice. In the last sub-section (3.4), examples of using a jurisdictional approach at state (Brazil) and provincial (Indonesia) levels are provided.

3.1 Sub-national public authorities

3.1.1 Rationale and incentives

High-level political leadership and a strong government determination from the concerned jurisdiction is the fundamental element to advancing a jurisdictional approach. It leads legitimacy, aligns policy-makers with actors within a formal framework and creates the enabling atmosphere for all involved parties to take positive steps towards sustainable palm oil production. Therefore, the initial determination and vision of the governments derived from perceived benefits and the actual progress from public-private collective efforts, have to be mutually reinforcing along the development process. As the commodities produced in the rural areas are the drivers for economic growth and social development, local governments in general have strong incentives to aim for higher value markets for their sustainably produced commodities. In theory, the primary motives for governments include the profits of sustained long-term economic growth and financial, technical assistances delivered by donors during the development process. However, political leadership is also one of the main risks to jurisdictional approaches. Thus when designing these initiatives, the resilience to political change should be taken into account (Fishman et al., 2017).

As mentioned earlier, the potential models for initiating a jurisdictional program can be implemented by local government, by external proponent such as NGOs, donors, industry actors or through collaboration among them. Leadership taken by the local government has the advantage of positioning government at the core of action to facilitate and coordinate formal regulatory procedures and policies with greater cross-sectoral impacts (G. Paoli et al., 2016). Typically, the government led model would not only focus on palm oil but have broader objectives on Green Growth or REDD+. Moreover, the support from non-governmental proponents is crucial in catalysing this process. Nonetheless, even if the initiatives of a jurisdictional program were mainly led by industry actors and NGOs, they would still need committed participation from the governments. One example of such collaboration between the public and private sectors is the

jurisdictional certification developed by the Roundtable on Sustainable Palm Oil together with sub-national jurisdictions in Indonesia and Malaysia.[180] The report by Fishman et al. (2017) observed that the key role of influential individual proponents (e.g. state governors), who are able to initiate networks and maintain momentum, are central to the jurisdictional approaches.

External factors can also create leverage to enable and strengthen political leadership in leading the jurisdictional policy mix initiatives. For instance, the establishment of the Governor's Climate and Forests Task Force (GCF), which is designed to protect forests and climate while enhancing rural livelihoods through low-emission jurisdictional development programs. It is a platform consisting of 35 jurisdictions (states and provinces) from nine countries that cover one quarter of the world's tropical forests (GCF, 2017). The GCF Governors in 2014 further committed to reduce deforestation by 80% by 2020 given long-term, sustainable international support (the Rio Branco Declaration). Very often this kind of development strategy involves assistance from the consultation type of non-profit organizations. In this way, the NGO-Business partnership discussed in Chapter 4 (sub-section 4.3) actually extends its role to include governments in its collaboration network. Additionally, such a platform can provide a forum for financial and technical collaborations between partners. Another example of external forces is the emergence of corporate deforestation-free commitments in the last decade as well as the willingness to adopt sustainable management practices (through RSPO) shown by a large number of oil palm developers. Similarly, external positive recognition can also reinforce the efforts of leading conservation governors and governments and incentivize further reforms (Fishman et al., 2017).

In fact, sub-national governments taking proactive steps as their policy responses to international affairs have grown significantly in the realm of global climate governance in the last decade (Jörgensen, Jogesh, & Mishra, 2015). Due to the high GHG emissions associated with palm oil production in South East Asia, this trend of governance evolution is surely relevant to this research. Betsill & Rabe (2009) categorize three periods for the climate change governance debate: 1) when the climate change debate was focused on international agreements and national level implementations; 2) when a top down international agreement failed, followed by the rise of climate strategies by cities, provinces, prefectures and states; 3) when literature started to examine the interplay between different levels of government, as well as between the public and private sectors. The last period of the climate change debate development reflects the concept of "polycentric systems" emphasized by Ostrom (E. Ostrom, 2012). Moreover, studies have

[180] These pilot RSPO jurisdictional certifications are implemented in the Seruyan district (Central Kalimantan) and in the Musi Banyuasin district (South Sumatra) in Indonesia and in the State of Sabah in Malaysia (RSPO, 2016c).

shown that subnational institutions could pioneer innovative policy initiation and implementation by developing and experimenting with new problem-solutions independently (Jörgensen et al., 2015). Although the pursuit of subnational initiatives has been developed longer in industrialized countries, emerging economies such as India and Brazil have also taken momentous steps with large-scale endeavours (Jogesh & Dubash, 2015; G. Paoli et al., 2016, p.33).

Given the significance of political leadership, a critical question is how to create and strengthen such leadership. Among the three key stakeholder groups discussed here, the rationales for local governments to participate or to take the lead in a jurisdictional policy mix approach for sustainable palm oil probably requires the most elaboration. Unlike multinational palm oil companies and importing countries subjected to mass consumer pressures and morality concerns in developed countries, the primary interests for production countries are typically economic growth and rural development needs. In other words, political leaders need a business case to support their actions (Fishman et al., 2017). Thus a jurisdictional approach should demonstrate sufficient benefits and long-term advantages over the business-as-usual scenario to offer compelling value propositions.

One of the important rationales for sub-national leaders in emerging economies to take the initiative in sustainable development are the perceived first mover advantages from the signal they received in consumer markets in developed countries and the continuous momentum towards sustainable development.[181] These advantages can include political gain, prestige, preferential sourcing and/or investments, faster spatial planning conflict settlement, donor funding and/or performance-based incentives from REDD+, central government or downstream supply chain actors (G. Paoli et al., 2016). Among these, the positive incentives created by the private sector and market demand are essential. The growing deforestation-free supply chain movement in the private sector can offer competitive advantages and investment to motivate jurisdictions facilitating compliance through public-private partnerships. This is for instance the case for the state of Sabah in Malaysia, where government officials attempt to use jurisdictional RSPO certification to differentiate their palm oil in the competitive international market (Fishman et al., 2017). However, potential benefits also entail risks and costs, for instance, reduced rent-seeking opportunities for personal (or interest group) gains due to better transparency. Eventually, for each actor to join a jurisdictional program, the benefits need to outweigh the costs.

[181] Personal communication with the governor of Sintang Distict in West Kalimantan and the Indonesia Country Director at IDH-Sustainable Trade Initiative during the United Nations Framework Convention on Climate Change, the 23rd Conference of the Parties in Bonn, held at Nov 6, 2017 – Nov 17, 2017.

For political leaders in the jurisdiction, taking part in a jurisdictional policy mix scheme could raise one's profile and positive publicity at the national level, attracts investments in the private sector, and increases legal security as governance transparency and accountability rise. This is in particular applicable to provincial governors in Indonesia (Paoli et al., 2016, p.46) because provincial governments have larger land areas, more financial and technical resources, and a more diverse economy compared with districts, which provide more flexibility and resilience to balance negative factors and sustainability throughout the jurisdiction.

3.1.2 Policy measures to take

Actions from governments have been identified as the major areas for improvement in order to achieve sustainable palm oil production. In a jurisdictional policy mix approach, the primary policy measures for governments to take are those addressing land use inventories, land use strategy, spatial planning and tenure clarification. These measures can optimize land-use plans and ensure land resources are assigned to their highest use values (CPI et al., 2015). They thus provide the necessary information as a basis for any further forest management plan, such as better licence issuance, enforcement and monitoring compliance. Spatial planning is a form of integrated regulation. So for instance, the use of water, forest and agriculture can be planned in accordance with the over-arching provincial or district level sustainability objectives. Moreover, governments can provide critical technical support and monitoring compliance through the use of satellite and remote sensing (Nagendra & Ostrom, 2012). Brazil is one of the successful cases in utilizing its great technical capacity (e.g. real time and fine resolution satellite imagery) to incentivize private landowners to preserve plentiful forest lands within their properties and monitor compliance. A transparent and reliable monitoring system is still an area needing improvement for the Indonesian government (Fuller, 2006).

Secondly, the government has to build a partnership or public participation framework with other stakeholders (e.g. the private sector, civil society and local communities) and reach a consensus on a mutually accepted "environmentally conscious and fair" production practices as well as how the governments can provide enabling conditions for it (e.g. reduce risks that deter private investment). Meanwhile, the governments also need to ensure and facilitate the inclusion of indigenous communities and smallholders. The inclusion of smallholders is necessary in order to reduce the risks of production fragmentation into green (clean) and brown (dirty) supply chains, which promotes leakage and displacement effects, such as those turn to markets with less stringent standards (Pacheco, 2016).

Third, governments can employ measures to better coordinate ministries and agencies responsible for natural resource management at different scales (vertical

coordination) and across sectors (horizontal coordination) (Denier et al., 2015). Multiple state-level (provincial level) agencies should align and coordinate their priorities around sustainable development, business and forest conservation to remove conflicting policies that undermine or impair common goals and allocate the necessary budget for implementation. Insufficient coordination can result in agricultural practices that are destructive to conservation and sustainable objectives, for instance, shifting the balance of public sector subsidies and taxes policies to support more holistic and aligned landscape strategies (e.g. between agricultural development, ecosystem conservation and income generation) (Denier et al., 2015).

Lastly, the enhancement of existing legal mechanisms and regulatory tools, such as the ISPO and peatland regulation, can contribute significantly to the long-term development outcomes. For instance, the Corruption Eradication Commission (KPK) in Indonesia initiated the "National Movement to Save Indonesia's Natural Resources" memorandum of understanding in 2014 with provincial governors, other national forestry and fishery ministries. It aims to cleanse the current management system of corruption, and to better monitor and integrate management of natural resources. According to this memorandum, KPK undertook a palm oil license legality audit to review palm oil concession permits which had been issued in 19 provinces (G. Paoli et al., 2016). Although these policy interventions do not directly reduce deforestation from palm oil conversion, they provide an influential enabling environment for the production sustainability in the jurisdictions. Moreover, at this initial phase of the jurisdictional approach for zero deforestation development, there is an opportunity for leaders to be an example and demonstrate how things can be achieved.

To sum up, the use of a jurisdictional approach can better demonstrate the important role sub-national actors play within broader national and international frameworks (Betsill & Bulkeley, 2006). Sub-national public authorities can take policy measures aiming at better land use strategy and spatial planning, engagement of private sector, civil society and smallholders, coordination across state agencies, enhancement of existing legal mechanisms and regulatory tools. On top of these, governments should also actively pursue international buyers. The province concerned acts as a platform to empower bottom-up efforts, coordinate national processes, align cross-sectoral policy and bridge multiple public and private actors' activities to produce a more comprehensive pathway towards low-emission, sustainable development.

3.2 Multinational palm oil conglomerates

3.2.1 Rationale and incentives

The private sector can be broadly categorized into three groups: actors based in a jurisdiction, actors sourcing from a jurisdiction and actors investing in production within a jurisdiction (Fishman et al., 2017). Here in this section, the main group being discussed is those actors who source from a jurisdiction, including international commodity traders, manufacturers/brands and retailers. All these actors have the flexibility to source from a particular jurisdiction or from lower-risk locations.

The private sector is typically the major driving force of large economic activities in a jurisdiction. Their investments and buying power shape the economic landscape and influence how commodities are produced. Moreover, they normally have considerable technical expertise. The incentives for industry actors to engage in sustainable production practices and self-regulation can be internal (e.g. environmental stewardship ethic), demanded by other business partners and customers, or reputational incentives demanded by external audiences (Morrison & Roht-Arriaza, 2007). More specifically, aside from potential cost savings already largely described in subsection 2.2, there are two main reasons to involve the private sector at the jurisdictional/landscape level.

First, the private sector so far has been the primary driver for major changes in the palm oil industry since they value their brand reputation greatly and the engagement with jurisdictional approach can be a means to achieve their commitments. In the world of a globalized economy, small shifts in market share can be significant and branding/differentiating a company's products is often essential to market access and share. A company's reputation as an environmental actor is thus critical (Morrison & Roht-Arriaza, 2007). Moreover, participating and supporting a jurisdictional wide industry improvement is a very public way to demonstrate a company's commitment. This is on the one hand a positive incentive on the basis of reputation and on the other hand, if the approach works, it will support and reduce their risks and costs for sustainable and responsible sourcing, as explained in subsection 2.2. So far, this level of private sector engagement has been a form of voluntary self-regulation for actors sourcing from, and investing in, production within a jurisdiction. Relevant public regulations from importing countries are categorized in the next subsection.

Second, appropriate and streamlined regulations and responsive regulators from the public sector can create an enabling environment for private investment. More clarity and transparency from improved land use planning and reconciliation will ease the regulatory burden and compliance costs for large palm oil companies. These processes include rationalizing and streamlining licensing requirements,

reducing illegal licensing to corrupt operators and curtailing pubic land encroachment by smallholders (Paoli et al., 2016, p.50). Consequently, more specific potential benefits include more available degraded land with clear tenure for acquisition, straightforward and predictable legal outcomes, better dispute management with communities, strengthened voluntary measures due to improved spatial planning and licensing and enhanced brand images. This will however require the private sector to have a different partnership with government authorities and local communities and moreover, together with NGOs to agree on a consensual "palm oil sustainability".

In addition, another motivation for the private companies to go into partnership with non-profit organizations and the public sector is that, despite their ambitious zero-deforestation commitments, the companies in fact do not have the means to achieve this goal within a promised time-frame. It is therefore in their interests to employ the expertise of non-profit organizations and jointly explore possible solutions to scale up their deforestation free supply chain commitments from current farm-by-farm or mill-by-mill private certification schemes to a larger scale of sourcing areas.

3.2.2 Policy measures to take

When companies are trying to improve their supply chains towards zero-deforestation, they can either shift their sourcing away from jurisdictions with high deforestation risks or support land planning and management reforms where their supply chains are located. As mentioned in the previous chapter, many Western companies chose to purchase alternative vegetable oil varieties in place of palm oil from Southeast Asia due to reputational concerns. This is although it is a direct strategy, at the same time it eliminates positive market pressure to improve production practice. In this case, palm oil suppliers in Southeast Asia may turn to buyers that are not concerned about the destructive production practices associated with their products. Therefore, it is important for the international community, environmental non-profit groups and financiers to acknowledge and 'reward' companies taking efforts to improve landscape management and to continue investing in improvements (Fishman et al., 2017).

Aside from the actions already taken by these large multinational agribusinesses, such as zero deforestation commitments (Paddock, 2016) and investing in being RSPO certified, for the jurisdictional approach, the financial incentives which the private sector can provide, are through its commitments on preferential sourcing policy (Fishman et al., 2017). This means that the companies can express their market interests in prioritizing sourcing from the entire regions that also aim for zero-deforestation or sustainable palm oil production. In general, traditional certification schemes can only supply a relatively limited quantity (CPI et al., 2015). For example, for many large ambitious manufacturers and retailers, such as

Unilever and Nestlé, their ultimate goal is to ensure complete deforestation-free supply chains, as well as bringing net environmental positive impacts and improving smallholder farmers' livelihoods. A jurisdiction that strives for this goal can not only provide a greater amount of standard compliant produce but reduce the costs of guaranteeing sustainability on a farm-by-farm, or mill-by-mill basis, and moreover, it can help in establishing a stable deforestation-free supply chain. Besides, branding products around their quality and linkage with conservation can give better access to lucrative western markets.

Other than preferential sourcing, another important measure for the private sector to undertake is to develop optimal collaboration between big agro-industrial complexes and smallholder farmers (Rival & Levang, 2014), the so-called "outgrower" schemes. The reasons why big companies would be willing to assist smallholders are two folds: one is the pressure from non-profit environmental organizations and another is to mitigate operational risks. The agro-industries can provide technical assistance and the necessary knowledge for smallholders to intensify and improve their plantation management and expansion to degraded lands, as well as to provide high-yield seedlings, fertilizers and maintenance of the delivery road network. This is not only because there exists a significant yield gap between smallholders and commercial plantations, but also because an increasing number of independent smallholders prefer to deliver their fresh fruit bunches to oil company's mills (G. D. Paoli et al., 2013). The control of production practice of these third-party suppliers is an important part of the agro-industries sustainable supply chain management. If these fresh fruit bunches from smallholders are not standard compliant, it would create more cost for the companies in terms of tracing and segregating.

The integration of smallholders in the agro-business complexes can be done by the establishment of private contacts or public regulation. For instance, the provincial government of Central Kalimantan is developing new regulations concerning company-community partnerships. This will provide the legal basis for such collaboration and also encourage more equitable and inclusive benefit-sharing of palm oil development. Nonetheless, the above commitments and actions taken by the private sector require constant checking and pressuring from the civil society and environmental/development NGOs.

In addition, the third group of private sectors (actors investing in production within a jurisdiction), such as private financial institutions and impact investors, are also a target group of environmental groups if they finance businesses related to tropical deforestation. International financial institutions are potentially associated with tropical deforestation through providing loans and other types of capital to actors in the forest risk commodity supply chains. This consequently exposes these financial institutions to risks when their clients directly or indirectly participate in the deforestation activities. Both their reputation and profits can be

impaired. Hence it is also a risk management for them to provide favourable interests or policies to investment in deforestation-free jurisdictions. When financial institutions establish a deforestation-free policy to mitigate the risks, investors and lenders can benefit while incentivizing a market shift towards sustainable supply chains. This kind of policies and commitments to remove deforestation associated commodities from banks' portfolios are increasing particularly for palm oil and timber products (MacFarquhar et al., 2016). For instance, the Equator Principles is a risk management framework adopted voluntarily by financial institutions to avoid investing in businesses associated with tropical deforestation (Equator Principles, 2018).[182] In 2014 and 2015, the Norwegian government pension fund, which is the world's largest sovereign wealth fund, divested its shareholding in more than 100 companies in the palm oil and paper producing sectors as well as other deforesters due to environmental concerns (Denier et al., 2015). Although the role of financial institutions in reducing tropical deforestation is slowly emerging, there is still significant room for improvement. When financial institutions effectively implement their policy and monitoring, and moreover continuously engage more companies into this process, they can not only reduce risks but also become an influential lever of change.

3.3 International initiatives and importing countries

3.3.1 Rationale and incentives

The international initiatives include donors and public agencies established by intergovernmental organizations. They primarily provide funding, technical and informational support to the jurisdictional programs. The importing countries here are mainly from Europe and other consumer markets with higher environmental and social awareness. Being at the fourth stage of Forest Transition (Mather, 1992) and on the right end of Environmental Kuznets Curve (Grossman & Krueger, 1991; Panayotou, 1995; Shafik & Bandyopadhyay, 1992), the main motivations for developed countries to support the sustainable management of palm oil production (and other tropical deforestation related commodities) are twofold. One is the hard law legal reasoning to comply with their obligations under the international agreements, such as the United Nations Framework Convention on Climate Change (UNFCCC) and Convention on Biological Diversity (CBD). In particular, reducing tropical deforestation is a cost-effective

[182] The financial institutions that adopted the Equator Principles implement the principles to determine, assess and manage their environmental and social risk in projects and to provide a minimum standard for due diligence and monitoring for responsible risk decision-making. Currently, there are 93 financial institutions in 37 countries which have officially adopted the principles, collectively covering more than 70 percent of international debt finance in emerging markets (Denier et al., 2015; Equator Principles, 2018).

way to reduce greenhouse gas emissions especially when being compared to energy sectors for example (Eliasch, 2008; Stern, 2006).

Another motivation is to meet their soft law commitments, such as protecting global common goods (e.g. stable climate and biodiversity) and achieving Sustainable Development Goals according to the UN 2030 Agenda for Sustainable Development (see Chapter 2, sub-subsection 3.1.6) (UN, 2015) since stopping tropical deforestation addresses multiple societal and environmental challenges. Other reasons can include avoiding transboundary environmental harm, moral and ethical concerns, pressures from domestic NGOs and/or consumer groups, and reducing unfair competition from illegal/unsustainable deforestation that undermines landowners who manage their forests sustainably (Union of Concerned Scientists, 2014), etc.

3.3.2 Policy measures to take

International supporting measures for a jurisdictional approach policy mix for better palm oil production can be a combination of payment for ecosystem services and for a preferential sourcing policy. The former one can be exemplified by REDD+ mechanisms or other donor activities through numerous financing institutions. It can be aid-like upfront funding to support capacity building at the beginning of the jurisdictional program development. In the later stage, it can be actual payments for GHG emission reduction, or the provision of other vital ecosystem services from tropical forests, or carbon credits. The REDD+ mechanism under the UNFCCC currently progresses rather slowly, but the essence of this innovation has been captured in the various initiatives and movement on the ground among actors. As more and more REDD+ readiness pilot projects are carried out in various tropical countries, the design of REDD+ started to shift its focus on individual projects to broader scale implementation, which aligns with the rationale for a jurisdictional approach.

The preferential sourcing policy can be extra territorial import restrictions taken by importing countries or commitments to prioritize purchasing commodities produced in deforestation-free jurisdictions. For example, the European Parliament issued a resolution to only import certified sustainable palm oil after 2020 and many European countries have committed to only source certified sustainable palm oil since 2015. Countries can also prioritize their sourcing for a jurisdictional program or via certification through public procurement policy. This measure taken by developed consumer market countries could potentially bring about the California Effect, which Vogel (1995, p.261) described as "lure of green markets." The size and importance of the domestic markets of importing countries that promote stricter standards are critical enabling factors to strengthen environmental standards (Perkins & Neumayer, 2012; Prakash & Potoski, 2006; Vogel, 1995, 1997). In the palm oil case, the EU has legal, economic and political

advantages. The WTO is unlikely to restraint its resolution. Moreover, its public groups' interests, its consumption and economic power (including those from private manufacturing and retail companies) are highly influential in setting the agenda in the global palm oil industry.

The next sub-section uses two examples in Brazil and Indonesia to further illustrate the potential of using a jurisdictional approach to manage the tropical forest risk commodity and palm oil industry.

4 The jurisdictional policy mixes

4.1 Synergies

Section 3 explained in detail the incentives and policy measures to take for three main actor groups in the jurisdictional approaches. In this section, we discuss the synergies of the jurisdictional approaches, interactions and the policy mixes among actors and lastly the potential barriers of the approach. First, however, before we enter into the discussions, Table 23 below reviews and summarizes what we examined in the previous section, namely the motivations and policy measures that can be taken by three actor groups.

Table 23: Summary of the buy-in mechanisms for main actors in the jurisdictional policy mix approaches

	Sub-national authorities
Motivations	- Profits of sustained long-term economic growth - Perceived first mover advantages from signals given by the private sector and consumer market - Financial, technical assistances delivered by donors - External positive recognition, publicity and political gains - Preferential sourcing and/or private investments
Policy measures	- Land use strategy, tenure clarification and spatial planning - Technical support and monitoring compliance - Mandatory certification schemes - Enhancing existing legal mechanisms and regulatory tools - Establishing a partnership framework with other stakeholders - Vertical and horizontal coordination across state agencies - Actively pursuing international buyers

Multinational corporates	
Motivations	- Reputational incentives demanded by external audiences - Publicly demonstrating companies' commitments to zero deforestation - Appropriate and streamlined regulations and responsive regulators from the public sector that ease regulatory burden and compliance costs - Reducing risks and costs for sustainable and responsible sourcing - Better access to lucrative western markets
Policy measures	- Zero deforestation commitments - Investing in jurisdictional certification - Preferential sourcing policy - Developing collaboration between big agro-industrial complexes and smallholder farmers - Sustainable and responsible financing policy
International initiatives and importing countries	
Motivations	- Protecting global common goods (e.g. stable climate and biodiversity) - Avoiding transboundary environmental harms, - Reducing unfair competition from illegal/unsustainable deforestation that undermines landowners who manage their forests sustainably - Reducing greenhouse gas emissions cost-effectively - Achieving Sustainable Development Goals
Policy measures	- Payment for ecosystem services/conditional performance payment - Preferential sourcing policy - Import restrictions

In Chapter 2, we examined the complexity of the global forest governance regime and in the last part of the chapter, the concept of policy integration through existing policies was introduced as a way to better reconcile and modify overlaps and duplication between policy components. In Chapter 3, we analysed a variety of policy instrument options for forest governance, as well as discussing the need for a policy mix and relevant design principles when applied to the same environmental problem. In Chapter 4, we studied the deforestation-driven global palm oil industry, its governance structure and furthermore, we identified current policy gaps. This then led to the present chapter, where we propose a policy mix especially focused within a jurisdictional boundary of certain palm oil production areas and provide some insights to solve the policy barriers. The previous section presented the characteristics and rationales behind a jurisdictional approach. This section now connects it with the need for a policy mix and reiterates how this combination can add to the current literature.

The jurisdictional approach to policy mixes[183] reflects the theories studied in the previous chapters. It not only contributes to the polycentricity of common pool resource governance, and to the incremental additions to existing regime elements, but also to the multi-level cross-sectoral forest governance. In the meantime, it has the potential to bring policy innovations and to strengthen the competitiveness of firms and sectors. Moreover, the jurisdictions can establish a sufficient scale to make sustainable sourcing a viable economic solution. This approach can further prioritize and target jurisdictions with most production. For example, in Indonesia, three provinces account for more than 50% of the palm oil production: Riau, North Sumatra and Central Kalimantan.[184] Meanwhile, these are also some of the provinces with a majority of the remaining forests with high risk projection of future forest loss and peatland conversion (G. Paoli et al., 2016). When being compared with other types of approaches to reduce deforestation, such as supply shed interventions (introduced in Subsection 2.2), community land mapping or conservation of certain ecological areas, the jurisdictional approach might progress slower due to its institutional complexity. However, it has more potential to induce long-term government policy changes and institutional progress, and prevent more deforestation leakages (C. Meyer & Miller, 2015). These different approaches are not by any means mutually exclusive. In fact, they can be pursued simultaneously in same areas with support from various resources.

The transnational palm oil industry concerns global forest governance, climate change and biodiversity regimes and global trade. Unlike other commodities with commodity agreements,[185] there is no international treaty regulating palm oil. Hence global palm oil governance consists mainly of the pressure from non-profit organizations and western importing countries, as well as the actions taken by private sectors and producer governments. These activities and actors all act at the international arena. As there exist many policy measures in place already (such as all those discussed in Chapter 4, Section 4), the jurisdictional policy mix approach aims to better integrate them and address various aspects of a common issue. In addition, through the multi-stakeholder's participation in integration at regional level, this arrangement is also aiming to build more cross-sectoral coherence and congruence in the fragmented forest and palm oil governance.

Governing the environmental sustainability of palm oil production is a complex dynamic multi-level process. Under a jurisdictional policy mix approach, the "mix" consists of mix across governance levels (international, national, sub-national),

[183] In reality, a jurisdictional approach in fact implies the use of policy mixes. However, due to the emphasis here in this research, I added "policy mix" in the use of the term.

[184] West and Central Kalimantan, South Sumatra and Jambi also have large areas of oil palm plantations with high expansion rate.

[185] For instance, International Tropical Timber Agreement, International Coffee Agreement, International Cocoa Agreement and International Natural Rubber Agreement, etc.

various actors (public, private and civil society, etc.), different forms of regulation and specific policy instruments. These dimensions are all interconnected and moreover, the "mix" in fact emerges and evolves spontaneously rather than being purposefully designed. Over the course of time, the regulatory instruments and actors integrate and interact along their operations. For instance, the policy measures taken by public authorities include command-and-control, such as land use planning, tenure policy reform, monitoring compliance, enforcement and mandatory certification scheme. However, the public authorities also increasingly carry out other measures such as internal coordination, enabling stakeholder participation and pursuing international buyers. In particular, the role of sub-national governments expands from the traditional interactions with other local governments or with national governments into transnational networks with multinational corporations, international NGOs and foreign states (such as EU and China) (Setzer, 2017). Thus, by the function of public authorities in the mix, it shows that the role of public authorities changes from traditional command-and-control to participation and orchestration in the governance networks under a transnational governance setting (Abbott & Snidal, 2009).

Effective governance and monitoring from the government would offer a low-risk environment for businesses in the long run and facilitate multinational business' investments by building infrastructure and supply chain networks. The private sector is often only interested in investing in, for instance productivity improvements, crushing facilities and mills when there is long-term capacity to support their needs. These investments from the private sector in return could provide employment opportunities, other economic advantages and the government would also receive more tax revenue from companies as they increase sourcing and investments in these jurisdictions (C. Meyer & Miller, 2015). Moreover, governments would benefit from better alignment with the private sector, especially when the private sector provides additional policing and pressure on their suppliers for legal compliance. Examples like this can be seen in the soy and cattle moratoria in Brazil, which have supported legal compliance and advanced property registration (this example was described in Chapter 4, Sub-section 4.1, Moratoria) (H. K. Gibbs et al., 2015; Holly K. Gibbs et al., 2016).

A zero-deforestation jurisdiction would lower costs and risks for companies along the palm oil supply chain. First, it would help scale down the gap between producers and reduce risks of deforestation for all types of crops and competitors. The incentives created with a zero-deforestation jurisdiction (e.g. through conditional payments or law enforcement) would lower the need for farmers and plantations to clear forests, which bring more properties closer to compliance with the private sector's deforestation free commitments. Hence this increases the amount of suppliers that are willing to participate in the deforestation free supply chain and therefore reduces the risks of laundering deforestation-linked commodities into the supply chain. Moreover, with proper law enforcement,

producers will not have competitive advantages from illegal operations or clearing forests (C. Meyer & Miller, 2015).

Second, monitoring deforestation across a jurisdiction creates an economy of scale that reduces the cost per unit of carbon and per hectare (Arild Angelsen, Streck, Peskett, Brown, & Luttrell, 2008). A public monitoring system would be independent form companies, streamline monitoring criteria and therefore reduce inconsistencies between public and private definitions and assessments of deforestation rates as well as risks of non-compliance (C. Meyer & Miller, 2015). A positive example of this cooperation between government and private sector to increase accuracy and reduce costs of monitoring is the Brazilian Soy Moratorium. The deforestation was monitored by the Brazilian space agency and thus companies could assure that the commodities sourced from Amazon biome were all deforestation-free (H. K. Gibbs et al., 2015).

A jurisdictional policy mix approach can better leverage funding, subsidies and programs to assist producers with law compliance and increase productivity. Public finance can provide substantial up-front and/or ex-post costs for implementation, or complement other sources while private financiers can finance agricultural inputs or investment in scaling up successful models. Meanwhile, the international donors or initiatives can support performance-based payments (Fishman et al., 2017).

The synergies from a jurisdictional policy mix approach are a dynamic process and will have most effects when all stakeholders make an effort and participate. For instance, the risk of deforestation can only be lower with adequate government enforcement and monitoring, but at the same time it also requires rigorous compliance from the private sector. And the incentives for both public and private sectors to act on achieving zero-deforestation are the commitments from each other as well as the foreseeable benefits obtained from mutual efforts. These benefits cannot be achieved if only one party takes action. Thus, it is important that all stakeholders reach agreement, continuously work together and exercise mutual supervision in order to obtain greater outcomes.

If we look at the regulatory design principles[186] for environmental policy mix proposed by (Gunningham et al., 1998, pp. 387-422) (which were summarized in Chapter 2, subsection 4.1), the current policy instruments in use are indeed less interventionist (Principle 2) due to the fact that the most influential measures are mostly private voluntary actions. Engaging the sub-national authorities

[186] The five principles are: Principle 1. Prefer policy mixes incorporating a broader range of instruments and institution; Principle 2. Prefer less interventionist measures in the viable circumstances; Principle 3. Ascend a dynamic instrument pyramid necessary to achieve policy goals; Principle 4. Empower participants which are in the best position to act as surrogate regulators; Principle 5. Maximize opportunities for win-win outcomes (Gunningham et al., 1998, pp.387-422).

incorporates a broader range of institutions (Principle 1) which work simultaneously across levels. The business, non-profit and third-party organizations are also empowered as surrogate regulators in a number of dimensions, such as using the power of the market to influence industry behaviour and supply chain practice (Principle 3). Nonetheless, after examining the current regulatory situation, it appears that the private sector and third-party actors have contributed to a degree in which their efforts would have limited progress if the producer governments were not further engaged. The policy measures taken by public authorities, in particular sub-national governments, need to be addressed more in this integrated policy mix, so the other principles by Gunningham et al. (1998) can also be acted upon.

At present, there is still tension between the re-claim of authority by producer governments and private governance standard setting. However, recent studies find that the employment of co-regulation between public and private institutions can capture both facilitation and mutual benefits without devaluing one or the other, which shows a crucial role to involve public institutions in the standard setting processes and politics (Bartley, 2014; Gale & Haward, 2011; Gulbrandsen, 2014). Therefore, instead of competing with one another, they should collaborate and explore the potential of a hybrid public-private governance partnership. Governments must solve tenure conflicts, stimulate the land use zoning process and support producers adhering to higher production standards. Companies must reduce their ecological footprints and improve palm oil yields in their own plantations as well as the yields of their suppliers. Together with public authorities, they should ensure and support smallholder inclusion via financial assistance and capacity-building so they are not left behind when standards are improved. Especially because there is substantial room for smallholder's yield improvement, which is a significant factor for palm oil intensification and production growth. Specific details of the jurisdictional approaches should be custom made based on locality.

Based on the instrument mixes summarized in subsection 4.2 in Chapter 3, there are a number of ways for the public authorities of palm oil producer countries to join and create a complementary policy mix. First, and the most fundamental one, is to provide information, especially the information on forest loss, deforestation, forest fire, the extent and planning of lands. Information is fundamental to the functionality to all other instruments (Gunningham et al., 1998, p.332). It facilitates the efficient functioning of other incentive or market schemes and legitimizes government policy and direct regulations, as well as enhances and reinforces the impacts of other instruments. The government can provide such information through better utilization of satellite images and clarify, re-zone the extent of forest and peatlands at risk, and forest zoned for conversion, etc. For instance, an important step in Indonesia is to identify forest and peat which risks being zoned for conversion, and redirect the development to large deforested

areas allocated as permanent forest within the official Forest Zone, which are unavailable for agriculture. In theory, re-zoning of such deforested land for development should be favourable for the public sector as they would obtain authority over these larger areas (Paoli et al. 2016, p.82). The shift of plantation to degraded land might at the first increase short-term costs but over the long term (5 to 10 years), yields will be potentially higher. Together with measures investing in yield improvements, this can increase the palm oil production in Indonesia to 119 million metric tons while reducing deforestation by 3 million hectares by 2030 (TFA2020, 2017).

Second, the governmental palm oil certification, namely the Indonesian Sustainable Palm Oil (ISPO) standards, can be used in combination with private voluntary standards, such as the Roundtable on Sustainable Palm Oil (RSPO). Specifically, at the moment the ISPO and the RSPO still target different levels of performance and for sustainable palm oil production practice, "beyond compliance" is certainly desired. Lastly, compulsory reporting and monitoring are critical for the effective and efficient functioning of other incentive-based instruments, such as soft loans and subsidies from international financial institutions or donors. One important thing to note here is that to this date, it is still unclear to what extent the palm oil sustainability standard should be harmonized (Pacheco, 2016). In other words, does a universal standard need to be established between the producer countries, importing countries and private sector altogether? Or is the standard only to be agreed between the sub-national jurisdiction and the private sectors? Nevertheless, after a conflict incident with the Indonesian Palm Oil Pledge (IPOP),[187] it is clear that this standard setting has to involve the public sector in producer countries.

In the majority of the global environmental governance literature, the nature of the state has been assumed to be at the centre of the formation of international regimes. The multi-level governance approach used here demonstrates a governance arrangement of complex, overlapping and interconnected spheres of authorities, and shifts the analysis of global environmental issues from a hierarchical model toward a polycentric system (Betsill & Bulkeley, 2006). Often, the important influences and inputs of sub-national or local authorities, non-profit organizations and private actors are insufficiently represented in the policy debate (Nagendra & Ostrom, 2012). Although the jurisdictional policy mix approach here emphasizes the engagement of sub-national public authorities, other actor groups (private sector, NGO, importing countries and international initiatives, etc.) are equally essential for achieving the goal of deforestation-free supply chains. In particular, given the recent IPOP development, it is crucial to

[187] The IPOP conflict was presented in Chapter 4, Section 5.

understand the parts of the palm oil industry that are opposed to land governance reforms and apply a more informed strategy to engage these actors.

To sum up, the above discussions regarding synergies brought by the jurisdictional policy mix approaches provide possible solutions to the policy gaps presented in Chapter 4, such as disagreeing stakeholders, discrepancies in sustainability standards and conflicts between the private and public sectors. More specifically, it reconciles the disagreeing stakeholders (Ch4, subsections 5.1 and 5.2); it emphasizes the importance of a more inclusive participation from the public sector before a private "race to the top" can occur (Ch4, subsections 5.3, 5.4 and 5.5); it shows that producer government authorities have the potential to be a more effective orchestrator among various stakeholders than NGOs or private actors (Ch4, subsection 5.6). Lastly, it echoes back to the need for incentive-based instruments, such as performance-based conditional payments and preferential sourcing, to provide financial support and/or market demands (Ch4, subsection 5.7). Concrete and detailed examples of the jurisdictional policy mix approaches are provided in the next section.

Nonetheless, there are still many practical details to consider when using a jurisdictional policy mix approach to reduce palm oil driven deforestation. These implementation and workable specifics depend to a large degree on the context and locality, such as the main deforestation drivers and the status of the current efforts. Much effort and experiments are ongoing at an early stage and still do not yet produce measurable results in a reduced deforestation rate or improvement in production efficiency or governance. Further research in case studies on specific regions or actor groups and more detailed implementation analysis in this topic area are surely desired and can be expected to emerge in subsequent years.

4.2 Potential barriers

Despite the potential advantages, the institutionalization of a jurisdictional approach will increase the complexity in decision making and management, and it will occur at a slower pace in contrast to a private sector led supply chain approach. There are also challenges for jurisdictional approaches, such as the overall elevated complexity, political turnover,[188] and long-established mistrust between stakeholders, the misalignment between the different speeds of the decision making process in government and corporate bodies, building sufficient trust and understanding among stakeholders, maintaining momentum, continuity and credible value propositions through a lengthened time frame for stakeholders and securing participation of less powerful groups, etc. (G. Paoli et al., 2016).

[188] However, this can also be an opportunity for even more proactive governance.

An integrated collaborative landscape approach in environmental conservation is not a new concept. However, it has been refined over time through numerous iterations in project developments and attempts to integrate economic and social considerations with natural resource conservation (Reed, Van Vianen, Deakin, Barlow, & Sunderland, 2016). Traditionally, the landscape approach does not include governmental actors in the process and therefore also does not emphasize the importance of an authoritative decision-making boundary (Denier et al., 2015). Additionally, in the past decade, the private sector, more specifically the multinational corporations typically do not collaborate with producer country governments on the sustainability issues. There was a time when market self-regulation and voluntary policy instruments were advocated and believed to be more efficient and effective than the top-down regulatory system (David Osborne, 1992; Humphreys, 2012). It is not until recent years, that the producer country governments started to take more action on the environmental and societal aspects of development. Hence, although a collaborative multi-stakeholder model is not a new concept, it is however a rather novel approach for supply chain environmental sustainability in the tropical developing regions. Moreover, in particular it involves the North-South dialogue between the producer country governments and global multinational companies. This type of North-South dialogue and collaboration has come a long way from the traditional North-South divide in international environmental politics and governance (Alam, Atapattu, Gonzalez, & Razzaque, 2015).

As it is still a nascent approach applied in this particular field and context, there are of course several challenges and risks that come with its promising potential. This sub-section specifically discusses six potential barriers in the jurisdictional policy mix approach for sustainable palm oil and how they can be mitigated. For instance, to address the challenge of changing leadership, it is better to legalize policy measures into local laws. Additionally, the jurisdictional approach does not immediately promote the highest standards. It is likely to first cater for minimum standards to provide incentives for the worst offenders and plantations facing greatest challenges. Then it incrementally raises standards throughout time.

A jurisdictional policy mix approach to tackle tropical deforestation may encounter several limitations, which require further research and experiments on the ground. First, limited finance and political will remain as challenges to jurisdictional wide reform for palm oil production, which could result in insufficient supply of sustainable palm oil to meet private sector commitments. The funding can come from developed countries, carbon markets, REDD+, multilateral institutions, national government and private companies. However, the political will also comes as opportunities with the evolving social, political, legal, and business climate, especially in a democratic system where candidates with sustainable development vision have the potential to be elected. Examples as such can be seen in Acre, Brazil. The undertaking of a jurisdictional approach

in Acre was associated with a political landscape change through social revolution that created the necessary conditions for new leadership to emerge (Fishman et al., 2017).

Second, the political and bureaucratic turnover can be either an opportunity or a challenge (Stickler et al., 2018). In terms of challenge, there are two types of strategies to mitigate this type of risks, which are to build policy resilience and structural resilience (Fishman et al., 2017). In order to build policy resilience, it is important for influential stakeholders and donors to articulate the significance of continuity. Early and substantial investment from the private sector would also lessen the dependence on the public sector and moreover make it economically and politically unfavourable for a government to alter predetermined policy. In addition, high-profile public commitment to the international community can also increase a government's accountability as well as continued pressure to deliver outcomes. As for structural resilience, the jurisdictional initiative should be established through the most authoritative legal instruments, so as to raise the threshold for future change. Similarly, governments can also relinquish some control to other stakeholders to divide the decision-making power and to secure multi-stakeholder participation. Nonetheless, there is no doubt that political and bureaucratic turnover is indeed an unavoidable challenge and risk for any type of policy reform (not only for the adaptation of a jurisdictional policy mix approach for commodity production) when involving public authorities.

Third, the inherent challenges of such multi-stakeholder framework are the risks of green-washing or free-riding. Some producers might appear to be more sustainable without actually improving their production practices. Moreover, this can happen especially when different definitions of deforestation and monitoring systems exist between jurisdictions, and this could lead to market confusion and a race to the bottom (C. Meyer & Miller, 2015). Hence in order to avoid the problem of different standards, parties involved need to employ a single definition for deforestation/zero-deforestation for all jurisdictions. This problem could also be lessened if monitoring systems are coordinated on a broader scale, such as at national level or state-level. In addition, the continuous oversight from non-profit organizations is critical in order to pressure private companies and reduce the risks of green-washing. The bottom line is, in reality to reach 100 percent sustainability or legality is impractical. However, there are measures to lower the risks of free-riding as much as possible. A jurisdictional approach to scale with transparency has the potential to better address this issue compared with private certification schemes.

Fourth, even though the risk of leakage and displacement would be reduced by solutions at larger scale, potential leakage into jurisdictions without deforestation-free commitments still exists. Producers within these jurisdictions could launder products associated with deforestation through properties within zero-

deforestation areas. However, this risk can be mitigated if the amount of companies making deforestation-free commitments are significant enough to cover the majority of the supply chains and thus they can pressure other producers and producing nations to improve their palm oil practices. This is because in general, a company's supply chains stretch over more than one jurisdiction and there would be significant costs in moving its supply networks and infrastructure to other areas. Thus companies should collaborate with the jurisdictions they already source from and place new infrastructure in the deforestation-free jurisdictions. Moreover, companies would have to continuously improve their product traceability (C. Meyer & Miller, 2015). Nonetheless, this is not to say that the issues of leakage and secondary market would be completely solved by the jurisdictional policy mix approaches, but would be mitigated compared to the private certification schemes. The measures taken from the production side are only a part of the solution. In fact, the demand side solutions are also needed to be taken into account, such as dietary shifts, lower consumption, and population planning. As long as there is endless demand from the consumer side, there will mostly likely continue to be leakage and displacement somewhere in the world.

Fifth, there are substantial concerns over the top palm oil consumption countries, namely China, Indonesia and India. The environmental awareness in these markets has not yet developed as far as markets in the European countries and hence the influence levers are less straightforward. Nonetheless, this is exactly the reason why companies in developed countries should not opt out from using palm oil so that they can exercise pressure on palm oil production at the source. Big companies and transnational corporations with deforestation-free commitments such as Unilever, Nestle, Cargill and Wilmar International have significant influence over a large number of suppliers and producers, similar to the notion mentioned in the previous paragraph, the more producers and suppliers are involved and pressured, the more leakage can be avoided. Hence, with the scaled up sustainable palm oil production from several jurisdictions and the engagement of a sizeable amount of the private sector, it is hoped that ultimately the palm oil exported to developing countries should already meet certain improved production standards.

Finally, jurisdictional policy mix approaches are not a panacea and are inherently a cumbersome process. Stagnation is indeed one of its weakness. The time required to establish effective multi-stakeholder initiatives is one of the greatest challenges since governments and businesses are often motivated by short-term rewards and results (Fishman et al., 2017). Larger and long-term policy reform does take time. Especially with multi-stakeholder processes, it takes time to build trust and relationships. However, this is a necessary process that needs to be gone through. There exist situations in certain jurisdictions where there is little consensus around common sustainable development goals and a lack of desire by

actors to align activities. In these cases, tools like certification or programs focused on individual responsible producers are more likely to be effective, and in the long run it may provide the groundwork for further reform at scale (Proforest, 2016b). In other cases, some areas might have a very onerous tenure situation to solve (Stickler et al., 2018). This will also mostly likely take extra years to reach a multi-stakeholder agreement. In this light, the jurisdictional policy mix approaches should be viewed as a complement rather than a substitute alongside other policy strategies, which are critical for establishing improved governance, reaching and engaging more producers with better practices over time while keeping up the ultimate goal: achieving deforestation free jurisdictions (Fishman et al., 2017).

5 Examples

As mentioned already in the beginning of this Chapter. The landscape approach is not a new concept. However, applying it at an authoritative political boundary with a focus on commodity production and multi-stakeholder processes involving producer country government is something that only emerged in the past years. Typically, non-profit organizations are the initiators of such multi-stakeholder process and they are normally the ones that initially hold together and connect the public sector in producer countries, local communities, multinational corporations and international buyers. By initiators here, it does not imply that these organizations just enter into the jurisdiction and start working on the multi-stakeholder framework. Very often, these non-profit organizations would have already been working on the ground for similar sustainability issues with local connections as well as with (global) buyer connections.

To start a multi-stakeholder process for a jurisdiction, numerous bilateral meetings would need to take place beforehand and a certain degree of interests and consent from various actors needs to be acquired. Thus often it is hard to say exactly which actor or organization can take the lead to make it happen. It is indeed a process built on many initiators. The non-profit organizations then act as a convenor or facilitator in this process to help these actors, for example, sign a Memorandum of Understanding and establish a multi-stakeholder consortium and governance structure (e.g. a steering committee) (IDH, 2015). In addition, the collaboration could also consist of several contracted partnerships among different stakeholders (Stickler et al., 2018). Subsequently, a joint framework of action and/or implementation plan might be developed as well. To date, the few organizations working on the jurisdictional approach for commodity production include for example, IDH the Sustainable Trade Initiative, WWF and the Earth Innovation Institute. However, even though at the beginning these non-profit organizations play crucial roles in initiating such collaborative framework, as the programs evolve, both the public and private sectors are all necessary actors.

These two examples, as already discussed in the previous section, also face risks and challenges. For one, the multi-stakeholder process for the entire state or province is by nature a lengthy operation. Thus, at times, there will be parallel processes occurring at both the broader provincial/state level as well as at municipal/district level. At the provincial/state level, an overall policy strategy or plan will be established, and then the more detailed and concrete implementation plans will roll out and run in a few pilot municipalities/districts. The public authorities partner up with non-profit organizations (both international and local), the private sector (local producers, processors, international traders and buyers, etc.) and local communities. If all actors share more similar goals, then an agreement could be reached sooner. However, this really depends on the local reality, such as past relationships among the government, the private sector and local communities, the characteristics of local communities, the type of commodities and sourcing patterns, the will and capacity of the government, the stability of funding, etc.

5.1 Mato Grosso, Brazil

As the jurisdictional approach is still nascent at its development stage, there are a few examples that are currently exploring the possibility. One of the leading cases is the jurisdictional approach to state-wide sustainable development in Mato Grosso in Brazil, a state that is deeply embedded in global commodity supply chains. The core strategy of the State is "Produce, Conserve, Include", which contains multiple objectives, such as double economic output through productive commodity supply chains (beef, teak, eucalyptus, rubber and soy, etc.), social inclusion, biodiversity conservation, zero net forest GHG emission and zero net deforestation (Stabile, Woldmar, Azevedo, & Silva, 2017).

The government of Mato Grosso partners up with the private sector (e.g. the farmers' federation and soy growers association), several NGOs (led and coordinated by the Earth Innovation Institute and IDH the Sustainable Trade Initiative), financial institutions and donor governments to develop necessary strategies and consensus-based time-bound milestones, secure funding, establish a monitoring system and experiment with pilot projects. The progressive movement of Mato Grosso is built on continuous work during the past decades. In 2007, the state was led by a strongly willed governor who believed that it is possible and economically beneficial to expand agricultural production without deforestation. It also took strong command-and-control measures to reduce its deforestation rate by 89 percent in 2012, compared to average historical levels. Building on previous success, the new governor further established strategies to provide positive incentives and strengthen stakeholder engagement (Earth Innovation Institute, 2015a; D. Nepstad, 2015).

The incentives in this jurisdictional approach are designed to stimulate sustainable production practices from farmers, regional governments and businesses. They include better risk management, finance from public donors and business pledges, better access to markets, public credits and loans, additional payment for high performance, technical and capacity building assistance, streamlined bureaucracy (e.g. permitting and compliance), sustainable commodities supply to business and GHG emission reduction flows to government and business (Earth Innovation Institute, 2015b; D. Nepstad et al., 2013). This jurisdictional sustainability system in Mato Grosso is still developing. It is however one of the more advanced jurisdictions due to its historical social and economic development. The main NGO facilitating the multi-stakeholder dialogue and strategy development is the Earth Innovation Institute and IDH. The role of them in this case is more than a partnership with business but closely in collaboration with the governments.

Additionally, the China Soybean Industry, who imports around 60 percent of the global soy trade, in these recent years has been starting to show its willingness to commit to sustainable sourcing. Mato Grosso exports 8 to 10 million tons of soy to China annually. Its state-wide jurisdictional sustainable development provides a comparative advantage when trading with large customers like the Chinese business association. It is hard for the traditional farm-by-farm certification approach to provide such a huge volume (MacIsaac, 2017). Mato Grosso for example is also in dialogue with the European Feed Manufacturers' Federation, which purchases 30 million tons soy every year and among which, 1.5 million tons are from Mato Grosso alone (IDH, 2016). The state-wide jurisdictional approach is thus especially attractive compared with the annual certified soy production from the Round Table on Responsible Soy (RTRS), which is about 4 million per year globally (RTRS, 2017). Such development in the global soy trade between producer countries and importing countries' business associations can have positive implications for the palm oil sector as well.

Another frequently discussed possibility within the broad jurisdictional approach is jurisdictional certification. Typically, certifications are approved at individual level or for a particular plantation or mill. With the jurisdictional approach, local governments work with key stakeholders and are committed to only produce certified commodities within the entire jurisdiction. Currently, a number of jurisdictions such as the State of Mato Grosso in Brazil, the federal state of Sabah in Malaysia, the districts of Seruyan and Kotawaringin Barat in Central Kalimantan and the province of South Sumatra in Indonesia are endeavouring to develop strategies towards jurisdictional sustainability (WWF, 2016c).

5.2 Central Kalimantan, Indonesia

In 2013, the province of Central Kalimantan launched the ambitious "Central Kalimantan Roadmap to Low-Deforestation Rural Development", aiming at reducing deforestation and forest degradation to 20 percent of the 2006-2009 average baseline, zero deforestation in the palm oil sector, increasing smallholder palm oil production from 11% to 20% by 2020 and alleviating rural poverty. The provincial government is moreover keen to enhance its Regulation (Perda) 5/2011 on Sustainable Plantations so it can be compatible with the RSPO and ISPO's standards and criteria (Irawan, Dohong, Armijo, Nepstad, & Jagau, 2014a). This roadmap is supported by two non-profit environmental organizations, the Earth Innovation Institute and Inovasi Bumi.

Central Kalimantan is the third largest province in the country, located on the island of Borneo. The province administratively consists of 13 regencies/districts (kabupaten) and 1 provincial capital city. Its economic growth is mainly driven by palm oil and mining. Its largest GHG emission sources are forest fires and peat decomposition. The main policy objective of this roadmap is to enhance the production efficiency of existing oil palm plantations and establish new plantations on lands that are already deforested and lands below their productive potential (Paoli et al. 2016, p.65). The short-term policy components of the roadmap include: promoting smallholder plantations, clarifying land classification and forest cover between Provincial and Central Government land-use plans, completing the provincial spatial planning, establishing a consistent operational licensing system, registration, monitoring and conservation program. The medium-term actions include creating greater market access for sustainable palm oil through preferential sourcing, ensuring adequate supply chain infrastructure and continuous financial and technical support for smallholders and ethnic communities.

This roadmap is supported by districts with varying degrees of focus on several issues. Among which, for instance, three districts: Kotawaringin Barat, Seruyan and Gunung Mas focus on collaborating with NGOs and certification agencies, aiming to obtain RSPO certification for the entire district. The districts of Kotawaringin Barat and Barito Selatan on the other hand showed more interest in implementing their commitments on only issuing permits in degraded lands, which is mandated in Perda 5/2011 (INOBU, 2017; Irawan, Dohong, Armijo, Nepstad, & Jagau, 2014b; Provincial Government of Central Kalimantan, 2015). Overall, the province and districts intend to produce commodities that are free from deforestation, environmental degradation and social conflicts from highly productive farmers and agribusinesses. Ultimately, the provincial government of Central Kalimantan wants to ensure long term sustained economic growth. And in order to achieve this, the governments and society need to maintain and value

the natural assets that underpin economic success, build resilience as well as provide equitably-distributed increases in regional GDP and living standards.

6 Discussions and policy implications

This chapter presents a jurisdictional policy mix approach for better management of palm oil production. In particular, it emphasizes actions taken in a defined political administrative boundary to achieve certain advantages. The policy mix for sustainable palm oil with a jurisdiction consists of political leadership, land use inventory/strategy and enhancement of existing regulations by public authorities; voluntary commitment, certification and preferential sourcing/financing policies by the private sectors; the inclusion and support for smallholder farmers from both sectors, and international support from donor countries on the basis of aid or payment for ecosystem services as well as preferential sourcing for public procurement in importing countries.

In this section, we will broaden the discussions on the jurisdictional policy mix approach from palm oil to more general policy trends in preventing tropical deforestation other tropical deforestation driven commodities. The first sub-section focuses on interactions between private and public sectors, and then it is followed by discussions on the trade-off between sustainability and legality. Lastly there is a discussion on policy implications for tropical deforestation risk commodities other than palm oil.

6.1 Public and private interactions[189]

Non-state certification programs, such as the Forest Stewardship Council (FSC) and the Roundtable on Sustainable Palm Oil (RSPO), have become one of the main elements of transnational private business governance in the field of sustainable production in global commodities (Eberlein, Abbott, Black, Meidinger, & Wood, 2014). These certification programs typically emerged as a response to international demand in markets with higher environmental and social awareness. Most of them were initiated collaboratively by NGOs and business (e.g. manufacturers and banks) from these markets in developed countries to regulate the upstream production practices in developing countries (Atika Wijaya & Glasbergen, 2016). Nonetheless, their standard setting process usually insufficiently addresses the needs of producer governments in the South (Hospes, 2014; Schouten & Bitzer, 2015). More recently, in parallel with private certification schemes, several large multinational corporations have also collaborated with environmental non-profit organizations to tailor their own

[189] The public actors here more specifically refer to producer countries' public authorities and those industry/producer associations closely linked with the governments. The private actors mainly refer to the multinational corporations and the external private sustainability standards channelled from the consumer side of the value chain as new conditions for production practices.

sustainable sourcing policies, covering different commodities associated with deforestation risks in their supply chains (see Chapter 4, sub-section 4.3). The degree of engaging public sector in these cases is still unclear. There is yet to be any research or evaluation of which kind of these two approaches are more stringent or effective. It however shows that these big multinational corporations are experimenting and exploring varied methods to reduce overall costs through mitigating their supply chain risks and through benefiting from economies of scale.

Despite the efforts taken by business and civil society actors, there exist difficulties from nation states and local producers in the South regarding implementation and diffusion of rules and standards set by global private partnerships. So far, the global research focuses largely on the development of global private partnership, non-state market driven governance/market-based governance and how actors in the South can be influenced (Hospes, 2014). However, much attention is needed on questioning whether and how public authorities in the South want to collaborate with global private partnerships; whether governments from the South think these private standards can serve to improve their policy development or power struggles, or how the political and structural context in the South has affected the implementation of these private partnerships. Hence, the limits of, and dissatisfaction with, global private standard setting have led to increasing calls for public participation in the standard setting processes (Morrison & Roht-Arriaza, 2007), in which public authorities either make private standards mandatory or create similar public standards on their own in parallel.

The latter situation, for instance, occurred with the production of palm oil in Indonesia and Malaysia. In these cases, the public sector's dissatisfaction with private standards stemmed from disagreement over sustainable principles and criteria, the high costs of obtaining the certification, unbalanced decision making power between producers and other private sectors, national pride, and the desire to regain control in standard setting (Pacheco, 2016; Atika Wijaya & Glasbergen, 2016). The attitude of the Indonesian government and national industry associations towards the RSPO changed from leaving it to the market (2004-2006), to being involved in the RSPO activities and acquainted with sustainability standards (2006-2010), to the development of its own scheme (2011 onwards) (Atika Wijaya & Glasbergen, 2016). Moreover, the Indonesian Sustainable Palm Oil (ISPO) standard emphasizes the legitimate political authority in defining sustainable cropping and allows more room for plantation expansion in forests, which indicate its competitive position to the RSPO (Hospes, 2014).

In fact, the development of the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC)[190] was to a certain degree a similar process. In the 1990s, the FSC was primarily established by environmental and social NGOs with more stringent sustainable standards for forestry management (Gulbrandsen, 2012) and the PEFC was created by government-backed industry and landowner associations as a competing scheme to the FSC (Gulbrandsen, 2014). The main differences between FSC/PEFC and RSPO/ISPO are that first, the PEFC remains as a non-governmental institution whereas the ISPO is part of mandatory public regulations. Second, the competition between the FSC and PEFC was mainly among NGOs and producers whereas the rivalry between the RSPO and ISPO involves the complicated North-South divide in international environmental politics. However, in recent years, the situation with timber certification also evolved in this direction: from private voluntary standards set by the Northern consumer countries to mandatory/regulatory standards set by the Southern producer countries. In 2003, the European Union developed Voluntary Partnership Agreement[191] with producer countries on licensing timber legality under the EU Forest Law, Enforcement, Governance and Trade (FLEGT) action plan. In the agreement, the producer countries are the main actors to determine requirements that meet the legal standards. Although the focus of the FLEGT license is merely on timber legality, it however sparked discussions and debates on whether public verification (e.g. the Indonesian mandatory timber legality assurance system) reinforces or undermines private sustainability standards (Hinrichs & Helden, 2012; Wiersum, Capiroso, & Visseren-Hamakers, 2014).

This trend of "reposition of producer countries in global value chains" (Schouten & Bitzer, 2015, p.181) recognizes that governments and producers in developing countries are apt to develop their own standards. In addition to the forest sustainability certifications and palm oil certifications mentioned in the previous paragraph, other examples include Brazil's Soja Plus (as the competing scheme to Roundtable on Responsible Soy), Brazil's sustainability Certifica Minas Café, the Sustainable Initiative of South Africa (SIZA) for the fruit industry[192] and the Indonesian Sustainable Cocoa Certification (ISCocoa)[193], etc. (Giovannucci, von

[190] See more details on FSC and PEFC in Chapter 2, sub-section 4.3 and Chapter 3, sub-section 3.2.

[191] See more details on the Voluntary Partnership Agreement under the EU Forest Law, Enforcement, Governance and Trade (FLEGT) action plan in Chapter 2, sub-section 3.3.

[192] As opposed to the GLOBALGAP private retail standard established in Europe and UK-based Ethical Trading Initiative (Schouten & Bitzer, 2015).

[193] The ISCocoa is different from other private certifications as it is only for farmer groups. This is because the cocoa sector in Indonesia wants to position farmer groups in a better bargaining position in their transactions against traders and companies. These two groups of private actors typically have more resources to obtain expensive private certification and thus weaken smallholder farmers' positions to negotiate (Atika Wijaya & Glasbergen, 2016). Indonesia is also preparing for the similar sustainable coffee certification, the ISCoffee.

Hagen, & Wozniak, 2014). Similarly, China as one of the largest re-exporters of timber products, also promotes its own domestically-driven certification scheme over the FSC certification (Bartley, 2014). The emergence of national standards is redefining the traditional understanding of "certification" as a form of private self-regulation. These national certifications are in fact a command-and-control type of policy instrument that not only provides additional information on production practices but also aim to acquire premium price or market access. Moreover, the informational and market aspects of these national certification schemes turn out to bring public sectors under the scrutiny of global environmental and social NGOs, which then gives these groups considerable leverage against national governments.

Wijaya & Glasbergen (2016, p.236) present another perspective from NGOs in Indonesia representing local people who are negatively affected by large palm oil plantations. They claimed that neither the RSPO nor the ISPO sufficiently address the needs of local people and their conflicts with companies. In particular, the ISPO is dominated by the interests of government and producers. Its main function is essentially no different from a regulator. The NGOs therefore suggested that the government should strengthen its law enforcement as a strong and effective regulator rather than develop its own certification scheme. Nonetheless, the ISPO does reflect that public authorities in producer countries react seriously and strongly to private standards imposed from the western consumer markets and assert their mandate to regulate "sustainability." The understanding of this type of action taken by the Southern producer countries is critical for the development of public-private partnership in promoting sustainable production in global commodities. The increasingly active role taken by producer countries not only indicates their potential willingness to develop and participate in jurisdictional wide sustainable production management but also to an extent allows them to have more market control. For instance, the state-driven certifications can establish rules favouring local producers and provide lower certification costs. Additionally, the state can actively seek international buyers[194] rather than depend on multinational corporations and intermediaries. Moreover, state-driven standards make "sustainable" production less dependent on the relatively unpredictable market fluctuation.

Although in general, public standards are less stringent, whenever possible, it is however essential to let the public sector retain appropriate control and decision-making power over its natural resources use. As we could see from the IPOP incident mentioned in Chapter 4, without engaging the public sector, even the most ambitious actions taken by the private sector could have the opposite effects.

[194] These international buyers include those in the emerging, promising markets in Asia, Eastern Europe and North Africa. In addition, domestic market consumption also has its potential (Atika Wijaya & Glasbergen, 2016).

The global private sustainable standard setting thus does require a different approach that involves both private sectors and public authorities in the South. This then also leads to the discussion in the next sub-section on the debate and trade-off between deepening or widening the sustainability standards.

6.2 The trade-off between deepening and widening

When talking about the jurisdictional policy mix approaches, the question about the trade-offs between deepening and widening of the standards often comes to the table. The reason is because it typically does not immediately promote the highest standards. It is likely to first cater for minimum standards to provide incentives for worst offenders and plantations the facing greatest challenges. Then it incrementally raises standards throughout time. This subsection further elaborates on this particular issue.

At first glance, legality and sustainability may appear to be compatible, but it is not necessarily the case and the situation can be more complicated. Following previous discussions on the competitive interaction between private and public standards, relevant discussions also centre around balancing the focus between legality and sustainability, as well as the trade-off or conflicts between the more inclusive lower standards or higher standards that can only engage limited producers. These issues can be observed with commodities like timber, palm oil and rubber, etc. For instance, the Indonesian Timber Legality Assurance System (SVLK) is a mandatory state certification scheme that is recognized by the EU Forest Law Enforcement, Governance and Trade (FLEGT) action plan. In the past decade, the FLEGT and the Voluntary Partnership Agreements on timber legality have attracted substantial considerations and resources. Some countries and producers thus pay more attentions to legality over sustainability. Subsequently, the Secretary General of the Indonesian Ministry of Forestry in 2013 stated that it is sufficient for companies to obtain SVLK instead of FSC, since SVLK is accepted in consumer markets, adapted to producer's local needs and compliant with national regulation (Giessen et al., 2016).

However, it must be borne in mind that legality does not necessarily translate into sustainability. It is typically the minimum requirement for sustainable forest management. The timber legality verification system is to a certain degree regarded as too narrow-focused, which is not adequate enough to ensure the protection of the social and ecological values of the forests (Cashore & Stone, 2012a). Moreover, legality can be further away from sustainability when it does not take into account local community needs. For example, legally protected areas with restrictions on human access or diverging views on "sustainable" forest practices between legal authorities and traditional communities can both make activities of local communities "illegal". Similarly, when obtaining legal recognition is beyond reach of traditional communities due to cost, technical or

organizational requirements, their activities become illegal (Davenport et al., 2010, p.79).

Similar to forest timber certification, Hospes & Kentin (2012) maintain that although the ISPO and the RSPO have comparable principles, the ISPO is surely not contributing to a race to the top in promoting palm oil sustainability. However, despite this claim, the ISPO does take up a formidable governance challenge to include a substantial amount of companies and smallholder farmers to improve their production practices. Moreover, ISPO is regarded as a more effective scheme in terms of legal compliance (Atika Wijaya & Glasbergen, 2016). The ISPO is legally binding for all palm oil plantations in Indonesia. In case of violation, the authority will decrease the plantation grade or revoke the business permit. As for the RSPO, although compliance with laws and regulations is required, due to its voluntary nature, no sanctions can be imposed on non-compliance.

Scholars have showed two opposite views on whether legality control by governments constricts or reinforces sustainability by global private partnerships. Cashore & Stone (2012) point out that legality verification may play an enabling role by establishing "necessary" but "insufficient" prerequisites for other policy interventions. They point out that when the logic of policy strategies is consistent, legality verification has substantial long-term potential to reinforce domestic forest governance and global private certification. Moreover, legality should be limited in scope in order to obtain wide spread global support and avoid a "race to the bottom" among developing countries (Cashore & Stone, 2012b). This is because countries with higher legality regulations (e.g. including wider environmental and social requirements) would be at a competitive disadvantage to other producers with lower legality rules, and hence the governments with higher regulations would reduce their domestic standards to gain market access. Over time, these public and private standard-setting processes will evolve and reinforce each other (Cashore & Stone, 2012b; Overdevest & Zeitlin, 2014).

On the other hand, Bartley (2014) focuses on the strengths of legality schemes. He maintains that legality schemes "force a more realistic accounting of the relationship between states, standards, and forest management practices than does forest certification (Bartley, 2014, p.104)." Additionally, he recognizes its potential long-term positive effects on promoting a wider base for domestic information on-the-ground and the "voice" of producer countries. However, he also argues that a timber legality regime does not necessarily augment sustainability certifications. Moreover, they might in fact curb the prevalence of private forest certification and there is already some evidence showing that the demands of firms have been re-oriented to legality over sustainability. Due to the administrative burden and financial costs associated with both public and private certification schemes, companies have to decide whether to participate in both or

in the mandatory scheme only. This therefore leads to a lower demand and weaker political support in private certification (Giessen et al., 2016).

It appears that despite the long term effects of legality schemes on private sustainability standards, the good governance of the producer countries would in any case have to start from this threshold and gradually increase the stringency, in particular, because the domestic market demands in producer countries and developing countries are substantial. In order to fulfil their needs, it is necessary to involve as many producers as possible to improve their production practices. Based on the development on timber legality schemes between the EU and the producer countries, it is possible that the EU will also negotiate with palm oil producer countries with their state-driven verification systems.

6.3 Policy implications for other tropical forest risk commodities

As discussed in Chapter 2, sub-section 2.3, palm oil, soy, beef/leather and timber, pulp and paper are the top four groups of deforestation and forest degradation drivers. Although other tropical forest risk commodities are not as significant as these four drivers, they still present continuous challenges and opportunities in the tropical regions. These include for example, cocoa, rubber, coffee, cane sugar, tea and maize.[195] These commodities are cultivated in the tropics, spreading across different continents and countries with varied global consumption/production and import/export patterns. Some are for both domestic and international consumption and some are mainly for export. Producer governments also have varied capacities and policy focuses towards different commodity production. However, by the in-depth study of the palm oil industry and as discussed in the previous sub-sections, state bureaucracies from producer countries in the South increasingly have a stronger influence over the global private partnerships. This emerging attitude from producer country governments, both at national and sub-national levels, has started to reshape the more established top-down treaty approach in global forest governance as well as the transnational private governance arrangements. Acting more as a bottom-up/from-below approach, domestic actors and political structures are increasingly gaining their importance in the international regime analysis.

From the study of palm oil governance, Wijaya & Glasbergen (2016, p.240) derive some propositions and underlying factors of the dynamic policy trend on tropical forest risk commodities. The first observation is a process of learning between Southern governments and private sustainable certification schemes. Second, the

[195] Extractive industries, i.e. mining, such as gold, oil, and other metals/minerals are sometimes also considered as tropical forest risk commodities. However, as they belong to quite a different sector from agriculture and forestry, they are not covered in this research.

producer governments have started to include the environmental and social issues associated with the production of agricultural commodities in their laws and regulations. Third, the senses of exclusion and unfairness are an important factor for the development of national standards. Moreover, for each type of commodity, the growing quantity of complex private certification with minor dissimilarities among the standards, results in doubts and confusion in the private regulatory system as a whole. Fourth, the private standards from the North are typically developed by NGOs and businesses while national standards of producer countries are normally a close collaboration between governments and producer organizations. Consequently, the latter put greater emphasis on the economic aspects and less on environmental and social impacts. Fifth, producer country governments observe that emerging markets, compared to Europe and the United States, are less willing to confirm private sustainability standards as a precondition in transnational trading. Hence, there are market opportunities for their national certification schemes.

The degree of public sector involvement as well as the degree to which the commodities are embedded in international trade, determines the pattern of the policy mix to govern the industry. For example, the more closely the commodity is linked with international trade, the more leverage the international buyers, retailers and manufacturers can have. In addition, the jurisdictional policy mix approach for palm oil exemplified in this chapter requires strong participation and even leadership from sub-national governments. It is not only because palm oil is a lucrative commodity traded internationally, but also due to the fact that a number of Indonesian and Malaysian sub-national governments perceive the benefits and are willing to engage. This model would be more difficult when governments do not have enough capacity and willingness, or when the commodities have a very limited international market reach.

Nonetheless, the majority of tropical forest commodities, concentrated in certain production areas, do have substantial international market demand and thus have the potential for a jurisdictional policy mix approach. For instance, the Tai region in Ivory Coast and Ghana's high forest region accounted for more than 21% of global cacao production in 2015. The states of Mato Grosso and Para in Brazil, together with Paraguay produce more than 40% of soy in a tropical climate and Viet Nam's Lam Dong province and Ethiopia's Oromia region accounted for around 12% of tropical coffee production. Tropical cattle production is also represented in a few jurisdictions in South America (TFA2020, 2017). Thus for example, even though in Africa, the international market factor has not yet played a significant role for its palm oil, there are however other commodities produced especially for international market demands, such as cocoa, coffee and timber. In the jurisdictions or areas where governments have less capacity, other actor groups such as private sectors and NGOs will have to play more important roles. In particular, the involvement of NGOs is crucial in the process of

establishing and implementing forest protection strategies. The constant engagement with various types of environmental NGOs is important for improving environmental quality (Binder & Neumayer, 2005) in a jurisdictional approach with strong government and private sector partnership, but even more so with areas where public engagement is weaker.

Last but not least, using export commodities as an entry point is just one type of incentives for applying a jurisdictional approach. A jurisdictional approach can also be spurred by the need for better climate change adaptation or water resource management, etc. It can also be primarily focussed on the domestic market that is supplemented by commodities to export. However, these different types of starting points for a jurisdictional policy mix approach to manage natural resources require different incentives and buy-in mechanisms to the ones discussed in this research. More comparative studies on various type of jurisdictional policy mix programs are needed.

7 Conclusion

The governance barriers to the regulation of the current global palm oil industry discussed in section 5 of Chapter 4 mainly derived from the disagreements between the global private partnership in developed countries and public sectors in the producer countries. This chapter thus introduced the jurisdictional policy mix approach as a potential long-term solution to reconcile the discrepancies among stakeholders as well as land use competition among sectors. A jurisdictional approach is a multi-stakeholder approach to manage forest and land use across a specific political boundary. In the context of this chapter it especially refers to sub-national governments, such as states, provinces, districts, counties, and municipalities. A jurisdictional approach at sub-national level is significant because when compared with national level governance, it is not as expansive, heterogeneous and distant from land users and thus the approach is a more adequate scale to support feasible policy implementation. A jurisdictional approach is not only more closely linked with local communities and farmers, but also often entails substantial authority to shape land-use decisions (Boyd et al., 2018).

The chapter has examined the sub-national governance on tropical forests within the multi-level environmental policy framework by linking various elements, including the polycentric forest governance architecture and the concept of policy integration. It extends the policy concept from existing international and national experiences as well as private sector practices to the sub-national scale. The jurisdictional approach represents a potential basis for connecting broader national and international incentives for sustainable forest and agriculture development. We also link the approach to the economic literature on the impacts of environmental regulation on competitiveness. By strengthening the

environmental protection and reinforcing the environmental regulations on the sustainability criteria of palm oil production in these particular sub-national provinces, it might create a situation which is to the advantage of both the tropical forests and the competitiveness of a sustainable palm oil industry.

The global demand for palm oil is projected to continue rising, Southeast Asian, African, and Latin American forests—as well as other tropical ecosystems that store large amounts of carbon—are all at risk of development. Although expansion has recently slowed down, growth is expected to continue in a select group of countries over the next decade other than Malaysia and Indonesia. These countries include Brazil, the Democratic Republic of the Congo, Liberia, Angola, Gabon, Cameroon, Peru, and Colombia, which have forested areas suitable for palm oil cultivation. It will be crucial to ensure that this expansion does not continue to come at the cost of forests. Conventional sustainability initiatives by companies have focused on individual supply chains and were thus fragmented. While the farm-by-farm certification system may improve field practices to a certain level, it has not induced transformation at a larger scale within a broader production region.

Therefore, even though private sustainability standards aim to halt environmental degradation in the tropics, deforestation and forest degradation have persisted during the implementation of these certification schemes. The increasing involvement of the public sector and its increased awareness invoked by the private sector on the issue areas have directed more attentions to the problem of law enforcement and the enabling environment created by the public sector. Moreover, it has also been gradually recognized that the coordination capacity of governments across levels (e.g. national, provincial and local) and their communications with producers are key to the success of sustainable production practices. Many businesses thus have shifted to participate in a more holistic 'jurisdictional' approach towards sustainability, in collaboration with public sectors and farmers. In this way, the companies can mitigate their reputational as well as operational risks, secure more long-term productivity and price stability, reduce the overall costs to verify sustainably sourced products, and secure access to more profitable western markets.

A jurisdictional policy mix approach engages producer countries, various types of private sector, international donors and importing countries. It also implies a combination of all the policy instruments employed by these actors across scales. In practice, planning and implementing such a jurisdictional policy mix approach requires substantial policy analytical capacity as well as effective governance capacity in relevant organizations. The theoretical review of the rationales and incentives for different stakeholders' participation in such an approach can support the subsequent experimentation and implementation on the ground in producer countries. During the process of analysing the jurisdictional policy mix

approach, it has become apparent that the recent development in the control of commodity sustainability in the producer countries has dramatically become the role of states again.

A number of national governments have created mandatory national certification/verification schemes to compete with the private standards, mainly imposed from the private partnership in developed countries. The emergence of state-driven certification on legality and less rigorous sustainability standards has sparked debates over the effects of interaction between public and private standards. Some scholars, such as Cashore & Stone (2012), maintain that when the logic of policy strategies is consistent, legality verification has substantial long-term potential to reinforce domestic forest governance and global private certification. While Bartley (2014) argues that the timber legality regime might in fact curb the prevalence of private forest certification.

The future development of state-driven certification and its interaction with private certification schemes is still uncertain. One possible scenario is that these two types of certification schemes will target different market groups. Each of them serves differentiated or fragmented parts of the global market. For instance, the more stringent private standards would still be more prevalent in the Western markets while state-driven standards with lower thresholds would serve the South. Nonetheless, Wijaya & Glasbergen (2016) predict that if Southern governments successfully implement reliable sustainability systems, it is possible that in the long run they could take over private schemes that also compete among themselves.

The jurisdictional policy mix approaches and the trend of repositioning producer countries in global value chains are not limited to the palm oil industry, but can be seen across a number of tropical forest risk commodities, such as timber, soy, beef, cocoa and coffee. Government capacity and political will, together with the international market reach of a particular commodity determine the strategies and different degrees of stakeholder engagement. The jurisdictional policy mix approaches in any case not only require long-term commitments from various stakeholders across governance levels, but also strong multi-stakeholder process, clear roles and responsibilities for stakeholder and a robust monitoring and evaluation system. It also requires fresh and innovative strategies for public-private collaboration. The jurisdictional policy mix approaches for governing tropical forest risk commodities is not just a new policy initiative but a recognition of the crucial role that multi-stakeholder collaboration plays for the environment in a multi-level governance system.

Chapter 6: Summary and Conclusions

1 The global tropical forest regime complex

Tropical forests contain up to 80 percent of terrestrial biodiversity and sequestrate up to 30 percent of global annual anthropogenic CO_2 emissions (Bellassen & Luyssaert, 2014). Deforestation and forest degradation continue across tropical regions at alarming rates. The loss of tropical forests cover is limited to the local or regional scale, but it has significant repercussions for global ecosystem processes, carbon balances, long-term sustainability and human well-being. Despite this widespread sense of urgency for transboundary forest governance since the 1990s, there is no global legally-binding forest agreement. International efforts to support forests resulted in a complex framework of overlapping soft law agreements and segments of relevant treaties and conventions, such as the International Tropical Timber Agreement (ITTA), the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC), the Ramsar Convention, etc.

The major drivers of tropical deforestation and forest degradation are agricultural expansion (palm oil, soy, cattle, cocoa, etc.) and timber extraction, both legal and illegal. In essence, forest governance is on the one hand the management of productive standing forests and on the other hand the task of keeping forests standing. Nonetheless, the worldwide popular notion of sustainable forest management in fact only governs standing forests. The agricultural aspect of deforestation drivers is very often hidden subtly in the tropical forest governance agenda at the international inter-governmental level. For instance, in the past decade, heated discussions on the UNFCCC mechanism for Reducing Emissions from Deforestation and Forest Degradation (REDD+) have concentrated largely on the carbon market component rather than on the fundamental direct agricultural causes of deforestation (D. H. Boucher, 2015b). In short, the international forest regime complex, although it concerns tropical deforestation, still predominantly focuses on the management of standing forests whereas the adjacent agro-business sector is equally important in terms of forest protection. Preventing forest conversion (into agricultural lands) should thus be included in a more comprehensive discussion and analysis of tropical deforestation and forest degradation. Connecting and filling in the literature gaps between the fundamental causes of tropical deforestation and the literature on global forest governance is exactly what this research has attempted to achieve.

At the other end of the spectrum, tropical deforestation has increasingly been taken seriously by the private sector, more specifically by multinational corporations targeted by environmental activist campaigns in developed countries. The uptake of commodity certification and zero deforestation supply chain commitments by private companies bloomed in the last five years with varied

degrees of rigorousness. In addition, these tropical deforestation-driven commodities are closely embodied in international trade and thus trade-related policy measures are often used in global forest governance. The most widely discussed scheme is the EU Forest Law, Enforcement, Governance and Trade (FLEGT) Action Plan on the legality of tropical timber products.

It is within this fragmented forest regime complex and the scattered information on tropical deforestation and forest degradation, that this study aims to re-examine the link between deforestation drivers and policy measures taken to address them. By applying the law and economics of policy instrument choice theory and the framework on multilevel governance policy integration, the following research question was raised: "how can mixes of policy instruments be designed to effectively govern the challenges of reversing deforestation and forest degradation in the tropics?"

In order to answer this research question, the research first examined the theoretical framework of policy instruments for forest governance, including command-and-control instruments, private and self-regulations, and incentive-based instruments. Each category of instruments has its own strengths and weaknesses and serves different purposes. This indicates that securing global forest sustainability requires a wide and flexible use of policy instruments. In particular, forest ecosystems with high levels of biodiversity are complex systems. This complexity, occurring at multiple spatial and temporal scales, needs to be taken into account when designing institutions to enhance and sustain forest common-pool resources. Ostrom indicates that contemporary policy analysis related to conservation mostly focuses on just two groups of solutions to manage common-pool resources: the creation of market institutions and the creation of national agencies. The third option - a polycentric system based on the law of requisite variety, has not received sufficient attention (E. Ostrom, 2013). Thus the above justifies the need for a combined use of policy instruments for forest governance across levels and sectors, taking advantage of mutually reinforcing and complementary instruments and institutions.

After the examination on the general policy instrument framework for forest governance, the research selected one of the major tropical deforestation drivers – palm oil, as the case study subject. By analysing the policy measures taken by different actors along its transnational supply chain, an attempt was made to answer the research question by first identifying the current global policy gaps in the palm oil industry and then providing potential policy recommendations based on theoretical inputs.

2 The global palm oil industry as a case study

The expansion of the global palm oil industry in the last few decades has been criticized for its linkage with the significant loss of tropical forests, endangerment of species, accelerated wildlife crime and smuggling, disruption and displacement of human and animal's habitats and populations, severe pollution, local land conflicts as well as its substantial contribution to climate change (D. Boucher et al., 2011; Gatto et al., 2015; S. B. Hansen et al., 2015; Potts et al., 2014). The present literature on this subject is quite scattered as the industry changes very fast and is primarily governed by private sectors with voluntary guidelines that evolved swiftly in the past years. There is a need for research that in particular focuses on organizing and analysing the key policy instruments targeting palm oil production and how they can be combined and strengthened. This research thus contributes to the literature by bringing the policies and research together, providing a systematic analysis and policy suggestions.

Indonesia and Malaysia together produce more than around 80 percent of the global palm oil. However, they also account for more than 80% of remaining primary forests in Southeast Asia. It is estimated that around 270.000 hectares of tropical forests were cleared annually between 2000-2011 for palm oil plantations in primary producing countries (Vijay et al., 2016) and about half of those were on forests lands (Cramb & McCarthy, 2016). Consequently, this conversion of tropical forests and peat lands into oil palm cultivation, not only contributes significantly to climate change, threatens the resilience and provision of vital forest ecosystem services, the survival of endemic animal and plants but also affects local livelihoods with a high degree of uncertainty (Carlson et al., 2012).

There exists a demonized misconception about palm oil which suggests that the use of palm oil should be banned altogether due to the associated environmental disaster. However, palm oil has the highest yield per hectare among all vegetable oil crops and it is one of the most economical options for people in developing countries. A complete ban from the developed countries would neither solve the issue of tropical deforestation nor improve the palm oil production towards more sustainable practices. On the contrary, a switch to other types of vegetable oils could bring unintended leakage or displacement, for instance converting eight times more forests for soybean and sunflower oil production (Rival & Levang, 2014). Moreover, a ban imposed by the western world would not only let companies in these countries lose their power of leverage in the palm oil industry but would simply shift the entire industry demand to the developing country's markets, which poses more difficulties and even higher barriers for possible production practice improvements. Therefore, the determining challenges here are to decouple palm oil production and deforestation (WWF, 2011) instead of boycotting the use of palm oil.

The policy instruments for governing the palm oil industry assessed in the study were categorized into three groups: regulations in the producer countries, regulations in the importing countries and private governance, which form a patchwork of public and private, formal and informal institutions across multiple governing levels supporting the industry. The policy measures taken by producer countries and consumer countries are mostly command-and-control, taxation and extraterritorial approaches. Actions taken by the private sector are in fact the most prominent in the environmental governance of the global palm oil industry, due to increasing awareness and global pressures from consumers and environmental non-governmental organizations. The industry thus has responded to this demand with the creation of a certification scheme as well as zero deforestation commitments. In addition, the REDD+ was also examined in the palm oil context and so far its direct progress on diverting palm plantation away from deforestation is limited.

In theory, the regulations in the producer countries are fairly direct measures to tackle the environmental sustainability issues of palm oil. However, it is not until recent years that the Indonesian and Malaysian governments increasingly recognize the need to mitigate the negative environmental impacts associated with palm oil (Aurora et al., 2015). Even though the global private sector takes the major part in palm oil governance in terms of mitigating negative externalities from palm oil production, the industry business actors alone have their limits when it comes to transform the sector even with their most desirable intentions. Strong legal frameworks and national laws with forceful and consistent enforcement need to remain as the foundation of all the international efforts. Some of the most important policy measures to govern the sustainability of palm oil taken by producer countries include land use planning and coordination, moratoria and a mandatory national certification scheme. On the demand side, the regulations in importing countries have been mainly taken by the European Union, such as import restrictions or taxes on unsustainable palm oil. Regrettably, this approach is at the current stage not feasible in the top two palm oil importing countries, namely India and China.

As for the private sector, global companies in recent years have become much more aware of the reputational, operational and legal risks they face when associated with tropical deforestation. They are in particular concerned about the materials and commodities in their supply chains that are responsible for negative environmental impacts. In 2013 and 2014, an unprecedented wave of major companies of producers, traders and retailers joined the ambitious time-bound targets of zero deforestation. This swift emerging momentum of high-profile deforestation free commitments shows a strong trend for private corporate governance and their opinions not only of corporate sustainable responsibility but also the business case associated with it. However, the majority of the companies have no knowledge and capacity to materialize their zero-deforestation

commitments. Therefore, in most cases these companies have to collaborate with non-profit organizations and/or certification bodies, such as the World Wildlife Fund (WWF), the Forest Trust (TFT) and the Roundtable on Sustainable Palm Oil (RSPO).

Academic research generally focuses more on the certification scheme, which has uniformed rules and thresholds and is thus easier to quantitatively evaluate. However, it is important to note that the NGO-business partnership is used by a substantial amount of companies, including the leading global traders. Moreover, these partnerships are not like certification with high thresholds which exclude innumerable resource poor producers. The NGO-business partnership is in general more inclusive and works with many private partners that have poor production practices for incremental improvements. Hence even though there exists little academic research or quantifiable proof on the effectiveness of this type of partnership, it does not only have great potential but also considerable implications for further transformation of the industry supply chain practices.

3 Barriers to effective sustainable palm oil solutions

The wide range of policy measures and institutions taken by state and non-state actors at various scales to govern the sustainability of palm oil comprise a governance regime complex that has implications for its supply chain and landscape where the crop is produced (Pacheco, Schoneveld, et al., 2017b; Rayner, Buck, et al., 2010). This palm oil transnational regime complex involves a growing number of stakeholders with diversified interests and perspectives from intra- and extra-chain across levels. There are disagreements among stakeholders over the development of sustainability priorities in the palm industry and which mechanisms are more appropriate. to address them. This results in competing, parallel or overlapping regulatory institutions and instruments (Pacheco, Schoneveld, et al., 2017b). In the detailed analysis in Chapter 4, it is not difficult to observe that there is a discrepancy concerning the definition of "sustainability" between public governance in producer countries and global private governing institutions. In addition, most of these instruments also act in isolation with weak alignment and without coherence, which not only increases compliance costs for actors in the supply chain but also increases the potential for conflicts.

The examples of discrepancies, especially between public and private sectors, can be observed with the establishment of the national certification schemes in Indonesia and Malaysia. It is viewed as the states' movement to reclaim the power of discourse over the 'sustainability' of palm oil industry from the private sector's standard setting (Hamilton-Hart, 2015b). Moreover, the RSPO standard to set aside high conservation value areas is in conflict with Indonesia's regulation, which deems these conservation areas as "wasteland" (See Chapter 4, subsection 5.2). Another example is the headlining incident between the Indonesian

government and the proactive Indonesian Palm Oil Pledge (IPOP) by major palm oil trading multinationals. The ambitious IPOP jointly committed to "No deforestation. No peat. No exploitation." However, these multinational palm oil traders were accused by the government for their "cartel practice" in attempting to coordinate their no deforestation, no peat and no exploitation standards (Pacheco, Schoneveld, et al., 2017b). The IPOP was viewed by the government authority as contravening its national laws and regulations on land and forest governance. Eventually, under the pressure of the Indonesian government's displeasure, possible anti-monopoly investigation and the risks of losing concessions, the IPOP was disbanded in mid-2016. The disbandment of the IPOP can be interpreted as Indonesian government's strategy to challenge the legitimacy of the private sector that undermines its national rights over the control of its palm oil industry.

The discrepancy between public and private governance in the palm oil industry also partially lead to the circumstances in which the policy measures were discussed in Chapter 4, Section 4 act in isolation. For instance, the national certification scheme, the RSPO and the NGO-business partnership are in fact three separated institutions working on overlapping issues without coordination. The willingness of producer states to collaborate with global non-state private partnership is often in doubt (Hospes, 2014). The NGO-business partnership has its own agenda that does not necessarily follow the RSPO standards. Companies in an NGO-business partnership might choose not to be certified even if they meet the RSPO requirements, or the companies can at the same time work with several different initiatives on sustainability. Meanwhile, the RSPO currently does not have a system to certify firms that skip normal RSPO standards and directly go for higher standards (RSPO Next) (see Chapter 4, Subsection 5.5). These weak alignments between the various regulatory institutions thus intensify the struggles for a more effective structural performance faced by the palm oil transnational regime complex (Pacheco, Schoneveld, et al., 2017b).

Therefore, there is a need for effective orchestration to enhance the links between public and private governance toward a more sustainable palm oil sector. Ultimately, the willingness to enforce and the capacity of producer governments are crucial for the alignment of various policy instruments. Building on the policy instruments assessment in Chapter 4 and the successful case example from Brazil, a collaborative approach that integrates public and private initiatives as well as a financing mechanism provides a potential solution to mitigate the current ecological externalities generated by the global palm oil industry. For instance, some sub-national governments in Indonesia see the potential for better opportunity, more investment and green economic growth through sustainable commodity production. So they actively engage in "No Deforestation" commitments and turn their attention on policies to improve land-use planning,

tenure clarification, smallholder incorporation and production practice with possible collaboration and assistance from the private sector. This proposed policy mix approach of public, private initiatives and financing mechanism was introduced in Chapter 5 with a particular focus on the sub-national/jurisdictional public actor and its interaction with private governance. The proposal shows how these many challenges faced by both the state and the private sector can also bring positive opportunities for change.

4 A jurisdictional policy mix approach

The discrepancies between public and private sectors in governing the palm oil industry require proactive participation from public authorities across different levels to resolve governance challenges and stimulate new development and transformation models. A so-called jurisdictional approach is considered a potential mechanism (G. Paoli et al., 2016) to facilitate such collaboration between sub-national government authorities and private sectors to act in a coordinated way at regional level in order to reduce agricultural conversion of tropical forests and peatlands. It fits into the growing need for the integration of a multi-level/ polycentric governance structure in environmental policy making. In recent years, the sub-national governments have increasingly become active and acquired influential roles to address global environmental problems (Setzer, 2017).

A jurisdictional approach focuses on the authoritative political level at which land use and sustainable rural development decisions are made and enforced (Earth Innovation Institute, 2017). It seeks "to align governments, businesses, NGOs, and other stakeholders around shared goals of conservation, supply chain sustainability, and green economic development" (Fishman, Oliveira, & Gamble, 2017, p.i). This coordinated action among groups provides the possibility to reconcile competing land use objectives at different scales and address the complexity of factors across sectors and stakeholders (Denier et al., 2015). Environmental issues with significant global implications originate from processes embedded in specific areas. Thus it is argued that the focus on regional/sub-national scope is a more coherent political jurisdiction to undertake the necessary policy measures with authoritative decision-making (Marks et al., 2008). Many sub-national governments have substantial authority over land use planning and other policy decisions. Moreover, they do not merely act in response to predefined international or national policy goals but take initiatives in their own rights (Betsill & Bulkeley, 2006; Rabe, 2010; Selin & VanDeveer, 2009).

The theoretical relevance of the jurisdictional approaches which were examined, relate mainly to multi-level environmental governance and the impacts of environmental regulation on industry competitiveness. The jurisdictional approaches centre on the sub-national decision-making unit to align stakeholders' interests, which in fact already imply mixes of policy instruments across

governance scales and various actors. It also reflects that fundamental elements of effective governance arrangement are situated in the linkages among influential actors at diverse levels but not at a mere single layer of governance (E. Ostrom & Ahn, 2009). It thus contributes to building a multi-level nested/polycentric forest governance architecture as a form of policy integration. In addition, based on the Porter Hypothesis and the Trading Up theory, by strengthening the environmental protection and reinforcing the regulations on the sustainability criteria of palm oil in these particular sub-national provinces, it might create a win-win situation between tropical forests and the competitiveness of the sustainable palm oil industry (Porter, 1998; Porter & van der Linde, 1995b; Vogel, 1995, 1997).

The jurisdictional approaches are presumed to pursue objectives that key stakeholders could not seek individually. For instance, even though a growing number of companies is working towards zero deforestation supply chains, due to the uncertainties in producer countries, companies are still exposed to risks despite their efforts on certification or deforestation free commitments. Mainly for the reason that plantation-by-plantation traceability approaches are hard to control and that there are matters such as tenure, mapping, aligning regulatory procedures, smallholder engagement, which cannot be addressed without the involvement of a public authority. Moreover, instead of having sustainability requirements imposed by "outsiders", i.e. multinational palm oil companies and international non-profit organizations, the jurisdictional approach strategies should be derived from and owned by the regional community in order to build a broader domestic constituency for sustainable palm oil. The promising benefits of the jurisdictional approach are summarized in the table below.

Table 24: Potential advantages of applying jurisdictional approaches for sustainable palm oil sourcing

Delivering commitments effectively	
Managing supply chain risk	Typically, suppliers are required to provide evidence that individual producers manage their production practice responsibly, which can be difficult and costly. A jurisdiction that successfully reduces its deforestation rate can provide a mechanism to assure buyers with lower risks associated with deforestation at lower costs for both producers and other supply chain actors.
Addressing complex issues	Certain sustainable sourcing commitments cannot be resolved by individual producer but can only be achieved when engaging multiple stakeholders, such as the long-term protection of conservation areas and social issues. Jurisdictional approaches provide a partnership framework to address these challenges.

Making certification more achievable	
Reducing the gap between normal practices and certification standards	Jurisdictional approaches can raise the production standards across the landscape. Therefore it reduces cost differential between certified and uncertified operations and makes certification more economically feasible.
Simpler auditing	Reliable existing legal, policy or enforcement frameworks can simplify and reduce the costs of certification assessments.
Small producers	Jurisdictional approaches can better facilitate producers to access certified supply chain by supporting organized groups for group certification or providing assurances that minimum standards are met.
Sourcing with positive impact	
Supporting positive change	Most buyers only purchase from producers that meet sustainable sourcing requirements instead of engaging with producers to improve their practices. However, all producers need to be involved for the long term meaningful impacts. Jurisdictional approaches provide such framework, expertise and pooled resources to include more producers for greater changes.
Providing incentives	Jurisdictional approaches can enable more favourable contracts or commitments to buy larger volumes as well as preferentially locate processing facilities. These provide incentives to producers for continued good practice. Furthermore, jurisdictional approaches can also combine the above supply chain incentives with other catalysts such as technical support and financial access.
Achieving scale and permanence	Jurisdictional approaches enable resources to be pooled and aligned with government and civil society resources around common goals to scale up the impacts and potentials for meaningful and permanent transformation, comparing to specific supply chains.
Better governance	Governance improves when the private sector and government actively align around the shared goal of effective implementation of the legal framework. Because a universally enforced legal framework is in the interests of all responsible companies and similarly, the private sector can undermine better governance through corruption or by widespread and systematic failure.
Including small producers	Small producers typically lack knowledge and resources to implement good practice. Jurisdictional approaches could provide better support, enforcement and monitoring to include small producers in sustainable supply chains.

Source:(Proforest, 2016a)

The three main groups of actors which were examined in detail to find out their incentives and rationales to participate in such an approach are: 1) sub-national public authorities, 2) multinational palm oil conglomerates and 3) international public initiatives and importing countries. Table 25 reviews and summarizes the results.

Table 25: Summary of the buy-in mechanisms for main actors in the jurisdictional policy mix approaches

Sub-national authorities	
Motivations	- Profits of sustained long-term economic growth - Perceived first mover advantages from signals given by the private sector and consumer market - Financial, technical assistances delivered by donors - External positive recognition, publicity and political gains - Preferential sourcing and/or private investments
Policy measures	- Land use strategy, tenure clarification and spatial planning - Technical support and monitoring compliance - Mandatory certification schemes - Enhancing existing legal mechanisms and regulatory tools - Establishing a partnership framework with other stakeholders - Vertical and horizontal coordination across state agencies - Actively pursuing international buyers
Multinational corporates	
Motivations	- Reputational incentives demanded by external audiences - Publicly demonstrating companies' commitments to zero deforestation - Appropriate and streamlined regulations and responsive regulators from the public sector that ease regulatory burden and compliance costs - Reducing risks and costs for sustainable and responsible sourcing - Better access to lucrative western markets
Policy measures	- Zero deforestation commitments - Investing in jurisdictional certification - Preferential sourcing policy - Developing collaboration between big agro-industrial complexes and smallholder farmers - Sustainable and responsible financing policy
International initiatives and importing countries	
Motivations	- Protecting global common goods (e.g. stable climate and biodiversity) - Avoiding transboundary environmental harms, - Reducing unfair competition from illegal/unsustainable deforestation that undermines landowners who manage their forests sustainably - Reducing greenhouse gas emissions cost-effectively - Achieving Sustainable Development Goals
Policy measures	- Payment for ecosystem services/conditional performance payment - Preferential sourcing policy - Import restrictions

Governing the environmental sustainability of palm oil production is a complex dynamic multi-level process. Under a jurisdictional policy mix approach, the "mix" consists of mixes across governance levels (international, national, sub-national), various actors (public, private and civil society, etc.), different forms of regulation and specific policy instruments. These dimensions are all interconnected and moreover, the "mix" in fact emerges and evolves spontaneously rather than being purposefully designed. Over the course of time, the regulatory instruments and actors integrate and interact along their operations. The role of public authorities changes from traditional command-and-control to participation and orchestration in the governance networks in a transnational governance setting (Abbott & Snidal, 2009).

A zero-deforestation jurisdiction would lower costs and risks for companies along the palm oil supply chain. First, it would help scale down the gap between producers and reduce risks of deforestation for all types of crops and competitors. The incentives created with a zero-deforestation jurisdiction (e.g. through conditional payment or law enforcement) would lower the need to clear forests from farms and plantations, which bring more properties closer to compliance with the private sector's deforestation free commitments. This increases the amount of suppliers that are willing to participate in the deforestation free supply chain and therefore reduces the risks of laundering deforestation-linked commodities into the supply chain. Moreover, with proper law enforcement, producers will not have competitive advantages from illegal operations or clearing forests (C. Meyer & Miller, 2015).

Second, monitoring deforestation across a jurisdiction creates an economy of scale that reduces the cost per unit of carbon and per hectare (Arild Angelsen et al., 2008). A public monitoring system would be independent from companies, streamline monitoring criteria and therefore reduce inconsistencies between public and private definitions and assessments of deforestation rates as well as risks of non-compliance (C. Meyer & Miller, 2015). Additionally, a jurisdictional approach can better leverage funding, subsidies and programs to assist producers with law compliance and increase productivity. Public finance can provide substantial up-front and/or ex-post costs for implementation, or complement other sources while private financiers can finance agricultural inputs or investment in scaling up successful models. Meanwhile, the international donors or initiatives can support performance-based payments (Fishman et al., 2017).

In the majority of the global environmental governance literature, the nature of the state has been assumed at the centre of the formation of international regimes. The multi-level governance approach used here demonstrates a governance arrangement of complex, overlapping and interconnected spheres of authorities and shifts the analysis of global environmental issues from a hierarchical model toward a polycentric system (Betsill & Bulkeley, 2006). Often, the important

influences and inputs of sub-national or local authorities, non-profit organizations and private actors are insufficiently represented in the policy debate (Nagendra & Ostrom, 2012). The jurisdictional policy mix approach here, although it emphasizes the engagement of sub-national public authorities, other actor groups (private sector, NGO, importing countries and international initiatives, etc.) are equally essential for achieving the goal of deforestation-free supply chains.

To be more specific, here the question is how a jurisdictional policy mix approach can be applied to palm oil production in West Kalimantan, Indonesia. West Kalimantan is one of the provinces subjected to a high risk for deforestation and peat conversion by oil palm. The deforestation rate appears to be high and accelerating. The province has more than 1 million hectares of planted oil palm (4th largest in the country) and planned expansion that will impact 1.4 million hectares of forests and another 1 million hectares of peat (G. Paoli et al., 2016). The district of Ketapang in the south of the province is one of the top priority areas with a high deforestation rate. The district has a high concentration rate of previous Indonesia Palm Oil Pledge (IPOP) members[196] and proactive companies and mills. In the meantime, there are also numerous ongoing NGO-led initiatives working on for example, land tenure issues, social forestry as well as compliance of monitoring of zero deforestation commitments (G. Paoli et al., 2016).

Bumitama Agri Ltd is one of the most influential oil palm growers in the area who launched its ambitious "No Deforestation, No Peat, No Exploitation" policy in 2015. In 2016, Bumitama joined forces with the Dutch-based Sustainable Trade Initiative (IDH) and the civil society organization Aidenvironment to establish a wild-life migration corridor to connect two major forests areas in and around one of its concessions as well as to conserve forests with high conservation value and high carbon stock (IDH, 2018). The company and organizations then sought support from other influential private sector (including other palm oil and logging companies) and NGO players operating in the same district. In 2017, the group further engaged with local forestry departments and signed an agreement to map out Essential Ecosystem Zones. Moreover, the involvement with local government is crucial to ensure the integrity of the village-level land use plans. Hence the companies and NGOs sought cooperation and engagement with district government prior to any work on the ground. The main motives for the companies are to mitigate reputational risks and to maintain key customer loyalty since it sells 75.4% of its palm oil products to Wilmar and Golden Agri Resources, which both have committed to "No Deforestation, No Peat, No Exploitation" (IDH, 2018). Subsequently, this district also attracts conservation finance and other new buyers that are keen to source deforestation-free palm oil. To date, the stakeholders in the district continue to work collaboratively to strengthen their

[196] See Chapter 4, subsection 5.3.

positions and to showcase the possibility that production and conservation can coexist and bring positive financial outcomes.

Despite the potential advantages, the institutionalization of a jurisdictional approach will increase the complexity in decision making and management, and it will occur at a slower pace in contrast to a private sector led supply chain approach. There are also challenges for jurisdictional approaches, such as the overall elevated complexity, long-established mistrust between stakeholders, the misalignment between the different speed of the decision making process in the government and the corporate sector, building sufficient trust and understanding among stakeholders, maintaining momentum, continuity and credible value propositions through a lengthened time frame for stakeholders and securing participation of less powerful groups, etc. (G. Paoli et al., 2016). More specifically, six barriers were discussed in Chapter 5. First, limited finance and political will remain as risks to jurisdictional wide reform for commodity production. Second, the political and bureaucratic turnover can be either an opportunity or a challenge (Stickler et al., 2018). Third, the inherent challenges of such a multi-stakeholder framework entail the risks of green-washing or free-riding. Fourth, even though the risk of leakage and displacement would decrease by solutions on a larger scale, potential leakage into jurisdictions without deforestation-free commitments still exists. Fifth, there are substantial concerns over the top palm oil consumption countries, namely China, Indonesia and India. Finally, jurisdictional policy mix approaches are not a panacea and are inherently a cumbersome process. The jurisdictional policy mix approaches should be viewed as a complement rather than a substitute alongside other policy strategies.

5 Policy implications

The non-state private certification standard setting process usually insufficiently addresses the needs of producer governments in the South (Hospes, 2014; Schouten & Bitzer, 2015). Moreover, global research focuses largely on the development of global private partnership, non-state market driven governance/market-based governance and how actors in the South can be influenced (Hospes, 2014). However, much attention is needed for questioning whether and how public authorities in the South want to collaborate with such global private partnership; whether governments from the South think these private standards can serve to improve their policy development or power struggles, or how the political and structural context in the South have affected the implementation of these private partnerships. As a result, the limits of and dissatisfaction with global private standard setting have led to increasing calls for producer countries' public participation in the standard setting processes (Morrison & Roht-Arriaza, 2007).

In the case of palm oil, the public sector's dissatisfaction with private standards stemmed from disagreement over sustainability principles and criteria, high costs of obtaining the certification, unbalanced decision making power between producers and others in the private sector, national pride, and the desire to regain control in standard setting (Pacheco, 2016; Atika Wijaya & Glasbergen, 2016). The rivalry between the RSPO and ISPO does not merely involve competition between NGOs and producers but even a more complicated North-South divide in international environmental politics. Similar trends of repositioning of "producer countries in global value chains" (Schouten & Bitzer, 2015, p.181) can also be observed with timber certification, soy, coffee, cocoa and fruits, etc. The emergence of national standards is redefining the traditional understanding of "certification" as a form of private self-regulation. These national certifications are in fact a command-and-control type of policy instrument that not only provides additional information on production practices but also aims to acquire a premium price or market access. Moreover, the informational and market aspects of these national certification schemes turn out to bring public sectors under the scrutiny of global environmental and social NGOs, which then gives these groups considerable leverage against national governments.

Although in general, public standards are less stringent, whenever possible, it is however essential to let the public sector retain appropriate control and decision-making power over its natural resources use. As we could see from the IPOP incident mentioned in Chapter 4, without engaging the public sector, even the most ambitious actions taken by the private sector could have the opposite effects. The global private sustainable standard setting thus does require a different approach that involves both private sectors and public authorities in the South. A relevant debate regarding public and private governance centres around the balance between legality and sustainability, as well as the trade-off or conflicts between the more inclusive lower standards or higher standards that can only engage limited producers.

Scholars have shown two opposite views on whether legality control by governments constricts or reinforces sustainability by global private partnerships. Cashore & Stone (2012) point out that legality verification may play an enabling role by establishing "necessary" but "insufficient" prerequisites for other policy interventions. On the other hand, Bartley (2014, p.104) focuses on the strengths of legality schemes. He maintains that a legality scheme "forces a more realistic accounting of the relationship between states, standards, and forest management practices than does forest certification." He also argues that the timber legality regime does not necessarily augment sustainability certifications. Moreover, they might in fact curb the prevalence of private forest certification and there is already some evidence showing that the demands of firms have been re-oriented to legality over sustainability.

6 Answering the research question

This emerging attitude from producer country governments, both at national and sub-national levels, has started to reshape the more established top-down treaty approach in global forest governance as well as the transnational private governance arrangements. Acting more as a bottom-up/from-below approach, domestic actors and political structures are increasingly gaining their importance in the international regime analysis. The policy barriers imposed on the palm oil industry are also present with other tropical deforestation driven commodities, such as tropical timber, soy, cattle and cocoa. The production of these commodities is associated with tropical deforestation with varied degrees. The public and private stakeholders engaged in their supply chains also face discrepancies and require improved and scaled up collaboration. Hence the jurisdictional approaches can also be applied to other commodities. In short, the jurisdictional policy mix approaches are the answer to our research question: "how can mixes of policy instruments be designed to effectively govern the challenges of reversing deforestation and forest degradation in the tropics?" It engages producer countries, various types of private sectors, international donors and importing countries coordinating at a sub-national jurisdiction. It also implies a combination of all the policy instruments employed by these actors across scales and thus creates the benefits of reducing certification costs, streamlining processes, simplifying traceability, sharing information and resources, more inclusive smallholder engagement, creating scalable and long-term impacts and avoiding leakage/displacement.

The degree of public sector involvement as well as the degree, to which the commodities are embedded the international trade, determine the pattern of the policy mix to govern the industry. For example, the more closely the commodity is linked with international trade, the more leverage the international buyers, retailers and manufacturers can have. In addition, the jurisdictional policy mix approach for palm oil exemplified in this research requires strong participation and even leadership from sub-national governments. It is not only because palm oil is a lucrative commodity traded internationally, but also due to the fact that a number of Indonesian and Malaysian sub-national governments perceive the benefits and are willing to engage. This model would be more difficult when governments do not have enough capacity and willingness, or when the commodities have very limited international market reach.

Nonetheless, the majority of tropical forest commodities, concentrated in certain production areas, do have substantial international market demand and thus have the potential for a jurisdictional policy mix approach. At the jurisdictions or areas where governments have less capacity, other actor groups such as the private sector and NGOs will have to play more important roles. In particular, the involvement of NGOs is crucial in the process of establishing and implementing

forest protection strategies. The constant engagement with various types of environmental NGOs is important for improving environmental quality (Binder & Neumayer, 2005) in a jurisdictional approach with strong government and private sector partnership, but even more so with areas where public engagement is weaker.

The global demand for palm oil and other tropical forest risk commodities is projected to continue rising, Southeast Asian, African, and Latin American forests—as well as other tropical ecosystems that store large amounts of carbon—are all at risk of development. The current academic literature regrading global forest governance is mostly distributed around climate change, carbon market, biodiversity conservation, timber legality and other indirect policy measures. This research attempts to conduct a more holistic review and link direct tropical deforestation drivers to solutions and thus contribute to the scale-up of solving urgent environmental problems. The jurisdictional approaches alone are not able to manage the fragmented forest regime complex and are ineffective as merely an additional layer or element to the complex international multi-level forest architecture. However, if this level of efforts is connected to more substantive polity-building and social-economic integration at national or even regional level, they can be an extremely promising unit for the implementation of novel policy governance tools. Government capacity and political will, together with the international market reach of a particular commodity will determine the strategies and different degrees of stakeholder engagement. The jurisdictional policy mix approaches are not just a new policy initiative but a recognition of the crucial role that multi-stakeholder collaboration plays in a multi-level environment governance system. In any case, it requires long-term commitments from various stakeholders across governance levels as well as fresh and innovative strategies for public-private collaborations.

7 Limitations

Aside from the potential barriers of the jurisdictional policy mix research that are detailed in the previous Chapter, the main limitation of this research is that the approach being applied to tropical forest risk commodity production is still a rather new development and in the process of being evaluated (Stickler et al., 2018). Moreover, it is important to reiterate that interventions from the production side are a mere part of the solution. Policies at local level to control deforestation are, although necessary, not sufficient to tackle tropical deforestation on a global scale (P. Meyfroidt, Rudel, & Lambin, 2010). Other solutions to address underlying drivers such as global pricing and demand management, dietary shift, use of biofuel, population planning, food security and nutritional choices are all critical components to achieve effective tropical forest protection.

8 Future research

Future research on this relevant tropic is still insistently needed, for example, into the governing and management of the multi-stakeholder process as well as the scaling up effect from the private-public-NGO collaboration compared to the traditional plantation-by-plantation certification approaches. The development of a more reliable and accountable global traceability technology and platform is also of urgent need. Additionally, the annual global subsidies in agriculture and fossil fuel could also potentially be moved away from business as usual to more sustainable commodity productions. However most importantly, the fundamental big questions concerning the global food system, competing land uses, commodity consumption patterns and economic models remain unanswered. How do we address and balance the issues of nature conservation, food distribution, nutrition, health, and development? Instead of focusing on better production practices on palm oil or beef, what about tackling the question from the very root of reducing overall vegetable oil and meat demand? What are the alternative livelihoods or development options for the current export-led agricultural development model? How can the profits of multinational corporations or the global economy decouple from non-irreversible natural resource extraction/exploiting activities? I understand that these questions are vast and complicated policy ideas for future research. However, they stand at the very core of the greatest challenges mankind has faced in history. Our planet is at the breaking point, and solutions from the production side are absolutely insufficient. We must address all necessary issues on all fronts, and it needs to be done fast.

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Summary

Deforestation and forest degradation continue across tropical regions at alarming rates despite decades of international efforts, primarily resulting from agricultural expansion (palm oil, soy, cattle, cocoa, etc.) and timber extraction, both legal and illegal. This thesis aims to investigate the use of policy instrument mixes to effectively govern the challenges of deforestation and forest degradation in the tropics. It concludes with an integrated jurisdictional governance approach to align the interests of producer countries in the South and developed markets in the North to improve supply chain sustainability. In this thesis, you will learn about the connection between tropical forest protection and agricultural deforestation causes and how forestry and agriculture are two inseparable sectors when addressing climate change and biodiversity issues. At the end of this book, you will be introduced an emerging landscape approach, the so-called jurisdictional policy mix approach and how it relates to tropical deforestation driven commodities, more specifically palm oil. Finally, I also show the current policy development trend and contentious issues regarding tropical deforestation as well as the limitations of taking a supply side approach.

In essence, forest governance is on the one hand the management of productive standing forests and on the other hand the task of keeping forests standing. However, the agricultural aspect of deforestation drivers is often hidden subtly in the tropical forest governance agenda at the international intergovernmental level. Preventing forest conversion (into agricultural lands) should be included in a more comprehensive analysis of tropical deforestation and forest degradation. Connecting and filling in the literature gaps between the fundamental causes of tropical deforestation and the literature on global forest governance is exactly what this research attempted to achieve. This thesis examines the global forest governance architecture which consists of five major groups of components and provides an analysis on how to reconcile the current fragmented forest regime complex through policy integration (Chapter 2). Policy instrument choice theory is applied here as the theoretical framework for forest governance and within this framework, I further reason the need of a mix of policy instruments for governing tropical deforestation and forest degradation problems (Chapter 3).

In Chapter 4, the study turns to an in-depth research on one of the biggest tropical deforestation drivers – palm oil, with a thorough review of the global palm oil industry, as well as the current policy measures taken by multiple actors across levels to tackle these palm oil governing challenges. The chapter ends with a discussion of the existing barriers to effective sustainable palm oil solutions. Subsequently, Chapter 5 suggests a "jurisdictional policy mix approach" as a potential solution to better govern the production of tropical deforestation driven commodities. The concept is introduced with theoretical relevance, main features and advantages. Furthermore, it provides a detailed analysis of the buy-in

mechanisms for key actor groups along the global palm oil supply chains, the rational and incentives for their engagements and the overall synergies generated. Last, the thesis broadens the scope beyond palm oil and discusses general policy trends associated with the jurisdictional policy mix approach in governing tropical deforestation driven commodity production, in particular the interactions and trade-offs between the public and private sectors.

Samenvatting

Ontbossing en bosdegradatie gaan in tropische gebieden met alarmerende snelheid door, ondanks tientallen jaren van internationale inspanningen. Dit is vooral het gevolg van landbouwexpansie (palmolie, soja, vee, cacao, enz.) en houtwinning, zowel legaal als illegaal. Dit proefschrift wil een mogelijke mix van beleidsinstrumenten onderzoeken om de problemen van ontbossing en bosdegradatie in de tropen effectief het hoofd te kunnen bieden. Het sluit af met een geïntegreerde jurisdictionele beleidsaanpak om de belangen van producerende landen in het zuiden en ontwikkelde markten in het noorden met elkaar op één lijn te brengen om de duurzaamheid van de productie te verbeteren. In dit proefschrift leest u over het verband tussen de bescherming van tropische bossen en de oorzaken van ontbossing door landbouw en hoe bosbouw en landbouw twee sectoren zijn die onlosmakelijk met elkaar verbonden zijn bij de aanpak van klimaatverandering en biodiversiteit. Aan het einde van dit boek verneemt u een opkomende landschapsaanpak, de zogeheten jurisdictionele beleidsmixaanpak en wordt aangegeven hoe deze verband houdt met grondstoffen die tropische ontbossing in de hand werken, meer in het bijzonder palmolie. Tot slot laat ik ook de huidige trend in beleidsontwikkeling zien, evenals controversiële kwesties met betrekking tot tropische ontbossing en de beperkingen van een aanpak aan leverancierszijde.

Bosbeheer bestaat in feite enerzijds uit het beheer van productieve bossen en anderzijds de taak om bossen te behouden. Maar het landbouwaspect als oorzaak van ontbossing zit vaak subtiel verborgen in de agenda van tropisch bosbeheer op internationaal intergouvernementeel niveau. Het voorkomen dat bossen worden omgezet (in landbouwgrond) moet worden opgenomen in een uitgebreidere analyse van tropische ontbossing en bosdegradatie. Het verbinden en vullen van gaten in de literatuur tussen de fundamentele oorzaken van tropische ontbossing en de literatuur over wereldwijd bosbeheer is precies wat dit onderzoek wilde bereiken. Dit proefschrift kijkt naar de opzet van wereldwijd bosbeheer die bestaat uit vijf hoofdgroepen van elementen en geeft een analyse van hoe het huidige, gefragmenteerde geheel van bosbeheer kan worden verenigd via beleidsintegratie (hoofdstuk 2). Hier wordt de theorie van beleidsinstrumentkeuze toegepast als het theoretische raamwerk voor bosbeheer en binnen dit raamwerk pleit ik verder voor een mix van beleidsinstrumenten voor het beheer van de problemen van tropische ontbossing en bosdegradatie (hoofdstuk 3).

In hoofdstuk 4 gaat de studie over in een grondig onderzoek naar een van de grootste oorzaken voor tropische ontbossing: palmolie, met een diepgaande analyse van de wereldwijde palmolie-industrie, evenals van de huidige beleidsmaatregelen die worden getroffen door diverse betrokkenen op verschillende niveaus om deze problemen voor het beheer van palmolie aan te

pakken. Het hoofdstuk eindigt met een bespreking van de bestaande barrières voor doeltreffende duurzame palmolie-oplossingen. Daarna stelt hoofdstuk 5 een 'jurisdictionele beleidsmixaanpak' voor als mogelijke oplossing voor een beter beheer van de productie van grondstoffen die de oorzaak zijn van tropische ontbossing. Het concept wordt geïntroduceerd door het theoretische belang, de hoofdkenmerken en de voordelen te beschrijven. Bovendien wordt er een gedetailleerde analyse gegeven van de motieven van belangrijke betrokken actoren in de wereldwijde productie van palmolie, de principes en drijfveren voor hun betrokkenheid en de algemene synergie die wordt gegenereerd. Tot slot kijkt het proefschrift verder dan alleen naar palmolie en bespreekt algemene beleidstrends in verband met de jurisdictionele beleidsmixaanpak bij het beheer van de productie van grondstoffen die de oorzaak zijn van tropische ontbossing, in het bijzonder de interactie en wisselwerking tussen de openbare en de private sector.

Curriculum vitae

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Short bio	
Chih-Ching Lan is a Law and Economic and environmental policy researcher at Rotterdam Institute of Law and Economics (RILE), Erasmus University Rotterdam, The Netherlands. Chih-Ching has been a Ph.D. researcher in the European Doctorate in Law and Economics (EDLE) Program. As of January 2019, Chih-Ching will be working as a professional at IDH the Sustainable Trade Initiative, focusing on global palm oil, soy and tropical timber value chains.	
Education	
Erasmus Mundus Master Program in Environmental Science, Policy and Management A joint master programme by four of the leading European universities: The Central European University (Hungary), Lund Universities (Sweden), University of Aegean (Greece) and University of Manchester (UK).	2012-2014
Department of Diplomacy, National Chengchi University	2008-2012
National Yilan Senior High School	2005-2008
Work experience	
Palm oil, Soy and Tropical Timber Program Officer at IDH the Sustainable Trade Initiative Work on the sustainable production of soy (Brazil), palm oil (Indonesia, Malaysia, Nigeria, Colombia and Liberia) and tropical timber (globally) via the landscape programs.	2019-present
PhD Candidate in the law and economics of forest policy and governance PhD Candidate at the European Doctorate in Law and Economics (EDLE) Program (Erasmus University Rotterdam, University of Hamburg and University of Bologna), focusing on policy instrument choice theory to prevent tropical deforestation.	2014-present
Online media environmental columnist at UDN Global Write articles to offer commentary and opinions on global environmental news. Topics covered include, for instance, UN climate change negotiations, wildlife trade, shale gas development, palm oil trade, marine debris, etc.	2014-present

Landscape program intern (with a focus on forest protection) at IDH the Sustainable Trade Initiative (Full-time) Performed specific research on forest protection, resulting in a forest protection strategy guidance, a discussion paper on sustainable agricultural intensification and a set of case studies on innovative forest protection strategies and success factors.	Aug.-Dec. 2018
Intern at the NAMA & Registry Unit, Mitigation, Data and Analysis Programme, the United Nations Framework Convention on Climate Change (UNFCCC) (Full-time) Drafted, researched and presented country profiles on Nationally Appropriate Mitigation Actions (NAMAs), in particular Thailand NAMAs and sustainability policies.	Jan.-Apr. 2014
Volunteer Translator/deckhand onboard Greenpeace International MV Esperanza Served as a translator for Taiwanese/Mandarin and English among the Captains on longliner fishing vessels and Greenpeace campaigners and contributed to Greenpeace's ocean campaign in the Western and Central Pacific tuna industry, policy measures and fishing practices.	Sep. 2011-Apr. 2012
Prizes and awards	
Erasmus Mundus Scholarship, Ministry of Education, Taiwan	2012
Financial Award, Central European University	2012
Tao-Nan Medal, National Chengchi University	2010
Publications	
Lan, Chih-Ching (forthcoming 2019). Examining the Jurisdictional Landscape Approach and Its Implications for African Palm Oil Industry. *Forest Policy and Economics* Special Issue on African Forest Policies and Politics	2019
Michael Faure et **Chih-Ching Lan**, L'importance des droits de propriete pour la protection de l'environnement et la croissance economique: le cas des pays africains. Dans: Michael Faure et autres, redaction, Les mutations foncieres en Afrique: enjeux economiques et environnemetaux, Limal, Anthemis, 2019	2019
Heine, Dirk and Faure, Michael G. and **Lan, Chih-Ching**, Augmenting Forest Sustainability Certificates with Fiscal Instruments (August 1, 2016). Rotterdam Institute of Law and Economics (RILE) Working Paper Series No. 2015/7.	2016
Co-author of *Energy for an integrated future: Opportunities for the Öresund Region,* 2013, Lund: IIIEE (International Institute for Industrial Environmental Economics).	2013

EDLE PhD Portfolio	
Name PhD student	: Chih-Ching Lan
PhD-period	: October 2014 – September 2018
Promoters	: Prof. Michael Faure, Prof. Sharon Oded

PhD training	
Bologna courses	***year***
Game Theory	2014
Introduction to the Italian legal system	2014
Game Theory and the Law	2014
Basic Statistics	2014
Experimental Economics	2014
Economic Analysis of Law	2014
Public L&E	2014
Lecture from Prof. Dean Lueck	2014
Behavioural L&E: Enforcement mechanism	2015
Behavioural L&E: Game theory	2015
European competition law & intellectual property rights	2015
European securities and company law	2015
Specific courses	***year***
Seminar Series 'Empirical Legal Studies'	2015
Academic writing skills for PhD students	2015
Seminar "how to write a PhD"	2015
Foundation of Ius Commune (Maastricht)	2016
Seminars and workshops	***year***
Bologna November seminar (attendance)	2014
BACT seminar series (Rottedam) (attendance)	2014 - 2018
EGSL lunch seminars (attendance)	2014- 2018
Rotterdam Fall seminar series (peer feedback)	2015
Workshop on "smart mixes in relation to forest & climate governance" (Amsterdam)(attendance)	2015

EMLE mid-term meeting (Rotterdam) (attendance)	2015
Smart mixes in relation to fishierie and oil pollution	2015
Joint Seminar 'The Future of Law and Economics' (Rotterdam)(attendance)	2016
Rotterdam Winter seminar series (peer feedback)	2016
Smart Mixes in Relation to Transboundary Environmental Harm (Rotterdam) (attendance)	2016
EGSL Review day (Rotterdam)(attendance)	2016
ISS 14th Development Dialogue (Hague) (attendance)	2016
21st Ius Commune Congress (Maastricht) (attendance)	2016
Presentations	***year***
Bologna March seminar	2015
Hamburg June seminar	2015
Rotterdam Fall seminar series	2015
IUCN Colloquium (Jarkata)	2015
EALE conference (Vienna)	2015
20th Ius Commune Congress (Leuven)	2015
Rotterdam Winter seminar series	2016
Bologna November seminar	2016
Rotter New Year Poster Presentation	2016
17th Global Conference on Environmental Taxation (Groningen)	2016
Joint Seminar 'The Future of Law and Economics'	2017
IUFRO Congress (Freiburg)	2017
IUFRO Congress poster presentation (Freiburg)	2017
IUFRO social sciences conference on African Forest Policies and Politics (AFORPOLIS) (Yaoundé, Cameroon)	2018
Attendance (international) conferences	***year***
19th Ius Commune Congress (attendance)	2015
UNFCCC SBSTA 42 meeting	2015
UNFCCC COP 21 (Paris) (attendance)	2015
EFFACE (EU Action to Fight Environmental) conference (Brussels) (attendance)	2016
14th Annual Colloquium of the IUCN Academy of Environmental Law (Oslo) (attendance)	2016

EALE 33rd Annual conference (Bologna) (attendance)	2016
Others	***year***
IUFRO Summer school 2017 "Forest and Environment Policy Research: From Theory to Method and Back	2017