DRIVERS OF DEFORESTATION AND FOREST DEGRADATION

A Synthesis Report for REDD+ Policymakers

BY GABRIELLE KISSINGER, MARTIN HEROLD, VERONIQUE DE SY

Acknowledgements

The authors wish to thank Stephen Cornelius, Peter Graham and Eirik Brun Sørlie for their guidance, support and advice; and also Donna Lee and Jim Penman for providing significant contributions. We also thank the following reviewers for their contributions:

Arild Angelsen, Federica Bietta, Anne Bodganski, Doug Boucher, Tim Boyle, Emily Brickell, Andreas Dahl-Jørgensen, Ruth DeFries, Christine Dragisic, Pipa Elias, Thomas Enters, Jagdish Kishwan, Cyril Loisel, Alex Lotsch, Nur Masripatin, Henry Neufeldt, Sekai Ngarize, Matthias Reiche, Kimberly Todd, Josefina Braña Varela, Ingrid Visseren-Hamakers, Nathalie Walker, Chunfeng Wang, and Reinhard Wolf.

This publication has been produced with the financial assistance of the United Kingdom Departments for Energy and Climate Change (DECC) and International Development (DFID) and The Government of Norway's International Climate and Forest Initiative.

The views expressed herein are the sole responsibility of the authors and do not necessarily reflect the views of Her Majesty's Government or the Government of Norway.

Referencing this report:
Kissinger, G., M. Herold, V. De Sy. Drivers of Deforestation and Forest Degradation: A Synthesis Report for REDD+ Policymakers. Lexeme Consulting, Vancouver Canada, August 2012.

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Acronym list

A/R	Afforestation and reforestation
CBFM	Community-based forest management
CIFOR	Centre for International Forestry Research
CGIAR	Consultative Group on International Agricultural Research
COP	Conference of the Parties
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	The FAO Statistical Database
FCPF	World Bank Forest Carbon Partnership Facility
FLEGT	European Forest Law Enforcement, Governance and Trade Action Plan
GDP	Gross domestic product
GHG	Greenhouse gas
IDH	Dutch Sustainable Trade Initiative
ILUC	Indirect land-use change
IPCC	Intergovernmental Panel on Climate Change
NAMA	Nationally Appropriate Mitigation Action
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PES	Payments for ecosystem services
REDD+	Reducing emissions from deforestation and forest degradation in developing countries: the '+' refers to the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.
RL	Forest reference level
REL	Forest reference emission levels
R-PP	REDD+ Readiness Preparation Proposal
R-PIN	REDD+ Readiness Plan Idea Note
SBSTA	Subsidiary Body for Scientific and Technological Advice
UNFCCC	United Nations Convention on Climate Change
UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
UK	United Kingdom
US	United States of America

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Executive Summary

The long-term viability of REDD+ depends on altering business-as-usual activity in sectors currently driving greenhouse gas (GHG) emissions from forests. This synthesis report investigates activities (drivers) that lead to deforestation and forest degradation. It explores the relevance of drivers in REDD+ policy development and implementation, key interventions to address driver activity, the role of drivers for national forest monitoring and for developing REDD+ forest reference (emission) levels. It concludes with recommendations intended to support the on-going international climate negotiations, as well as country-level plans and interventions to affect drivers of deforestation and forest degradation.

Current drivers and future projections:

Proximate or direct drivers of deforestation and forest degradation are human activities and actions that directly impact forest cover and result in loss of carbon stocks. **Agriculture is estimated to be the proximate driver for around 80% of deforestation worldwide.** Commercial agriculture is the most important driver of deforestation in Latin America (around 2/3 of total deforested area). In Africa and (sub)tropical Asia it accounts for around 1/3 of deforestation and is of similar importance to subsistence agriculture. Mining, infrastructure and urban expansion are important but less prominent. Findings on global patterns of degradation indicate that (commercial) **timber extraction and logging activities account for more than 70% of total degradation in Latin America and (sub)tropical Asia.** Fuel wood collection, charcoal production, and, to a lesser extent, livestock grazing in forests are the most important drivers of degradation in large parts of Africa.

Underlying or indirect drivers are complex interactions of social, economic, political, cultural and technological processes that affect the proximate drivers to cause deforestation or forest degradation. They act at multiple scales: **international (markets, commodity prices), national (population growth, domestic markets, national policies, governance) and local circumstances (subsistence, poverty).** Our findings confirm that economic growth based on the export of primary commodities and an increasing demand for timber and agricultural products in a globalizing economy are critical indirect drivers. In REDD+ readiness plans, **many countries identify weak forest sector governance and institutions, lack of cross-sectoral coordination, and illegal activity (related to weak enforcement)** as critical underlying drivers. Population growth, poverty and insecure tenure are also cited. International and market forces, particularly commodity markets are also key underlying drivers.

Pressures from many international drivers to clear forests are expected to increase in future due to global urbanization, increasingly meat-based diets, long-term population trends, increasing developing country prosperity, growth in developing country regional markets for key commodities, and climate change adaptation factors.

Drivers in REDD+ policy development and implementation:

While pressures to clear forests will increase in the future, there are **promising strategies to decouple economic growth from deforestation.** In some cases, REDD+ incentives will be insufficient to affect drivers. National approaches – based on effective land-use planning, policies and incentives – allow for re-directing high opportunity cost activities to places with lower carbon values without sacrificing economic development. Addressing the underlying factors is crucial to determine whether direct driver interventions will succeed in achieving the emissions reductions intended.

Countries engaged in REDD+ readiness activities most commonly prioritize sustainable management of forests, followed by fuel wood efficiency, and better enforcement and institutional strengthening, particularly related to slowing rates of illegal logging. Community forest management and addressing tenure and rights concerns is also a priority. A significant number of countries place emphasis on REDD+ driver interventions appropriate to mosaic landscapes; these include agroforestry, afforestation, reforestation and assisted natural regeneration. **Countries largely define strategies and interventions to deal with national and local scale drivers, but face problems addressing international drivers and acknowledge that international pressure will increase.**

Country interventions to affect drivers share commonalities and challenges. A few critical enabling factors stand out when designing strategies to affect drivers in REDD+ policy development and implementation. For instance, the **importance of good governance and tenure security as a basis for effective REDD+** incentives. Others require more information and strategy sharing between and within countries (such as how to ensure agricultural intensification does not increase forest clearing, and how to create effective cross-sectoral commitments). Countries can explore synergies – how addressing one driver affects other underlying drivers – when designing interventions.

Scales of interventions to affect drivers:

As drivers of deforestation and degradation operate at sub-national, national, regional, and global scales, so too must strategies and interventions aiming to affect them. Interventions can engage actors at various scales, for instance commodity roundtables and public-private sector partnerships. Consumer and producer countries have a range of tools and interventions to **address international activities driving deforestation.** These can be voluntary measures (e.g. EU Voluntary Partnership Agreements, procurement and sourcing commitments) or regulatory (such as import controls). Where demand- and supply-side interventions are mutually reinforcing, there will be greater chance to affect driver activity. **National-level interventions** can include a range of incentives (e.g. tax policies, benefit-sharing), disincentives (e.g. moratoria, fees) and enabling measures (e.g. adequate governance, enforcement, policies and land-use planning, secure tenure rights). **Local-level interventions** need to be suited to local conditions, but considered within the context of national REDD+ plans to ensure the right incentives, enabling conditions, and policy levers are in place.

Effective delivery will depend on capacity and institutions capable of carrying out interventions at the appropriate scales. Also, impact assessments, transparency and monitoring should be in place at the outset to track intervention performance and attribution. Interventions seeking to affect commodity production (agriculture, forest products, mining, etc.) would benefit from information sharing that extend beyond national boundaries, particularly on cross-border trade, domestic and trans-boundary drivers of deforestation and degradation and leakage effects, as a basis for informed strategies and interventions.

The role of drivers in national forest monitoring and in developing forest reference (emission) levels:

Regularly assessing and monitoring drivers are valuable for designing and performing REDD+; in particular to facilitate engagement with non-forest sectors. Many REDD+ countries are starting to quantitatively identify drivers at the national level. Spatial assessments based on remote sensing and ground data to link forest changes to land-use activities are important to capture the spatial and temporal relationships between proximate drivers, track their impacts over time and to support region-specific strategies to reduce emissions. Analysing and assessing underlying causes, such as international markets, trade policies, technological change and population growth, are not readily detectable using remote sensing and ground data, but rely on economic and social indicators, data sources, statistical analysis and modelling.

The types of **drivers of deforestation and forest degradation have great influence on the forest carbon impacts and the choice of data sources and methods used to measure** and monitor them. Thus, the usefulness of different monitoring approaches varies. Indicators, methods and proxies need to be carefully chosen, particularly for monitoring activities leading to forest degradation.

Historical data and **understanding forest change patterns and underlying causes are important for developing forest reference (emission) levels,** as information concerning which drivers are important is needed to take national circumstances into account, and to construct plausible future scenarios that may deviate from historical trends. Since the availability of data on drivers remains uncertain in many REDD+ countries, **a stepwise approach can provide a starting point that matches the available data and their quality with the choice of reference level methods,** its uncertainties and country circumstances; while improving national capacities and the quality of reference levels over time.

The conclusions and recommendations offered at the end of this report synthesize key findings and potential actions for consideration in international climate negotiations, and national plans and interventions to affect drivers of deforestation and forest degradation.

Section 1 ///

Introduction

This report aims to improve knowledge on the role of drivers of deforestation and forest degradation for REDD+[1] by promoting a common understanding among delegates of the United Nations Convention on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technological Advice (SBSTA). The report intends to support the work of SBSTA, as well as related REDD+ processes and initiatives, in order to inform a decision-making process leading towards guidance or a decision on drivers of deforestation and forest degradation (hereafter "drivers") at the 18th UNFCCC Conference of Parties in December 2012 in Doha. Appendix II of the December 2010 Cancún Decision 1/CP.16[2] requests the SBSTA to:

> (a) Identify land use, land-use change and forestry activities in developing countries, in particular those that are linked to the drivers of deforestation and forest degradation, identify the associated methodological issues to estimate emissions and removals resulting from these activities, and assess the potential contribution of these activities to the mitigation of climate change, and report on the findings and outcomes of this work to the Conference of the Parties (COP) at its eighteenth session on the outcomes of the work referred to in this paragraph;

The REDD+ Partnership workshop on drivers of deforestation and REDD+ on 13 May 2012[3] emphasized different levels of understanding amongst representatives. The country submissions in March 2012 to the SBSTA[4] are far-ranging and exhibit varying degrees of specificity relating to drivers, as did the subsequent initial consideration at SBSTA 36 in May 2012.

The synthesis provided here on drivers of deforestation and forest degradation is building, as much as possible, on the scientific literature and available national and international data. It contains a global assessment of key drivers, explores the relevance of drivers in REDD+ policy development and implementation and key interventions to address proximate and underlying drivers, the role of drivers for national forest monitoring and for developing forest reference emission levels and/or forest reference levels. Furthermore, it offers strategic advice to REDD+ policy makers on what particular contributions the UNFCCC might provide to support and enhance national efforts to affect the drivers of deforestation and forest degradation. Based on this synthesis, a set of recommendations is derived that the authors hope will help to underpin and support the on-going international climate negotiations, as well as country-level plans and interventions to affect drivers.

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1 Reducing emissions from deforestation and forest degradation in developing countries: the '+' refers to the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.
2 1/CP.16 Appendix II http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2
3 Find more information at http://foris.fao.org/meetings/download/_2012/redd_partnership_meeting_2/misc_documents/bonn_meeting_and_workshop_report_may_2012.pdf and http://reddpluspartnership.org/73943/en/
4 See http://unfccc.int/resource/docs/2012/sbsta/eng/misc01.pdf and http://unfccc.int/resource/docs/2012/sbsta/eng/misc01a01.pdf

We need to promote development that does not destroy our environment.

— WANGARI MAATHAI

Key Messages

1. In the REDD+ debate the term 'driver' is used broadly but for analysis, assessment and intervention strategies it is important to separate proximate/direct causes and underlying/indirect causes of deforestation and forest degradation.

2. Assessment of direct and indirect drivers and their interaction on the national level are just starting to emerge and are often generic and incomplete.

3. Commercial agriculture is the dominant proximate driver of deforestation in the majority of developing non-Annex I countries and especially in all Latin America.

4. Commercial timber extraction and selective logging activities are the main drivers of forest degradation in Latin America and (sub)tropical Asia while fuel wood collection and charcoal production are the main forest degradation drivers on the African continent.

5. The main indirect driving forces of forest change are all expected to increase in the coming years. These include population and economic growth based on the export of primary commodities, national and international demand for agricultural products (food and biofuels), wood products and minerals are all expected to increase in the coming years.

6. In their Readiness Preparation Proposals (R-PPs), most countries stress weak governance and institutions in forest-related sectors, including conflicting cross-sectoral policies and illegal activities (related to weak enforcement) as critical underlying drivers of deforestation and degradation.

7. Shifts are occurring in underlying drivers that will redefine pressures on forests in the future, such as global urbanization, increasing developing country prosperity, changing food consumption patterns, growth in developing country regional markets for key commodities, and climate change adaptation factors.

/// 2.1 Overview and definitions

A distinction is commonly made between proximate/direct causes and underlying/indirect causes of deforestation and forest degradation (Geist and Lambin, 2001; Millennium Ecosystem Assessment, 2005). Proximate causes are human activities or immediate actions that directly impact forest cover and loss of carbon. These causes can be grouped into categories such as agriculture expansion (both commercial and subsistence), infrastructure extension and wood extraction.

Underlying causes are complex interactions of fundamental social, economic, political, cultural and technological processes that are often distant from their area of impact. These underpin the proximate causes and either operate at the local level or have an indirect impact from the national or global level. They are related to international (i.e. markets, commodity prices), national (i.e. population growth, domestic markets, national policies, governance) and local circumstances (i.e. change in household behaviour) (Geist and Lambin, 2001; 2002; Obersteiner et al., 2009).

In this report we understand drivers in a broad sense as reflecting both proximate and underlying causes, however it is often important to address them separately and examine them at various scales for specific analysis and intervention strategies.

/// 2.2 Analysing the importance of different drivers

Although agricultural expansion has been identified as the key driver of deforestation in the tropics in the 1980 and 1990s (Gibbs et al., 2010; Kaimowitz and Angelsen, 1998; Chomitz, 2007), drivers vary regionally and change over time (Rudel et al., 2009; Boucher et al., 2011). Analyses of drivers have largely been based on local or regional case studies (Geist and Lambin, 2002) or on coarser assessments on the continental and global scales (DeFries et al., 2010, Rademaekers et al., 2010); with less focus on the national level. However, several data sources have recently become available based on country REDD+ readiness activities that allow for a more comprehensive assessment of country-level drivers of deforestation and forest degradation. It should be noted that as the quality and sources of national information on drivers are not always clear, this section should be seen as a first inventory of what countries identify as relevant and important drivers.

2.2.1 Overview of direct or proximate drivers

For the assessment of the importance of proximate drivers of deforestation and forest degradation, we used Readiness Plan Idea Notes (R-PIN)[5] and Readiness Preparation Proposals (R-PP)[5] prepared for the World Bank Forest Carbon Partnership Facility (FCPF) and UN-REDD Programme Documents, a study on proximate drivers of deforestation throughout history for 25 tropical countries (Matthews et al., 2010), CIFOR country profiles (CIFOR, 2012), and the UNFCCC National Communications (see Hosonuma et al., 2012 for more details). We used these data sources to synthesize proximate/direct driver data for 46 non-Annex I countries, which encompass 78% of the total forest area (in 2010) of the total 100 (sub)tropical non-Annex I countries under consideration (FAO, 2010a; Romijn et al., 2012).

The proximate drivers are considered separately for deforestation and forest degradation. We consider commercial and subsistence agriculture, mining, infrastructure extension and urban expansion as direct drivers of deforestation[6]; while activities such as logging, uncontrolled fires, livestock grazing in forests, and fuel wood collection and charcoal production are considered to be drivers of forest degradation[7] (Hosonuma et al., 2012). We use these general definitions[8] and broad categories to provide a set of driver types for comparative analysis that allow for the variation in detail and quality of information reported by countries.

5 The data from the REDD+ country reports are self-reported by countries and are of varying quality given the different level of capacities to identify and analyse drivers.

6 Deforestation here is defined as the conversion from forest into other land use categories, with the assumption that forest vegetation is not expected to regrow naturally in that area.

7 Forest degradation is defined as reduction of the canopy and loss of carbon in forests remaining forests, where the human disturbances are not associated with a change in land use and where, if not hindered, the forest is expected to regrow or be replanted.

8 We note that there are various other definitions of deforestation and degradation, these were merely used for this analysis.

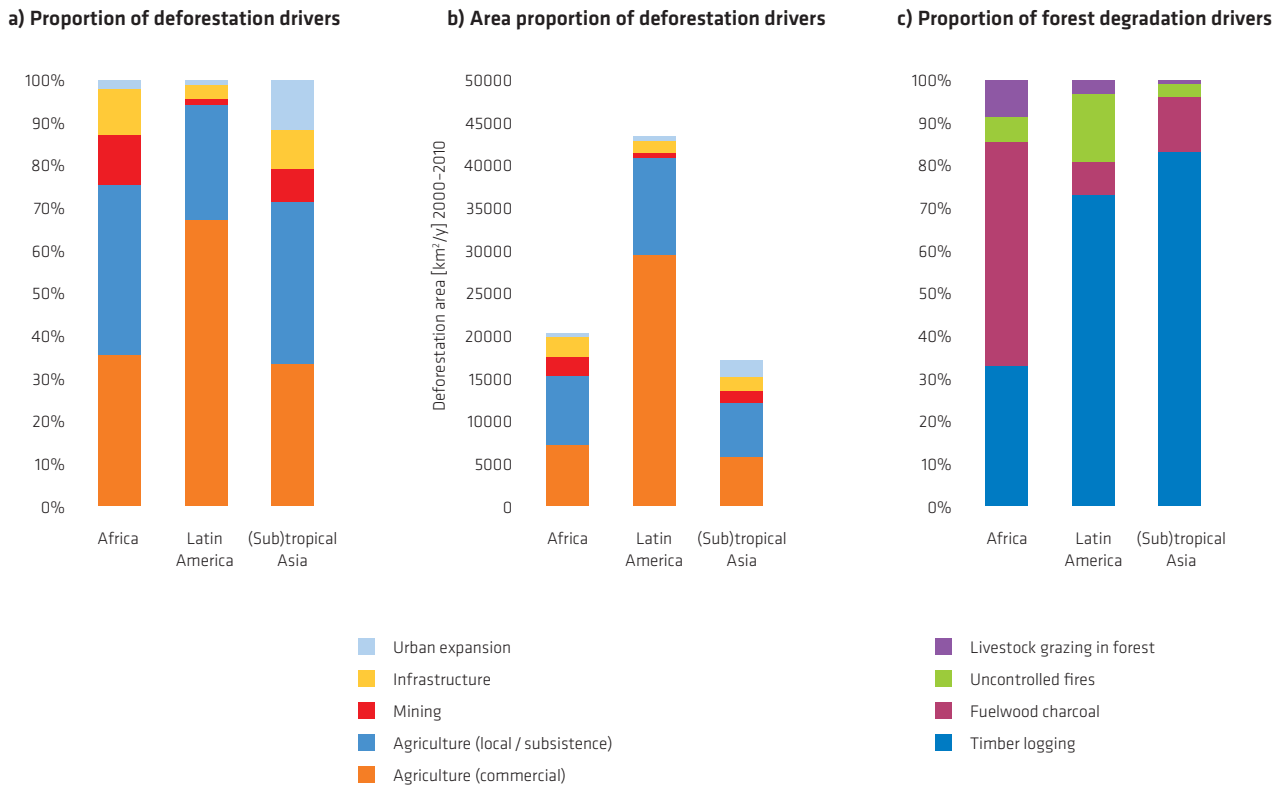

FIGURE 2.1 *Continental-level estimations of the importance of deforestation drivers as reported by 46 countries: (a) in terms of overall continental proportions as sum of country data weighted by net forest area change by country (km²/y, FAO, 2010a) for the period 2000–2010 (b) the same data shown in terms of absolute national net forest area change by (km²/y, FAO, 2010a), and (c) for continental estimations of relative importance of degradation drivers (Source: Hosonuma et al., 2012)*

The national driver estimations are presented for the three continents Africa, Latin America, and (sub)tropical Asia (including Oceania) for deforestation (Figure 2.1a and b) and degradation (Figure 2.1c). Commercial agriculture (including livestock) is the most important driver of deforestation in Latin America leading to around 2/3 of total deforested area. In both Africa and (sub)tropical Asia commercial agriculture accounts for around 1/3 of deforestation and is of similar importance as subsistence agriculture. Based on this synthesis of nationally reported data, agriculture is estimated to be the proximate driver for around 80% of deforestation worldwide which is in line with estimates provided by Geist and Lambin (2002), and Gibbs et al. (2010) for the 1980s and 1990s. Mining plays a larger role in Africa and (sub)tropical Asia than in Latin America. Urban expansion is most significant in (sub)tropical Asia, perhaps due to the large population growth (De Fries et al., 2010). Timber and logging activities account for more than 70% of total degradation in Latin America and (sub)tropical Asia (Figure 2.1c). Fuel wood collection and charcoal production is the main degradation driver for the African continent, and is less prominent in (sub)tropical Asia and Latin America.

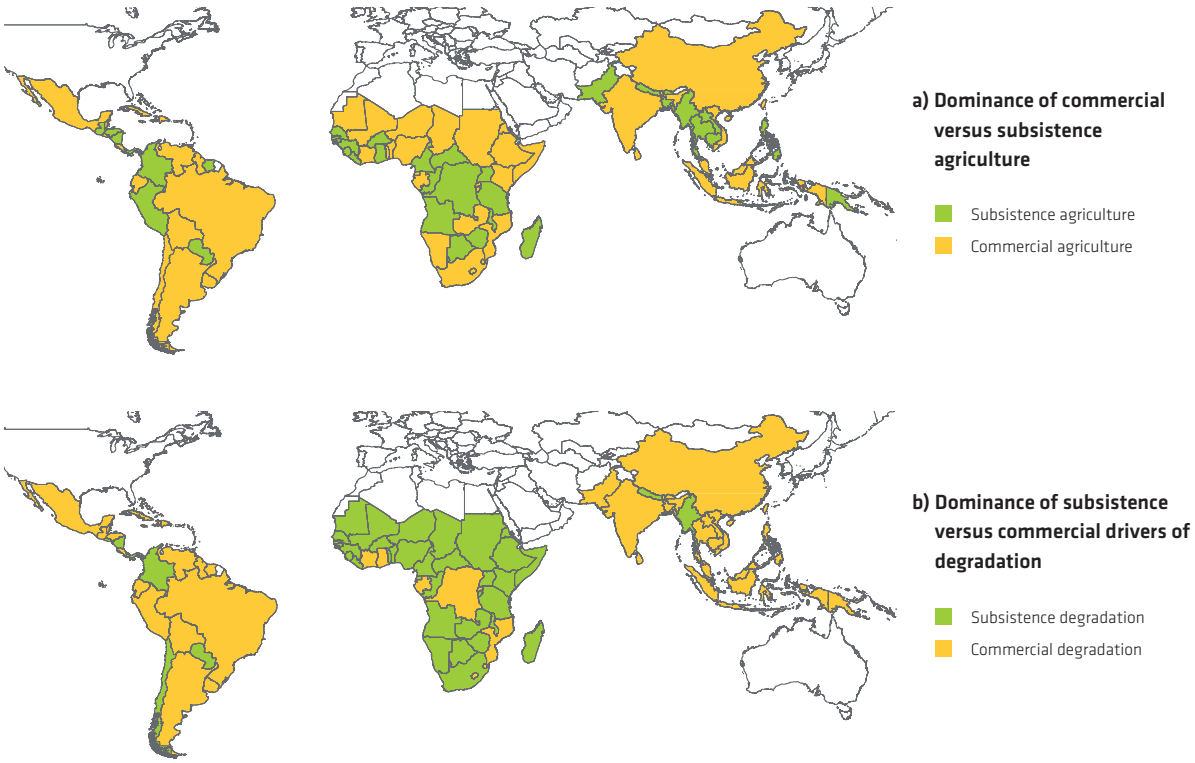

FIGURE 2.2 *Spatial distribution of dominance (importance < 50%) of subsistence agriculture versus commercial agriculture (a); and of subsistence drivers of degradation (fuel wood collection, charcoal production and livestock grazing in forest) versus commercial drivers of degradation (timber/logging) (b) for 100 (sub)tropical non-Annex I countries*

Agriculture is the most significant driver of deforestation, but with differences in geographic distribution of the importance of commercial versus subsistence agriculture (Figure 2.2). For decades the common view was that growing populations of shifting cultivators and smallholders were the main driver of forest changes. More recently, it is shown that commercial actors play a larger and increasing role in the expansion of agriculture into forests and for many countries commercial agriculture is dominant over subsistence agriculture (Boucher et al. 2011, Figure 2.2a) in particular in the Amazon region and Southeast Asia. Here agribusinesses, increasingly producing for international markets (cattle ranching, soybean farming and oil palm plantations) were identified as main drivers of post-1990 deforestation (Rudel et al., 2009; Boucher et al., 2011). Figure 2.2b shows that fuel wood collection, charcoal production and to a lesser extent livestock grazing in forests are the most important drivers of degradation in large parts of Africa while in the majority of countries on other continents forest degradation is dominated by commercial wood extraction.

2.2.2 Overview of indirect or underlying drivers

Underlying drivers consist of an interplay of demographic, economic, technological, institutional, and socio-cultural factors (Geist and Lambin, 2002). This section gives an overview of common underlying drivers of deforestation and forest degradation identified in scientific studies, and of those reported by countries as part of REDD+ readiness activities. For both these sources the analysis of underlying drivers stays rather generic in both cases, and more comprehensive analysis is needed at national levels as part of REDD+ readiness planning.

Economic growth based on the export of primary commodities and increasing demand for timber and agricultural products in a globalizing economy are identified as main indirect drivers of deforestation and degradation across the

pan-tropics (Rademaekers et al., 2010). Recent remote sensing data, combined with population and economic trends illustrates that agricultural production for domestic urban growth and agricultural exports to other countries are the primary drivers of tropical deforestation, with the impact of smallholders decreasing (DeFries et al., 2010). Tropical deforestation and forest degradation in Africa remains dominated by small-scale processes, not by large-scale globalized agriculture (DeFries et al., 2010; Fisher, 2010). Population growth and population density are closely interrelated with increased demand for agricultural land, pressures on fuel wood, easier access to remote forests due to infrastructure development, land tenure arrangements, agro-technological change and increased demand for forest products (Rademaekers et al., 2010). Poor governance, corruption, low capacity of public forestry agencies, land tenure uncertainties, and inadequate natural resource planning and monitoring can be important underlying factors of deforestation and forest degradation; for example regarding the enforcement of forest policies and combatting illegal logging (Rademaekers et al., 2010).

An analysis of the underlying drivers, drawing largely on 31 national REDD+ R-PPs (see Appendix A for summary), reveals that countries identify weak forest sector governance and institutions, including conflicting policies beyond the forest sector, and illegal activity (related to weak enforcement) as critical underlying drivers of deforestation and degradation (93% of countries). Population growth is the next most commonly reported underlying driver (51%), followed by poverty (48%) and insecure tenure (48%). 41% of countries explicitly mention international and market forces, particularly commodity markets, prices, and foreign direct investment as key underlying drivers. Some countries that reference agricultural export commodities as direct drivers of deforestation do not make the linkage to international and market forces as underlying drivers. The contrast between findings of scientific and other studies and what is reported by countries, emphasizes the fact that there is a need for more robust and comprehensive information about underlying drivers of deforestation and degradation.

/// 2.3 Expected developments for key underlying drivers

Historical patterns in drivers of deforestation and forest degradation drivers may not necessarily be repeated in the future. Shifts are occurring that will redefine pressures on forests; in global urbanization, increasingly meat-based diets, long-term population trends, increasing developing country prosperity, growth in developing country regional markets for key commodities, and climate change adaptation factors.

Population growth and economic development leads to trade-offs between different land uses. International trade, the shifting regional balance, and the demand for natural resources (e.g. minerals, timber, agricultural products) and land (e.g. infrastructure development, urbanization) will play an increasing role as global underlying drivers of deforestation and forest degradation (see Table 2.1, page 14).

2.3.1 Population growth and economic development

A growing population implies a growing demand for agricultural and forest products (Rademaekers et al., 2010). Stabilized rural birth rates, increased per capita consumption of food (largely due to increased meat consumption) and increased urbanization in the future reinforces the trend of deforestation increasingly being driven by global commodity markets, and not by local populations (DeFries et al., 2010).

2.3.2 Agriculture

The FAO predicts a 70% increase in the demand for food by 2050, with a needed increase of 49% in the volume of cereals produced and an 85% increase in the volume of meat to be produced (FAO, 2009). Nearly all that additional food is expected to be consumed by developing countries, based on population and living standard increases (Foresight, 2011). Increasing agricultural yields has been the predominant mode for increased food production for the last several decades, but intensification can also lead to more deforestation in some circumstances (Boucher et al., 2011; Rudel et al., 2009). Foreign direct investment in land in least developed countries in Africa and Southeast Asia due to global shortages of arable land is

TYPE	MAJOR FUTURE TRENDS
Global population	• Global increase, predominantly in urban areas, to 8.2 billion in 2030 • Largest increases in population in Africa (+235 million) and Asia & Pacific (+255 million) • Stabilized population level of 8 to 10 billion after 2050 due to rising living standards, urbanization, and declining birth rates
Economic growth	• Brazil, the Russian Federation, India and China are anticipated to continue growing over the next ten years at 8% per annum (OECD/FAO, 2012) • Developing world will account for more than half of global economic growth throughout 2012/14 (World Bank, 2012)
Agricultural commodities	• Overall, 70% increase in demand for food products by 2050 (FAO, 2009)
Oil seeds	• 23% expansion of oil seed production between 2011–2020 (OECD/FAO, 2011) • Two-thirds of global expansion is expected to occur in the developing world • Developing countries (particularly Asia), will likely continue to dominate the increase in vegetable oil (and oilseed meal) consumption (OECD/FAO, 2011)
Oil palm	• 45% rise in palm oil output (mainly by Indonesia and Malaysia)(OECD/FAO 2011)
Meat	• 85% increase in the volume of meat produced by 2050 (FAO, 2009) • Developing countries will account for about 78% of the additional output, mainly in Latin America (Brazil) • Growth in demand from large economies in Asia, Latin America and oil exporting countries (OECD/FAO 2011)
Biofuels	• Global production expected to increase rapidly over the next ten years • Ethanol increasing from 100 to 160 billion litres and biodiesel from 20 to 42 billion litres from 2010 to 2020 (OECD/FAO, 2011)
Wood products (Pulp, Paper and sawlogs)	• Annual potential sustainable production capacity of plantations will reach in 2020 around 1.8 billion cubic meters per year • More than 80% of this potential is located in the tropics and other countries in southern hemisphere • Brazil, China and Russia will take over as world leaders with India and Vietnam increasing their relative market importance of the international trade of wood products by 2020 (FAO Advisory Committee on Paper and Wood Products, 2007) • International trade represents only 3.5% of the total global roundwood production (Rademaekers et al., 2010), thus domestic consumption, domestic fuel wood use and illegal logging are not represented in trade statistics
Fuel wood/ Charcoal	• People reliant on traditional biomass use globally will decrease by 175 million between 2008 and 2030 • 34% increase in fuel wood consumption from 2000–2020 for Sub-Saharan Africa (FAO, 2009)
Mining	• Projected to increase due to population growth and economic development • Developing countries and emerging markets will see greatest supply and demand expansion (PriceWaterhouseCoopers, 2012)

TABLE 2.1 *Indications of future drivers*

increasing (see Section 3.3.6, page 24), potentially impacting local food security and forests, however there are few projections on future patterns.

Environmental and social concerns might relieve some of the pressure on forests caused by this increased demand for food and feed. Growing consumer awareness of the environmental and social impacts and environmental non-governmental organizations campaigns and round-tables might create stricter standards around expanding agriculture (Greenpeace International, 2007; OECD/FAO, 2011; Boucher et al., 201; Paoli et al., 2010).

Climate change will likely increase its role as a key underlying driver, causing shifts in land use in response to ecosystem change (HLPE, 2012). How this will affect pressure on forests is unclear.

2.3.3 Wood products (timber and pulp)

There are indications that production is moving away from primary forests and onto plantations (FAO, 2010b), with eucalyptus pulp and logs dominating the market. While traditionally timber production has not been an important driver of deforestation in Africa (Fisher, 2010), it may be growing in importance (Laporte et al., 2007).

Import controls in the US and EU are having an effect on illegal logging, and an increasing number of countries are participating in the EU Voluntary Partnership Agreements under the European Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan. An in-depth study (Lawson and McFaul, 2010) demonstrates that actions taken by governments, civil society and the private sector over the last ten years in response to illegal logging and related trade have been extensive and had a considerable impact. There is a risk that as domestic wood consumption increases in developing countries, demand-side pressure from consuming countries with import controls could have less effect, to the extent that a larger proportion of domestic trade willing to source illegal wood dominates. Greater focus may now be required to slow illegal logging from smaller concessionaires and domestic producer-country markets for illegal wood products.

2.3.4 Energy

Developing economies are surpassing developed economies in economic development and GDP growth, and accounted for all the net growth in global crude oil consumption in the last decade (World Bank, 2012). This increase in oil consumption is a good indicator of the rising demand for energy and mineral resources. Rising oil prices will likely make alternative energy sources, such as biofuels and wood, more attractive in the future, and also increase the land demand for hydroelectricity.

Government adoption of policies and support measures for alternative energy sources, including time-bound targets for biofuel consumption (e.g. the EU Renewable Energy Directive (RED), U.S. Renewable Fuel Standard (RFS2), Brazil, China and India each have targets), has increased demand for biofuels. It is estimated that by 2020, 21% of the increase in global coarse grains production above current levels, 29% of the global vegetable oil production's increase, and 68% of global sugar cane production's increase will go to biofuels (OECD/FAO, 2011). As such, expansion of land used for biofuel production is expected to increase pressure on forests in the near future (Lapola et al., 2010).

There have been significant regional shifts in the patterns of fuel wood use globally in the past 15 years, with wood for energy having increased significantly in Africa and Latin America, but declined in Asia by approximately half, reflecting a pattern of increasing development and the availability of alternative fuel sources available to households in these countries (Klenk et al., 2012). Fuel wood will remain a major source of domestic energy for some time and domestic fuel wood use is expected to remain relatively stable over the next 20 years, while the demand for charcoal is likely to increase due to an expected increase in urbanization, as urban inhabitants use more charcoal than rural ones (Hofstad et al., 2009).

2.3.5 Mining

As worldwide demand for minerals and metals rises, mineral resources will be further exploited and this can contribute to forest degradation and deforestation (Rademaekers et al., 2010). Developing countries and emerging markets will see greatest supply and demand expansion (Price Waterhouse Coopers, 2012). However, while emerging markets are leading the long-term demand projections, supply remains constrained, with challenges such as declining grades, more remote locations, and the increasing scale of projects required to generate economic returns (Price Waterhouse Coopers, 2012). Production levels in 2010 increased across all major commodities (coal, iron ore, gold, bauxite, potash, nickel, platinum, zinc), with only copper and diamonds declining slightly (ibid). Not only industrial mining responds to rising commodity prices of minerals (e.g. gold); but also small-scale and illegal mining operations will likely increase as a result which can be detrimental for primary forests (Swenson et al., 2011; Schueler et al., 2011).

Over the coming decades, a decrease in the availability of productive land and competition with other land uses will make a global forest transition difficult to achieve. A combination of technological innovations, sound land management policies, adoption of more efficient land-use practices, and changes in consumption patterns holds the potential to affect the supply of and demand for wood and agricultural products, and to promote a global restoration of forests.

— PATRICK MEYFROIDT AND ERIC LAMBIN

Key Messages

1. Decoupling economic growth from deforestation is possible through cross-sectoral commitments and a mix of incentive investments, disincentives and enabling measures.

2. Interventions to reduce pressures from the largest driver of deforestation – commercial agriculture – are not adequately accounted for in REDD+ readiness plans, therefore it is critical to look beyond the forest sector to design and frame interventions to affect drivers.

3. Countries view agroforestry, afforestation and reforestation as essential strategies to address fuel wood demand, demand for construction materials, to increase carbon stocks and to restore degraded lands.

4. While countries face international drivers and acknowledge that international pressure will increase, countries largely define strategies and interventions that address only national- and local-scale drivers.

5. Information sharing between countries, particularly for tracking leakage effects beyond national borders, will be crucial. More understanding of options and tools countries can apply to address international drivers will be useful in the future.

6. Adequate forest governance, enforcement capacity and tenure security are pre-conditions for effective operation of incentive schemes.

7. A mix of incentives, disincentives and enabling measures, under a comprehensive REDD+ strategy, aimed at the most important proximate and underlying drivers is likely to provide greatest leverage. Measures pursued singly, e.g. agricultural intensification, will be much less effective or even counter-productive.

8. The development of REDD+ strategies that focus solely on affecting proximate drivers in order to demonstrate quantifiable emissions reductions may place less emphasis on addressing the critical underlying factors that will determine whether proximate driver interventions can succeed in achieving the intended emissions reductions.

Developing countries face the challenge of meeting their development objectives while preserving natural capital and not clearing forests. As identified in Section 2 (page 9) the main underlying drivers of forest change such as population and demand for agricultural products are all expected to increase. Historical patterns in the drivers of deforestation and forest degradation may not be repeated in the future, largely due to the expected more rapid economic development among developing countries. However, decoupling economic growth from deforestation is possible, and is explored in this section, with a focus on national-level interventions. International and local levels (or scales) are featured in Section 4 (page 25).

/// 3.1 National-level interventions

National decision-makers in REDD+ countries have three complementary means to affect drivers at national to local levels: incentives, disincentives and enabling measures (Börner et al., 2011). A further distinction is made between policy-based and incentive-based interventions, with policy-based interventions being comprised of policies to shift the balance of profitability between agriculture and forestry, policies that directly regulate land use, and cross-sector policies that underpin the first three (Angelsen, et al, 2009). Whether interventions are policy- or incentive-based will depend on a variety of factors, including the degree to which a country embraces a market- or policy-based approach to REDD+, the characteristics of the proximate and underlying drivers, strength of existing institutions and governance, the tenure rights of forest users, and many other factors.

Defining pathways to implement enabling measures will be critical, particularly as 93% of countries reviewed stress weak forest sector governance and institutions, including conflicting policies beyond the forest sector, and illegal activity as critical underlying drivers of deforestation and forest degradation.

The development of REDD+ strategies that focus solely on affecting direct drivers in order to demonstrate quantifiable emissions reductions may place less emphasis on addressing the critical underlying factors that will determine whether direct driver interventions can be successful in achieving the intended emissions reductions. Most often, a mix of incentive investments, disincentives and enabling measures, under a comprehensive REDD+ strategy, will provide greatest leverage to affect drivers (see Section 3.3.4, page 22) for insights on how this has worked in Brazil). For instance, an examination of the incentives, enabling policies and financial mechanisms necessary to intensify agricultural production without causing deforestation in Brazil, Ghana and Indonesia identified three key levers across the regions and commodities:

1. the provision of up-front public finance, followed by low-interest loans,

2. the establishment and enforcement of the correct enabling policy and regulatory frameworks,

3. the need for significant public investment in increasing the capacity of agricultural producers, and smallholders in particular (Prince's Charities' International Sustainability Unit, 2012).

Countries can devise strategies to align economic development with REDD+ and channel benefits back to influencing driver activity. For example, Argentina has a 35% export tax on soybean exports. Additionally, the National Forest Law created a fund to provide financing to strengthen capacities of provincial governments and compensate land owners conserving forests, funded via a 2% tax imposed on export agriculture commodities, resulting in a budget of $100 million in 2010, and resulting in rates of deforestation being reduced by 60% in one hotspot (Argentina, 2010). Another example is Indonesia's policy interventions – including a moratorium on forest conversion, combating illegal logging, associated trade and corruption, forest fire prevention, mandatory and voluntary instruments of sustainable forest management and verification of timber legality – which have reduced forest cover loss from 3.51 million hectare per year (1996-2000) to 0.83 million hectare per year (2006-2009) and further down to 0.45 million hectare per year (2011-2012) (MOFOR, 2012).

INTERVENTION/STRATEGY	Percentage of countries reviewed pursuing interventions/strategy as part of REDD+
Sustainable forest management	55%
Fuel wood efficiency/cookstoves	55%
Illegal logging/enforcement/institutional strengthening	45%
Community forest management/CBFRM/ Participatory Forest Management	45%
Agroforestry	42%
Tenure and rights	42%
Policy and governance reform	42%
Zoning and land-use planning	35%
Cross-sectoral coordination	32%
Agricultural intensification	32%
Reforestation	29%
Livestock/rangeland management	29%
Shifting expansion to/reforestation on degraded lands	26%
Payments for ecosystem services	23%
Protected areas strategies	23%
Afforestation	19%
Environmental and social impact assessment for development proposals	19%
Finance/credit disincentives	16%
Financial incentives (agriculture sector)	16%
EU Voluntary Partnership Agreements-FLEGT	16%
Promotion of alternatives to wood fuel (energy sector)	13%

Source: Author, based on assessment of 31 REDD+ readiness plans

TABLE 3.1 *Summary of national REDD+ readiness plan interventions and strategies to address drivers of deforestation and forest degradation*

/// 3.2 Overview of current national REDD+ strategies and interventions to address drivers

The authors reviewed 31 national REDD+ R-PPs, which are part of national REDD+ readiness activities. Appendix A (page 44) summarizes the direct and indirect drivers identified by countries reviewed. National draft strategies to address those drivers are indicators of what country REDD+ strategies will look like, based on initial assessments of drivers. Countries in the readiness phase seek to finalize draft strategies in subsequent REDD+ planning phases.

Sustainable forest management is the most commonly identified intervention, though the specific strategies ranged from better inventories and management plans, improved silvicultural technologies and forest certification to community forest concessions and better management regimes for agro-sylvio-pastoral systems (Table 3.1). A significant number of countries place emphasis on REDD+ driver interventions appropriate to mosaic landscapes; these include agroforestry, afforestation, reforestation and assisted natural regeneration. Agroforestry was identified by 42% as part of their REDD+ strategies to address the range of drivers that persist in many tropical frontier landscapes, particularly in mosaic and

multiple-use landscapes. 19% of countries include afforestation and 29% include reforestation in draft REDD+ strategies. These countries recognize afforestation and reforestation as essential strategies to address fuel wood demand, demand for construction materials, to increase carbon stocks and to restore degraded lands. Afforestation and reforestation (A/R) activities are generally seen as being different from the "enhancement of forest carbon stocks" referenced under REDD+ scope in the UNFCCC, however this needs further clarification. Currently, A/R is included in the Clean Development Mechanism. Many countries identify the need for plantations for pulp and sawlogs to satisfy market demands as well as meeting fuel wood and charcoal needs. Finding solutions to the fuel wood driver of forest degradation is a clear priority for 55% of countries reviewed, which seek to promote more efficient cook stoves.

Further linked to forest sector reforms and sustainable forest management, 45% of countries seek to increase enforcement capability, forest sector institutional strengthening and more effective controls on illegal logging with 16% specifically mentioning the EU FLEGT as a key priority for their REDD+ strategy. Countries are candid about the need for policy and governance reform (42% of countries reviewed) as a key strategy to address drivers, though this is also a core component of country readiness activities to prepare for REDD+. Community forest management is also identified as an intervention to address weak governance, high opportunity costs of forests, and insecure tenure arrangements, with 45% of the countries reviewed identifying various forms of community-based forest management approaches, often tied to REDD+ benefit-sharing arrangements. Securing tenure and rights of access and use is a priority for 42% of countries, and depending on the national and regional circumstances, this is tied to benefit-sharing and also community forest management.

While degradation is generally less important than deforestation in terms of emissions, Table 3.1 (page 19) illustrates the degree to which draft readiness plans focus on solutions relating to forest products, lacking the necessary emphasis on agriculture, especially commercial agriculture. While a number of countries seek REDD+ finance to support agricultural intensification (32%) and promote better utilization of degraded or abandoned agricultural lands (26%), no country explicitly ties these two strategies together, and only one country has identified both priorities (though they are not linked). Four of the countries that envisage their REDD+ strategy promoting agricultural intensification also identify land-use planning as a priority, which may offer avenues to identify degraded lands and encourage cross-sectoral land use solutions. See Section 3.3.4 (page 22) on agricultural intensification and avoided deforestation strategies and Section 3.3.5 (page 23) on cross-sectoral coordination for insights on how this shortcoming can be addressed.

Four countries explicitly mention poverty reduction as a primary REDD+ strategy, however other countries include this intent in their plans for establishing benefit-sharing mechanisms, plans to bolster community forest management, or as a side-benefit of payments for ecosystem services.

Based on this review of draft REDD+ strategies, it is apparent that while countries face international drivers and acknowledge this threat will increase, countries largely define strategies and interventions that address national- and local-scale drivers. Those few countries that articulate cross-border approaches (related to commercial agriculture and illegal/legal wood flows) express interest in information sharing with neighbouring countries, particularly for tracking leakage effects. Thus, greater understanding of options and tools countries can apply to address international drivers may be useful in the future (see Section 4, page 25).

/// 3.3 Commonalities and challenges

Based on a comprehensive literature review and review of the 31 national REDD+ R-PPs, the following issues are explored in greater depth: land tenure security, adequate information systems for decision-making, the value of good governance, agricultural intensification as a deforestation strategy, cross-sectoral commitments, and the challenges of leakage, indirect land use change and foreign direct investment. Some of these are critical to consider when designing interventions to affect drivers in REDD+ policy development and implementation (such as improved governance and security of tenure) and others stand out as requiring more information and strategy sharing between and within countries (such as how to ensure agricultural intensification does not increase forest clearing, and how to create effective cross-sectoral commitments).

3.3.1 Land tenure security: a critical determinant in forest outcomes

Land tenure security, defined as "the assurance that land-based property rights will be upheld by society" is a critical determinant of forest outcomes that slow deforestation, based on a review of over 100 empirical cases of forest outcomes under specific land tenure conditions (Robinson et al., 2011). Of the 31 country readiness plans reviewed for this report, 48% list insecure tenure as a key underlying factor of unsustainable forest use (see Appendix A, page 44). REDD+ readiness plans are candid in their characterization of how tenure directly relates to legal and illegal forest clearing activity, and the challenges of government's role in management and enforcement of policies affecting lands without clear land tenure security. Land tenure security is generally associated with less deforestation, and ensuring that tenure is secure is perhaps more important than the form of tenure for designing policies to influence forest outcomes (Robinson et al., 2011). Their review finds that legitimate communal land, public property and leased property can also be secure, and thus security of tenure is more important than private property rights. Security of tenure is an enabling factor for incentives (i.e., benefit-sharing) and disincentives (i.e., land use policy) to succeed. Countries are encouraged to follow the Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security (HLPE, 2011).

3.3.2 Adequate information systems for decision-making

Countries are rapidly building national capacities and data quality for REDD+ information systems, and identify the need for integration of information beyond the forest sector, to track driver activity, social and environmental safeguards, and evaluation of trade-offs and livelihood implications. Adequate information systems to support decision-making and evaluate the effect of interventions are needed. Assessing the social and environmental impact of interventions both *ex ante* and *ex post* (Jagger et al., 2010) is important for adherence to safeguards. In essence land systems must be understood and modelled as open systems with large flows of goods, people, and capital that connect local land use with global-scale factors (Lambin and Meyfroidt, 2011) and thus all of these dynamics will influence driver activity, and potential responses to them. Further, countries will increasingly need to evaluate simultaneously climate change mitigation and adaptation impacts and measures, of particular importance for evaluating food security options (recommendation #7 in Beddington et al., 2012) and forest impacts.

3.3.3 REDD+ compensation, opportunity costs and good governance

Many R-PP's reference high opportunity costs of forest conservation as an underlying driver of forest clearing. However, many of these same countries reference weak forest sector governance, a lack of enforcement capability and often insecure tenure as key underlying drivers of deforestation and forest degradation. In cases where deforestation and/or forest degradation activity is legal and forest rights holders exist *outside* of the main market economy, opportunity costs can be a starting point to determine appropriate levels of funding to stem driver activity (Gregersen et al., 2010). Where activities are illegal and legal use rights are not clearly defined and assigned, national-level activity should include strengthening relevant laws and regulations (e.g. enforcement and inter-sectoral rationalization), fiscal mechanisms (e.g. taxes and subsidies), and promoting public investments (e.g. tenure reform, benefit-sharing, rehabilitating degraded land) instead of focusing on opportunity costs in order to positively affect rates and drivers of deforestation (Gregersen et al., 2010).

REDD+ actions and strategies should consider a mix of incentives, compensation schemes and governance reforms to affect drivers depending on national and local circumstances. A recent analysis of payment for ecosystem services (PES) and REDD+ in the Brazilian Amazon found that combining existing command and control 'sticks' with PES 'carrots' could increase the political scope for reducing deforestation by providing alternatives to the otherwise widely unacceptable and unequally distributed welfare gains or losses of applying any of the two instruments individually (Börner et al., 2011). The importance of overcoming the institutional barrier of insecure tenure and removing administrative obstacles to effective enforcement in order to make conditional compensations work at larger scales are found to be critical in order to combine the two approaches in Brazil.

It is unlikely that carbon payments alone can affect oil palm and timber drivers of forest clearing, as the net present value of most estimates of oil palm plantations ranges between US $6000–US $9000 per hectare, but incentives to keep these forests standing generate only US $614– US $994 per hectare in carbon credits (Pacheco et al., 2012; also see Fisher et al., 2011). However, linking opportunity costs with deforestation drivers can help inform how the financial incentive benchmark for results-based incentives could be set, and the relativity of enabling factors to be addressed, as evidenced in a recent Ecofys analysis. That analysis assessed opportunity costs of REDD+ program implementation in Cameroon, Vietnam, Indonesia and Brazil and the impact of different policy scenarios on country-specific deforestation rates, emission reductions, REDD+ revenues and costs (Ecofys 2012). The opportunity cost approach should complement concerted efforts to address underlying drivers and enabling factors, including strengthening governance, bundling incentives and disincentives (such as agricultural intensification linked to avoided deforestation goals), for integrated landscape approaches which will have other benefits in terms of ecosystem services and national resource management. Such approaches should be national in scale, in order to avoid leakage between regional or project scales and overpaying for high opportunity cost emission reductions. Complimentary incentives made by the private sector should also be considered, including increasing procurement, market share of certified commodities, and preferential financing terms. Further, different incentives apply at different scales, with international incentives to REDD+ countries for emissions reduction results occurring at a different scale than provision of incentives at the local level (See Figure 4.1 page 27).

3.3.4 Agricultural intensification as a deforestation strategy: Can yield increases on their own slow expansion into forests?

Recent analyses have demonstrated that the land-sparing hypothesis – which asserts that by increasing the yields and productivity of agriculture, prices decrease, and demand for new farmland is reduced, thus decreasing deforestation rates – does not hold true when demand for products and commodity prices are elastic. A 2009 analysis of 161 countries and ten important agricultural crops, based on FAOSTAT data, demonstrates that agricultural intensification was generally not accompanied by declines in cropland area at national scales, except in countries with grain imports and conservation set-aside programs (Rudel et al., 2009). To ensure intensification without encouraging deforestation, agricultural incentives should be combined with other incentives and strategies, like land-use zoning and stronger tenure rights (Rudel et al., 2009). Furthermore, intensification should be encouraged in specific places such as already cleared land close to urban centres, not at the agricultural frontier (Rudel, 2012, in Angelsen, 2012; Chomitz, 2007). Agricultural intensification strategies should also be evaluated for other sources of GHG emissions, such as increased use of fertilizers.

Our review of REDD+ readiness plans shows that 32% of countries seek to include agricultural intensification strategies to combat deforestation drivers, however countries are not making explicit spatial or policy linkages between this strategy and strategies to better utilize degraded or abandoned agricultural lands. Brazil's demonstration of increased agricultural production with simultaneous decreases in deforestation demonstrate this is an achievable goal, when accompanied by complimentary policies, finance measures and enforcement that are implemented as a package. Brazil's cereal, pulse and oilseed production increased 185% between 1990 and 2012 (Brazil Instituto

Brasileiro de Geografia e Estatística, 2012), due in large part to Embrapa's soil improvements in the cerrado grasslands, which allowed for utilization of formerly unsuitable areas to accommodate livestock production, and adaptation of soybeans to tropical production. Since 2004, the peak of deforestation, the rate of forest clearing in Brazil has fallen by almost 75%, attributed to the 2006 voluntary moratorium between industry/ NGO's (later endorsed by the government) on soy produced on land cleared in the Amazon after the moratorium was announced, sanctions on illegal loggers, strong monitoring and enforcement capabilities, and the Bank of Brazil's veto of agricultural credit for soy farmers seeking to plant in newly cleared forest. While soybean profitability has returned to pre-2006 levels over the past four years, rates of deforestation continued to decline, suggesting that policy interventions and incentives have influenced the agricultural sector (Macedo et al., 2012).

Though Brazil's agricultural intensification and production is expected to continue, avoided deforestation and degradation can be achieved if policies promote the efficient use of already-cleared or degraded lands while restricting deforestation, provided: a) enough already-cleared or degraded land is available to meet the need (Macedo et al., 2012), and b) a combination of market pressure, forest code enforcement, technical guidance and land-use planning, financing and incentives as well as increasing areas under multiple uses (crop-livestock-forest integration, silvopastoral and agroforestry systems (Strassburg et al., 2012). Strassburg et al. propose a "Land-Neutral Agriculture Expansion" mechanism of incentives linking agricultural performance more directly to forest cover (ibid). Indonesia's expansion of palm oil cultivation from 9.7 million ha to 18 million ha by 2020 without clearing more forest may be possible through the implementation of a properly planned and spatially explicit development strategy (Koh and Ghazoul, 2010). Effective agricultural intensification that delivers on avoided deforestation requires a mix of incentives and disincentives. Interventions seeking to restrict or change behaviour solely through compensation to restrict activities (the opportunity-cost approach) may miss opportunities to shift or modify driver activity through policy, planning or technological interventions.

3.3.5 Beyond the forest sector: cross-sectoral commitments

As the largest drivers of forest conversion are outside the forest sector, cross-sectoral commitments will be essential to influence driver activity. Interventions to reduce pressures from the largest driver of deforestation – commercial agriculture – are not adequately accounted for in REDD+ readiness plans, with some countries challenged by strong government mandates entirely in conflict with REDD+ goals, and no solid plans for how to reconcile these conflicts (Kissinger, 2011).

One case study offers a model for creating cross-sectoral commitments: Acre State, Brazil (Kissinger, 2011). Acre State's REDD+ programme encompasses all land-use types, including the full range of agricultural uses that affect Acre's forests. It offers a mix of incentives and payments, bundled under an umbrella REDD+ programme linked directly to the Acre Sustainable Development Plan, bringing small-, medium- and large-scale producers into its programmatic objectives. Its emission reduction targets are nested within federal targets; it is based on multi-sector land-use plans and commitments; and governance of the programme, including enforcement abilities, appears strong.

Further, countries are exploring tools and mechanisms, linked to policy formation, that help to reconcile sector conflicts, such as Argentina's deforestation risk index and Kenya's spatially explicit future trajectories of emissions/ removals under different economic and development scenarios. Effective land-use planning is also critical for aligning sectoral interests, and in overcoming jurisdictional differences between national, regional and district levels of government. Mexico's readiness proposal has evolved beyond its original design which was more akin to a PES programme, and is now based on multi-sectorial strategies embedded in the context of rural sustainable development. Mexico's REDD+ Vision now contains institutional agreements and public policy; financing schemes; the forest reference level and measurement, reporting, and verification (MRV) system; capacity building and communication, social participation, and transparency (Mexico National Forest Commission, 2010).

3.3.6 Challenges: Leakage, indirect land-use change, foreign direct investment

LEAKAGE: Leakage or displacement occurs when restricting driver activity in one area shifts deforestation and the associated GHG emissions to another area, thus negating some of the climate benefits of the original emission reduction. In voluntary forest carbon market standards, leakage discount factors are applied to estimates of potential emission reductions, which in some cases can be 40% of estimated gross emission reductions, reflecting the difficulty of limiting leakage effects at project scales. In establishing national programmes and addressing drivers of REDD+ it should be possible to put systems in place to detect shifts in activity associated with leakage, and to estimate the effect on emissions. A distinction is made between accounting for leakage and minimizing leakage, with the emphasis for REDD+ countries on properly accounting for leakage within their jurisdiction. Tracking and information systems for leakage across borders and across regions will be considerably more complex. Tracking leakage across national boundaries can be addressed by combining information from national systems and international sources, which could enable countries to design synergistic REDD+ strategies. International leakage is also addressed by increasing REDD+ participation.

INDIRECT LAND-USE CHANGE (ILUC): ILUC occurs when one land use is replaced with another (for instance, biofuel production replacing existing food production) and the original activity shifts in response, such as to the forest frontier. The potential for ILUC exists with all incremental land uses and should be considered in land use policy design seeking to mitigate GHG emissions. The magnitude of GHG emissions from ILUC can be significant (Fritsche and Wiegmann, 2011). Evidence of mechanized agriculture encroaching on existing pastures in Brazil, displacing cattle production to the forest frontier, has been observed (Arima et al., 2011). The EU has become increasingly aware of socio-economic and environmental implications of the EU Renewable Energy Directive, and has supported a range of assessments and mandated sustainability criteria, seeking to account for and to mitigate the effects of ILUC. The US Renewable Fuel Standard similarly includes methods to assess ILUC. Increased information from national systems showing that national and international leakage are being addressed as part of REDD+ strategies may allay concerns about ILUC, and help in the context of the increasing numbers of international demand-side commitments discussed in Section 4.1 (page 26).

FOREIGN DIRECT INVESTMENT: Recent evidence from sub-Saharan African large-scale farmland acquisitions made between 2005 and 2011 indicates that the impact of foreign direct investment competing with other land uses, such as existing agricultural and forested land, is most striking in Ethiopia and Ghana – for instance, in Ethiopia the magnitude of documented acquisitions is equivalent to up to 42.9% of the total area considered potentially available and suitable for agriculture; in Ghana it is 61.6% (Schoneveld, 2011). Neither country identifies strategies in its REDD+ readiness plan to address this directly. Foreign direct investment can have strong implications for long-term food security, rates of deforestation and rural livelihoods. However, foreign direct investment can promote economic development and address current underinvestment in developing countries' agricultural sectors, if channelled properly. Countries could benefit from sharing information on foreign direct investment risks and benefits and identify compatible strategies (legal, standards-based, financial) with investors and stakeholders. Domestic political support for foreign direct investment can be strong, particularly when the perceived benefits (i.e. increased export market access, technology investments) are viewed separately from the downsides (i.e. increased tenure risk for customary land users, loss of domestic food production capacity).

Key Messages

1. Interventions will benefit significantly from information tracking and sharing[9] that extends beyond national boundaries as a basis for informing options, strategies and interventions; particularly on cross-border trade, domestic and trans-boundary drivers of deforestation and degradation and leakage effects.

2. For REDD+ to be successful, incentives, disincentives and enabling measures will need to reach the actors responsible for addressing the drivers of deforestation and at the appropriate scale.

3. When demand- and supply-side interventions are mutually reinforcing, there will be greater chance to affect driver activity.

4. Coordinated efforts within entire sectors or focused on key commodities, aided by supportive government policies and financial incentives directing investment and lending to progressive practices, hold potential to significantly change commodity production, thereby reducing deforestation pressures over the long term.

9 Inter-governmental organizations and research entities (FAO, CGIAR) can play important roles to monitor changes in drivers globally.

Drivers of deforestation and forest degradation occur at all scales (global to local), and thus strategies to address drivers will occur at all scales. Section 3 deals primarily with national interventions to affect deforestation and degradation drivers. Interventions at international and local scales are also important, and assessment of the most appropriate scale for intervention must be considered by policy and decision-makers. Thus, this section provides a brief overview of interventions at relevant scales.

Many drivers will require interventions at multiple scales. Figure 4.1 (page 27) offers a conceptual framework for how REDD+ driver interventions and actors relate at different scales. Enabling factors such as effective information systems to guide decisions, institutional capacity, transparency and accountability, political will, and consultation with stakeholders underpin any strategy to affect drivers. For REDD+ to be successful, incentives, disincentives and enabling measures will need to reach the actors responsible for addressing the drivers of deforestation and for shifting land use. These actors span all scales, from international commodity buyers to forest-dependent communities. The very design of REDD+ as performance-based payments to countries for reduced emissions requires interventions at multiple scales to shift business-as-usual activities.

/// 4.1 International interventions

Consumer countries and producer countries have a range of tools and interventions to address international activities driving deforestation. These can be voluntary measures (e.g EU FLEGT Voluntary Partnership Agreements, procurement and sourcing commitments) or regulatory (such as import controls). When demand- and supply-side interventions are mutually reinforcing, there will be greater chance to affect driver activity. For instance, consumer concern over environmental impacts of food production, manufacturers fears about future predictable supplies, and increased awareness that sustainability is important to their bottom lines, drives food product retailers and brand manufacturers to make purchasing commitments that reduce climate impacts at the production level. This can be complimented by supply-side interventions, such as incentives for increased production on degraded lands. Further, exploring synergies – how addressing one driver affects other underlying drivers – is of particular importance in designing interventions. For instance, international efforts to control illegal logging have had spin-off effects in generally improving forest sector governance, a key underlying driver (Lawson and McFaul, 2010).

Demand-side activities hold potential to significantly shift demand for key commodities and the way they are produced, directly affecting rates of deforestation in developing countries (Kissinger, 2012). However, as many of the commitments outlined below are recent, their overall future effect is not yet clear. Here are some examples of interventions:

1. **LARGE PURCHASERS:** An increasing number of companies (mostly retailers and manufacturers) identify high-risk agricultural raw materials in their supply chain and set aggressive time-bound targets and goals for more sustainable sourcing and supply arrangements (Kissinger, 2012). For example, the Consumer Goods Forum, a CEO-led organisation of 400 consumer goods manufacturers and retailers, with combined revenues of USD $3 trillion, has committed to zero net deforestation by 2020, with initial focus on beef, soy, palm oil and paper/pulp (Consumer Goods Forum, 2012).

2. **GOVERNMENT FACILITATED COMMITMENTS:** The Netherlands supports the Dutch Sustainable Trade Initiative (IDH) and Dutch Product Board for Margarine, Fats and Oils (MVO) to ensure all palm oil imported into the Netherlands is sustainable by 2015. The UK government is encouraging sustainable production and consumption of palm oil through mapping UK supply chains of palm oil. In 2010, the UK and the Chinese Ministry of Commerce announced plans to explore options for the Chinese government to encourage sustainable sourcing of palm oil. The Dutch also support its feed industry to source responsible soy. Germany, France, Spain and Portugal may be starting processes to encourage sustainably sourced soy (see Kissinger, 2012). EU member countries also have timber and sustainable wood procurement policies that have been

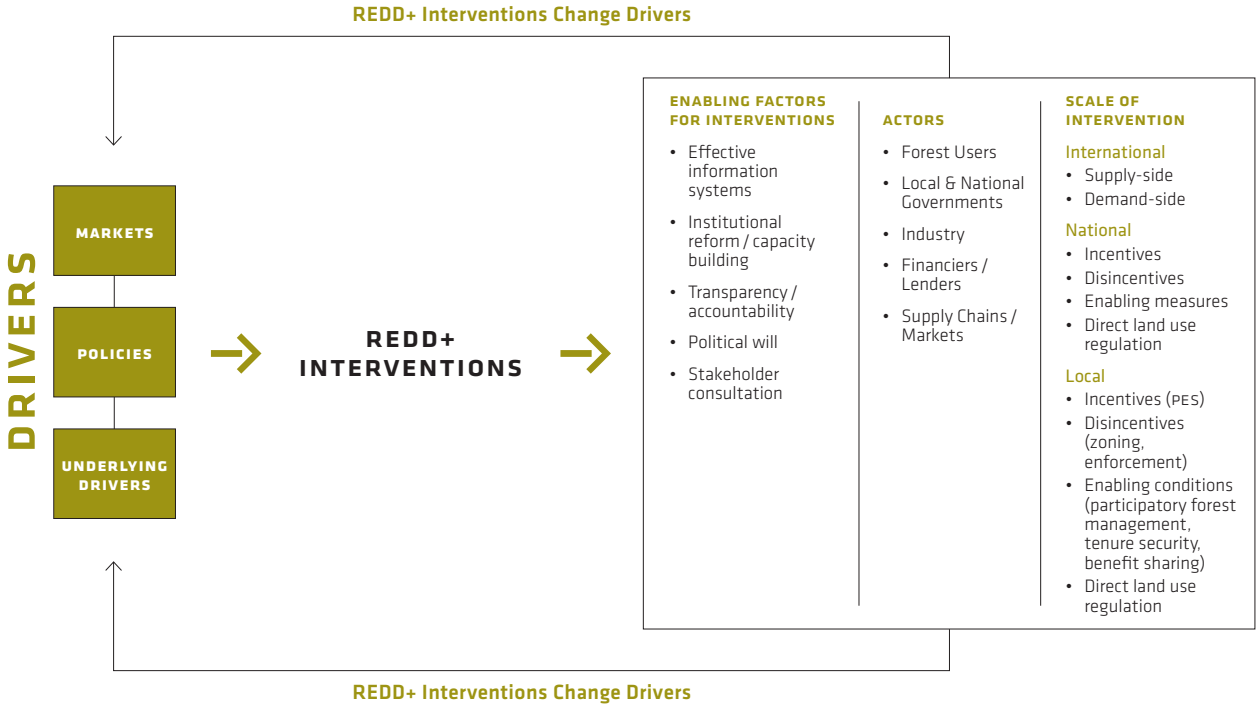

FIGURE 4.1 *REDD+ driver interventions, actors and scales*

important drivers of the private-sector response to illegal logging in consumer, processing and producer countries.

3. **IMPORT CONTROLS, LAWS, BILATERAL AGREEMENTS AND TRADE ACCORDS:** Actions taken by a country to affect attributes of products coming into the country, such as the EU Voluntary Partnership Agreements on FLEGT and the *US Lacey Act*, which provides a number of measures to exclude illegal timber from markets, improve the supply of legal timber and to increase the demand for responsible wood products.

4. **COMMODITY ROUNDTABLES, SUSTAINABILITY STANDARDS AND CERTIFICATION:** Commodity roundtable multi-stakeholder initiatives seek to influence forest conversion by applying sustainability principles and linking the producers and other actors in the supply chain. Examples include: The Roundtable for Sustainable Palm Oil (RSPO), Roundtable on Responsible Soy (RTRS), The Better Cotton Initiative, Bonsucro, Roundtable on Sustainable Biofuels (RSB), Global Roundtable for Sustainable Beef (GRSB), and Brazilian Roundtable on Sustainable Livestock (GTPS). The Roundtables often apply sustainability standards and certification, however do not yet include zero net deforestation as a criteria for certification.

a) Certification has both supply-side and demand-side benefits, and a number of countries seek to increase certification of forestlands, such as via the Forest Stewardship Council, as part of REDD+ strategies.

b) One challenge is for certification to apply at scales larger than individual projects and sites, applying chain-of-custody, national controlled wood or group certification approaches to cover larger areas. Independent certification and legality verification has proven effective in stemming illegal logging.

5. **PUBLIC-PRIVATE SECTOR PARTNERSHIPS:** These are coordinated efforts within entire sectors or focused on key commodities, aided by supportive government policies and financial incentives that direct investment and lending to progressive practices. Recent examples include the US announcement at Rio+20 to "forge a private-public partnership to support a concerted international effort to reduce deforestation by promoting sustainable supply chains" (Consumer Goods Forum, 2012), the Dutch Sustainable Trade Initiative's (IDH) efforts to promote public-private partnerships for sustainable approaches to agricultural commodity production, and Dutch and Norwegian support for Solidaridad's work with the business community to make production chains more sustainable.

6. **IMPACT AND CARBON DISCLOSURE:** Public disclosure by companies of GHG emission reductions and minimizing exposure to high-risk commodities is increasingly being valued by companies as a way to demonstrate action to decrease value chain impacts on GHG emissions and deforestation (from timber, beef, soy, palm oil, and biofuels). An example is the Global Canopy Programme's Forest Footprint Disclosure Project, which is merging with the Carbon Disclosure Project.

All of the above interventions would benefit significantly from information systems that extend beyond national boundaries, particularly on cross-border trade, domestic and trans-boundary drivers of deforestation and degradation and leakage effects, as a basis for informed strategies and interventions.

/// 4.2 Local level interventions

Local interventions can include incentives, disincentives and enabling measures. Incentives can include measures designed to encourage forest conservation, e.g. PES, credit guarantees, alternative revenue generation activities, and alternatives to fuel wood and charcoal. Performance-based incentives can be effective at sub-regional and local scales, where local economic agents (farmers, companies, rural households, communities) may be more responsive than national governments (Karsenty and Ongolo, 2012). Disincentives include measures to discourage forest clearing, such as taxes, fines, limits on production, zoning, or moratoria, and require some level of enforcement. Enabling measures can include community and participatory forest management, resolving tenure security, bolstering governance and capacity, benefit-sharing, all of which prepare the ground for incentives and disincentives to work effectively (see Figure 4.1, page 27).

Local-level interventions need to be suited to local conditions, but considered within the context of national REDD+ plans to ensure the right incentives, enabling conditions, and policy levers are in place. Effective delivery will depend on capacity and institutions capable of carrying out interventions. Also, impact assessments, transparency and monitoring should be in place at the outset to track intervention performance and to inform assessments of attribution.

Key Messages

1. National monitoring of drivers is valuable, and in particular can facilitate engagement with different (non-forest) sectors and inform decisions on incentives in the context of broader development objectives, such as those linked to national mitigation actions or low carbon development strategies.

2. Identifying and assessing drivers on the national level needs resources additional to regular REDD+ related estimation and reporting using the IPCC Good Practice Guidance. Both monitoring efforts should be well integrated.

3. Some activities or land uses that are commonly referred to as drivers of deforestation are also resulting in GHG emissions that are additional to those directly caused by the conversion of forest land (e.g. agriculture).

4. Monitoring drivers on the national level can help link the monitoring of activity data and associated GHG emissions directly to drivers, and provide data for indirect methods such as statistical analyses and modelling to assess underlying causes. Monitoring international drivers requires joint coordinated efforts on the international level.

5. The types of drivers of deforestation and forest degradation have great influence on the forest carbon impacts and the choice of data sources and methods used to measure and monitor these impacts.

6. Consideration of drivers is important to justify adjusting reference (emission) levels according to national circumstances. To overcome data availability issues in many REDD+ countries, a stepwise approach can provide a starting point that matches the available data and their quality with the choice of reference level methods, its uncertainties and country circumstances. National capacities and the quality of reference levels can be improved over time.

7. Assessing drivers is important to design and implement policies to slow down deforestation and forest degradation. It can also be used to set more realistic reference (emission) levels, increasing the effectiveness and efficiency of REDD+ finance.

	COUNTRY FOREST AREA CHANGE MONITORING CAPACITY			
Quality of reported driver data	Low	Medium	High	Total
Low (listing)	8	7	3	18
Medium (ranking)	3	10	2	15
High (quantitative)	2	4	6	12
Total	13	21	11	45

TABLE 5.1 *Comparing country capacities for forest area change monitoring (derived from FAO, 2010a; see Romijn et al., 2012) with the quality of reported data on drivers from REDD+ readiness reports of 45 countries (i.e. R-PP, CIFOR reports, see Hosonuma et al., 2012)*

/// 5.1 Importance and national capacities for monitoring drivers

Monitoring and provision of robust information on drivers and the related activities that lead to deforestation and forest degradation provide an essential data stream for countries in their REDD+ strategy and policy design and its implementation (Herold and Skutsch, 2011). Identifying forest change drivers (locally, nationally, internationally) is needed for several reasons: to help track their activities over time, to attribute emissions to specific causes, to design dedicated mitigation actions that address them, and to assess the impact of these.

Identifying and assessing drivers on the national level requires resources and efforts additional to regular estimation and reporting for GHG accounting using the IPCC Good Practice Guidance (IPCC, 2006). Countries should integrate and combine capacity development efforts for monitoring drivers with on-going national forest monitoring for REDD+. In particular countries should, where possible, link activity data monitoring (i.e. forest area change) with the monitoring of drivers.

Looking at current country capacities (Table 5.1), there is a tendency that countries with higher capacities for forest area change monitoring are able to provide higher quality driver data (in their REDD+ readiness reports). The assessment of the driver data quality is based on whether countries just list important drivers (low), rank them according to importance (medium) or provide quantitative data (high quality). However, there are also cases that deviate from this trend in two ways (Table 5.1):

1. where monitoring capacities are lower some countries are still able to provide good driver data – emphasizing that data on drivers are derived from other national efforts (i.e. from other sectors) and that these efforts need to be well coordinated and integrated in REDD+ monitoring and capacity building, and

2. where countries are able to provide good activity data but still need to expand and integrate the efforts to also identify the drivers; an effort that should be done in an integrated way.

It is important to note that some activities or land uses that result in deforestation can also result in additional GHG emissions after the deforestation event. The most prominent case is for agriculture that releases significant amounts of GHG depending on the type of crops or livestock, management type (i.e. irrigation), use of fire, fertilizer use, and soil carbon characteristics (i.e. organic peatland soils). Measuring and monitoring these emissions requires different methods and approaches, and additional capacities and resources. But they can also be an opportunity for REDD+ strategies, for example, if a country combines agricultural Nationally Appropriate Mitigation Actions (NAMAs) – to provide a separate financial stream to help change farming practices – with forest governance and a results-based REDD+ program.

/// 5.2 Linking area change monitoring with proximate drivers

Linking forest area changes to specific activities and follow-up land use is essential for assessing drivers and their impact for a particular location.

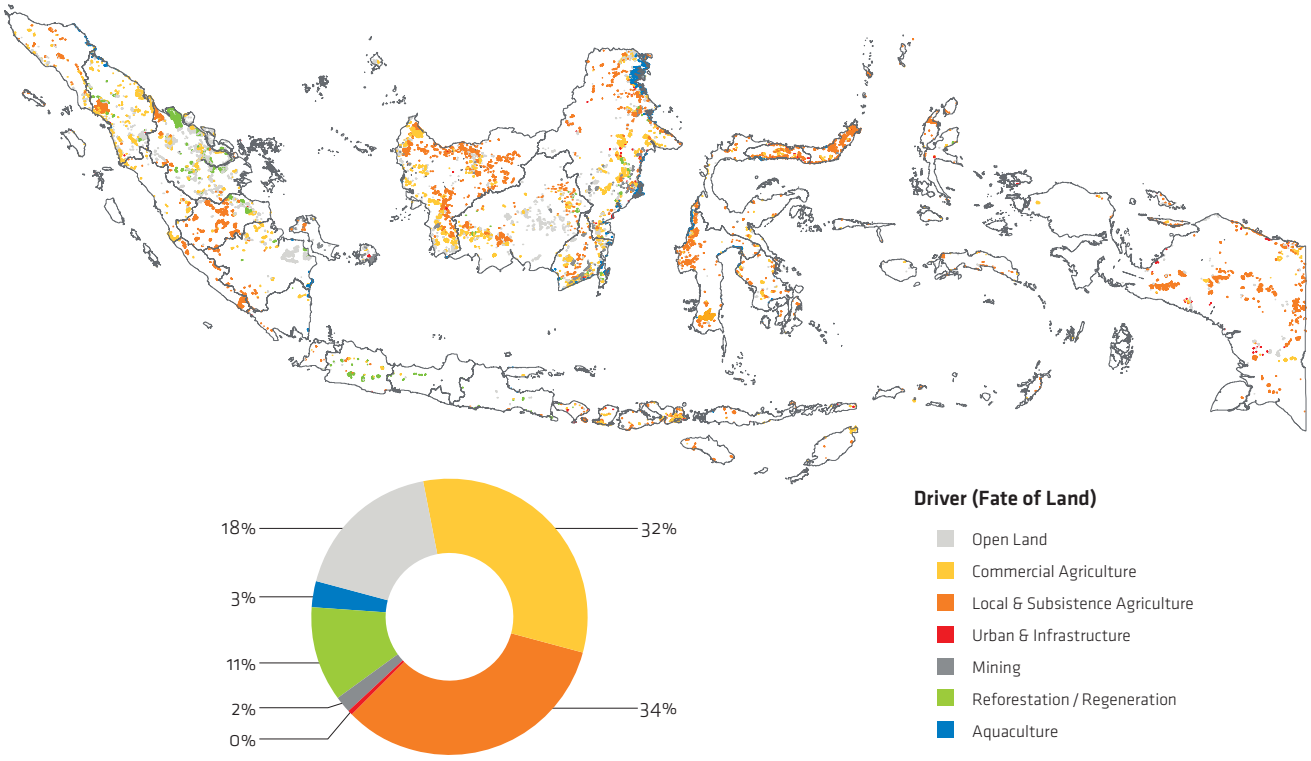

FIGURE 5.1 *Spatial distribution of deforestation areas and its follow-up land use and links to drivers for Indonesia mapped from Landsat remote sensing data from 2000–2009 (Source: MOFOR, 2011).*

Information useful for assessing which drivers are present in particular locations and to attribute land use change with specific activities and drivers can come from remote sensing analysis (GOFC-GOLD, 2011). The size of deforestation clearings, for example, is a strong indicator and discriminator between commercial vs. subsistence agricultural expansion as a deforestation driver. Size can be determined from analysis of deforestation polygons mapped with common satellite sensors (DeFries et al., 2007). In addition, the spatial context and location (such as shape, distance to settlements and previous forest change, location of concessions) and the presence and absence of other features such as new roads and infrastructure can help in the interpretation to better understand the causes of change. Remote sensing time series analysis can also provide information on land use following deforestation, for example row crops or pasture, which helps to assess the commodities driving deforestation. Such interpretations of land use patterns require regional and local knowledge on the on-going forest change processes and need to be underpinned by ground observations from either national inventories or data acquired by local experts or participating communities (Danielsen et al., 2011; Pratihast et al., 2010).

A national example of identifying the follow-up land use and the type of deforestation activities linked to drivers for the case of Indonesia is presented in Figure 5.1. The spatial distribution shows the large spatial variability associated with different proximate drivers. Spatial assessments are important to capture the space-time complexity of drivers to track their impacts over time and to support region-specific strategies to reduce emissions. For example, presence of large-scale agricultural clearing would suggest that policies aimed at large-landholders rather than smallholder farmers would be most effective in reducing deforestation in that region. Other countries have used similar approaches to nationally assess the contribution of different drivers to the overall deforestation (i.e. Guyana, 2010; GFC, 2011).

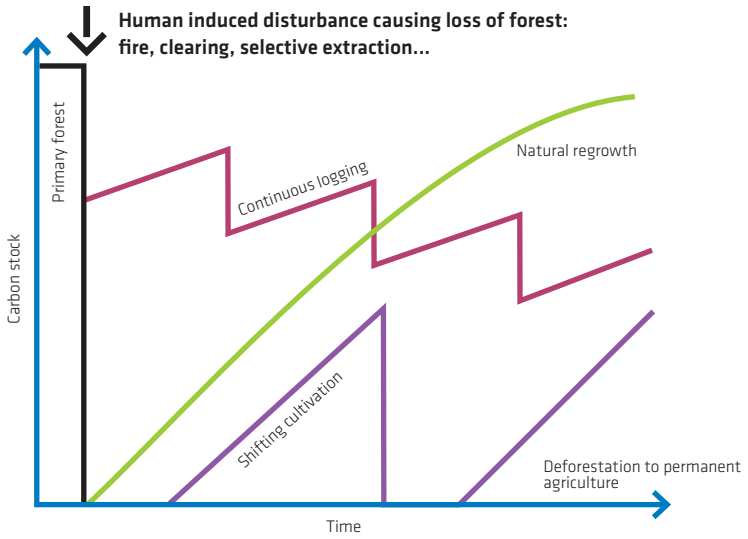

FIGURE 5.2 *Schematic overview of the impact of different deforestation and forest degradation processes leading to carbon stock changes in forests such as unsustainable commercial timber extraction (continuous logging), subsistence agriculture (shifting cultivation), deforestation (for permanent agriculture), and for forest clearing with natural regrowth. Note: this figure is schematic and only includes few examples of potential carbon stock changes*

Besides assessing the role of drivers in terms of deforestation area it is also important for national REDD+ policy development to assess GHG emissions from different drivers. Attribution and estimation of GHG emissions associated with different drivers have commonly not been performed on the national level. This can be challenging since the data on carbon stocks and emission estimation are often not available and usually require more time to be acquired and analysed in different country circumstances (Romijn et al., 2012).

/// 5.3 Analysing and assessing underlying drivers

Underlying causes such as international markets, trade policies, technological change and population growth, are not readily detectable using remote sensing and ground data, and relies more on economic and social indicators, data sources and trend analysis. However, the link between and data about deforestation patterns and underlying causes are important for developing reference (emission) levels where understanding of which drivers are important is essential in order to take national circumstances into account and construct plausible future scenarios that may deviate from historical trends (Herold et al., 2012).

Statistical analyses and modelling using economic, social and demographic data, and analysis of policy and governance issues, can help unravel these underlying drivers (DeFries et al., 2010; Soares-Filho et al., 2006). In particular for international drivers, dedicated models can be used to assess and predict their characteristics and behaviour (Rademaekers et al., 2010). Combining the presence or absence of drivers with the occurrence of deforestation/degradation can suggest which drivers are present and influential in particular places. Such analyses are often empirical and rely on good sub-national data (i.e. on provincial or municipal levels) that describe the economic, social and demographic conditions and associated changes linked to deforestation patterns (see Table 5.2, page 33). However, there are difficulties to establish clear links between underlying factors and deforestation/degradation patterns (Angelsen, 2008). Proximate causes of deforestation and forest degradation are often easier to monitor and quantify because they relate more to specific deforestation and degradation events on the ground. Since data to study proximate and underlying drivers are multi-fold and linked to different sectors, the required data are often not easily available. They are commonly scattered among different sources, sectors and ministries nationally, and need to be integrated and harmonized.

Activity/driver of deforestation and forest degradation	Indicator for mapping	Common sources for activity data (on national level)	Common data sources for emission factors/estimations (on national level)	Examples of other data on proxies and for assessing underlying causes
Commercial agricultural; clearing for cattle ranching, row crops etc.	Large-clearings; post-clearing land use	• Historical satellite data (i.e. Landsat-type data time series) for deforestation area and land use following deforestation	• Traditional national forest inventories/ground measurements	• Commodity prices • Agriculture census, Agriculture GDP, exports etc.
Subsistence agriculture, small-holder farming and shifting cultivation	Small clearings, often rotational fallow cycles	• Historical satellite data (i.e. dense Landsat time series and high-resolution data) for determining area and rotation pattern	• Traditional national forest inventories, ground measurements and targeted surveys • Efforts to assess long-term net emissions	• Population growth in rural and urban areas • Agriculture imports/ exports • Land use practices (i.e. rotation cycles etc.)
Infrastructure expansion (roads, mines, settlements etc.)	Road networks, new mines, and build up areas	• Historical satellite data (i.e. Landsat time series) for deforestation area and land use following deforestation	• Traditional national forest inventories and ground measurements	• Growth in urban/rural population • Infrastructure/ development programs • Mining: commodity prices/exports
Industrial/ commercial extraction of forest products such as selective logging	Small-scale canopy damage, Logging roads and infrastructure	• Historical satellite data (i.e. Landsat time series) analysed with concession areas • Direct approach should be explored for recent years	• Regular national forest inventories, ground measurements and harvest estimates from commercial forestry • Emissions factors can be measured and consistently for historical periods	• Timber prices and demand (nationally, internationally) • Timber import/exports
Extraction of forest products for subsistence and local and regional markets (fuel wood and charcoal, forest grazing)	Very small-scale canopy damage, understory impacts, footpaths,	• Limited historical data • Information from local scale studies or national proxies • Only long-term cumulative changes may be observed from historical satellite data	• Limited historical data • Information from local scale studies • Emission factors can be measured and consistently for historical periods • Key role for community-based monitoring • Besides direct forest carbon stock changes, more indirect methods such as headloads of fuel wood may be useful	• Rural/urban population growth • Energy use/fuel sources (% of population) • Consumption pattern and its changes
Other disturbances such as (uncontrolled) wildfires	Burn scars and associate impacts	• Historical satellite-based fire data records (since 2000) to be analysed with Landsat-type data	• Regular estimation of emission, can be measured today and can be applied consistently for historical periods with suitable activity data	• Land use practices, i.e. agricultural fires • Link to other activity data to attribute fire emissions • Fire prevention • Natural wildfire events?

TABLE 5.2 *Options for monitoring approaches and data sources of the main forest change activities and drivers on the national level beyond the use of default data (adapted from GOFC-GOLD, 2011 and Herold et al., 2011)*

/// 5.4 Implications for data availability and monitoring approaches

The type and drivers of deforestation and forest degradation have great influence on the net forest carbon impacts (Figure 5.2, page 32), and the way these impacts can be measured and monitored. Thus, the usefulness of different monitoring approaches varies and different indicators, methods and proxies are needed to measure and monitor them accurately and consistently over space and time (Table 5.2).

As described in Table 5.2, clearing for commercial agriculture and infrastructure expansion commonly leads to a permanent conversion that can

be accurately monitored with a combination of remote sensing and forest inventories. The monitoring of subsistence agriculture and shifting cultivation is more challenging and requires more detail since the disturbances are smaller and the long-term net carbon impacts are more complex.

Forest degradation processes and their specific drivers are more difficult to detect through remote sensing. The changes in carbon stocks vary greatly in space and time, and thus require more frequent ground surveying. Monitoring industrial/commercial extraction of forest products can build upon the combined use of archived satellite data, forestry concession data, and forest inventories. In particular for the case of forest degradation associated with local markets and subsistence, proxy data may be needed as historical field data sources are generally rare and remote sensing approaches have limited ability to provide information based on archived data (Skutsch et al., 2011).

/// 5.5 Role of drivers for developing forest reference (emission) levels

Forest reference level (RLs) and forest reference emission levels (RELs)[10,11] are most commonly conceptualized as business-as-usual baselines to assess a country's performance in implementing REDD+ (UNFCCC, 2011). The availability and quality of data (in particular for historical periods) are fundamental and determine the methods used to develop RL/RELs. Consideration of drivers and activities causing deforestation and forest degradation is important particularly in relation to adjusting reference (emission) levels based on historical data according to national circumstances. The assessment of expected future developments in forest related emission and removals is directly linked to specific activities and their underlying causes. Where assumptions about expected future developments differ from the observed historical trends in forest changes and emissions, these assumptions should ideally be justified and supported by an explanation of expected change of activities and drivers. Separate consideration of drivers may be needed, within a coherent account of expectations about national development.

Countries should assess the historical, recent and projected future drivers and use that information to inform the development of REDD+ strategies and implementation design. This can help mitigate the risks and concerns related to non-permanence and leakage. The information may also be used to quantify and justify adjustments to forest reference (emission) levels.

Availability of quantitative data on drivers (and other relevant data sources) is still uncertain in many countries (see Table 5.1, page 30). Different countries are currently exploring different approaches for developing RL/RELs taking into account information on drivers and national circumstances (i.e. Sugardiman 2011, Pham et al., 2011). As countries work though the development of their RL/RELs for REDD+, the demand for this type of data is expected to increase. While there are ways to work with the limited quantitative data that is currently available, a process of on-going data collection and monitoring of drivers will help to improve the quality of the RL/RELs, the design of interventions and the ultimate success of REDD+ strategies. A stepwise approach to developing RL/RELs can help to reflect different country capacities and facilitate broad participation, early start-up and the motivation for improvements over time, alongside efforts to enhance measurement and monitoring capacities. Concepts for stepwise approaches to developing forests reference levels to improve the quality and accuracy, and reflect national circumstances for measuring REDD+ performance over time with increasing capacities and improved data has been proposed (Herold et al., 2012).

10 The difference between reference level (RL) and reference emissions level (REL) is not always clear. The distinction is often made that REL refers to gross emissions from deforestation and forest degradation, while RL refers to deforestation and forest degradation, as well as other REDD+ activities on enhancement of carbon stocks, sustainable management of forests and forest conservation. In this report we use REL/RLs.

11 See also UNFCCC decision 12/CP.17 on guidance on systems for providing information on how safeguards are addressed and respected and modalities relating to forest reference emission levels and forest reference levels as referred to in decision 1/CP.16: appendix I COP 17 decisions: http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cop17_safeguards.pdf

Section 6 /// *Conclusions and recommendations for negotiators and country decision makers*

Strategic Advice

Based on the synthesis on drivers of deforestation and forest degradation provided in the preceding sections of this report, the following conclusions and recommendations are offered to underpin and support the on-going international climate negotiations, as well as country-level plans and interventions to affect drivers.

/// 6.1 Assessing current and future drivers

1. National and international assessments of drivers are important for designing and implementing REDD+ strategies or action plans, particularly as a basis for engaging different (non-forest) sectors impacting forests. Both direct/proximate drivers and indirect/underlying drivers need to be understood.

    > Countries should be encouraged to identify and quantify the proximate and underlying drivers and develop the necessary capacity to do so.

2. Most countries currently lack the data to quantitatively identify and address drivers, particularly on the national level. This should be supported through resources and assistance in readiness activities.

3. Direct or proximate drivers can be identified and quantified on national levels. The relative importance varies with national circumstances, but commercial agriculture, commercial timber extraction, fuel wood collection and charcoal production are often significant.

4. Indirect or underlying drivers such as population and economic growth, national and international demand for commodities, and weak governance are known, but their impacts are hard to quantify. However, the impact of many of these drivers is expected to increase in the future.

5. Countries should assess the historical, recent and projected future drivers and use that information to inform the development of REDD+ strategies and implementation design. This can help mitigate the risks and concerns related to non-permanence and leakage. The information may also be used to quantify and justify adjustments to forest reference (emission) levels.

/// 6.2 Drivers in REDD+ policy development and implementation

1. Looking beyond the forest sector to design and frame interventions to address drivers is critical.

    > Countries should assess sector policies (in agriculture, mining, infrastructure, energy, and forestry) that conflict with REDD+ objectives, and develop comprehensive plans to meet sustainable development objectives, enabled with cross-sectoral commitments and political/institutional support.

    > Low carbon development plans or national climate change action plans can also help guide the development of solutions to sectoral conflicts.

    > In most cases, REDD+ incentives alone will be insufficient to affect drivers. National approaches – based on effective land use planning, policies and incentives – allows for re-directing high opportunity cost activities to places with lower carbon values without sacrificing economic development. In other words, modifying a driver's activity is generally less costly than stopping the activity altogether.

    > For REDD+ to be successful, incentives, disincentives and enabling measures will need to reach the actors responsible for addressing the drivers of deforestation, particularly in non-forest sectors and among stakeholders, and at the appropriate scale.

    > Effective contributions to REDD+ can include initiatives not identified by many countries' REDD+ readiness plans, such as commodity roundtables (see Section 4.1, page 26). Alignment of these activities with REDD+ is encouraged.

2. Countries largely define strategies and interventions that address national and local level drivers, but also face international drivers that are expected to increase in pressure.

- Options for reducing the impact of international drivers via the finance sector should be further considered. For instance, codes of conduct or sustainability guidelines for providing international finance, such as Equator Principles, International Finance Corporation Performance Standards, and others, should be promoted.

- Consumer and producer countries can promote government-facilitated commitments on sustainable commodities, public-private partnerships and related international interventions (see Section 4.1, page 26), as well as identify strategies to minimize negative impacts of indirect land use change and foreign direct investment.

- There are benefits to international information sharing, particularly on cross-border trade, domestic and transboundary drivers of deforestation and degradation and associated leakage, to inform effective strategy design and intervention. Countries should be encouraged to consider and share experiences on measures being taken to reduce underlying drivers of deforestation, to share best practices and lessons learned.

- Periodic global assessments of emissions from deforestation and forest degradation, to improve the effectiveness of financing mechanisms could be performed to ensure that incentives are providing global benefits over time and contributing to Article 2 of the Convention, i.e. reductions in overall global anthropogenic emissions.

3. Linking different measures in an integrated manner can increase effectiveness of REDD+ interventions. Measures pursued singly, e.g. agricultural intensification, can be much less effective or even counter-productive.

    - Countries are encouraged to pursue a mix of incentives, disincentives and enabling measures, under a comprehensive REDD+ strategy, aimed at proximate and underlying drivers in order to provide greatest leverage.

    - Coordinated efforts within entire sectors or focused on key commodities, complimented by supportive government policies and financial incentives that direct investment and lending to progressive practices, hold potential to reduce deforestation pressures.

    - Countries can explore synergies – how addressing one driver affects other drivers – when designing interventions. For instance, controlling illegal logging has spin-off effects for generally improving forest sector governance.

    - Countries should prioritize improving governance, transparency, capacity and enforcement, providing secure tenure and combatting illegal activities as foundational activities that will enable greater success in other interventions to affect drivers.

4. Coordination between REDD+ and emerging agricultural and energy mitigation objectives could result in significant synergies across climate change mitigation and adaptation.

5. The livelihoods of local communities may depend on current drivers of deforestation and forest degradation, thus intervention strategies must consider impacts on livelihoods and adhere to safeguards.

    - Transparency and involvement of stakeholders in national-level information systems is critical and should include assessment of how REDD+ driver interventions can promote or enhance social and environmental benefits both before and after interventions.

    - National- and local-scale interventions to affect proximate and underlying drivers must be consistent with the guidance and safeguards agreed in Decision 1/CP.16 to support social and environmental benefits.

6. Given the potential linkages between REDD+ and other sectoral mitigation approaches, guidance to countries on how to prepare and streamline approaches, for example, how best to link and integrate REDD+ activities and NAMAs, particularly agriculture.

/// 6.3 Drivers in national forest monitoring and in developing forest reference (emission) levels

1. Many developing countries focused on information gathering as part of REDD+ readiness and demonstration activities are increasingly recognizing the need for more robust information – not only on forest carbon and forest management activity, but also on drivers and associated trends in land use change.

2. Monitoring drivers on the national level can help link the monitoring of activity data and GHG emissions to its underlying causes, and provide data for indirect methods such as statistical analyses and modelling to assess underlying causes.

   > Identifying and assessing drivers on the national level is complementary to REDD+ related estimation and reporting using the IPCC Good Practice Guidance. Both monitoring efforts should be well integrated.

   > Countries may need support and guidance from the international community for improving data quality on drivers, land use and land use change, and estimating associated emissions, using IPCC methods.

3. There is need for regular updates and information sharing to determine the development of underlying drivers and their impacts on the international level. In that context, better international coordination should be encouraged and lead to periodic global assessments of the activities of key international drivers and related emissions from deforestation and forest degradation from international organisations.

4. The types and drivers of deforestation and forest degradation have great influence on the net forest carbon impacts and the choice of data sources and methods used to measure and monitor these impacts. Exchange of experiences and improvements with monitoring different types of REDD+ interventions in addressing the drivers of deforestation and forest degradation are needed.

5. Consideration of drivers is important to justify adjusting forest reference (emission) levels according to national circumstances. Since the availability of data on drivers remains uncertain in many REDD+ countries, a stepwise approach can provide a starting point that matches the available data and their quality with the choice of reference level methods, its uncertainties and country circumstances; while improving national capacities and the quality of reference levels over time. In this context, there is need to develop quantitative methods linking drivers to the development of reference levels, their quality and links to financial incentives.

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Appendix A: Summary of the main country reported information on direct and indirect drivers

Country	Direct drivers	Indirect drivers
ARGENTINA R-PP (FCPF June 2010)	Industrial/commercial soybean, with new threat of biofuel, livestock production expected to increase.	Climate change; increased international demand and prices for certain commodities; insufficient law enforcement, the change of scale and increased availability of capital associated with the emergence of crops consortia; and macro-economic factors.
BOLIVIA (UN-REDD March 2010)	Agricultural expansion, illegal forest activity, infrastructure (electrification, oil exploration and extraction, roads), fires. Degradation mostly from domestic logging (incl. firewood) and legal and illegal forest sector activity.	Inobservance of land use legislation, agricultural incentives (policy, subsidies), weak forestry sector governance and enforcement, international demand for agricultural/wood products/bio-fuels, demographic growth, corruption.
BURKINA FASO R-PP (FCPF June 2012)	Agricultural expansion (rates of deforestation may be double FAO's stats), land grabbing, livestock production and overgrazing, fuel wood.	Population growth and poverty, Lack of land tenure security, Inadequate skills, poor governance, including lack of enforcement, inconsistencies in sectoral policies.
CAMBODIA R-PP (FCPF March 2011)	Large-scale agro-industrial development: rubber, sugarcane, increasing role of biofuels.	Population and migration pressures, lack of effective implementation of existing laws and policies for forest land.
CENTRAL AFRICAN REPUBLIC R-PP (FCPF September 2011)	Unsustainable livestock farming, slash-and-burn agriculture, informal and uncontrolled logging and collection of fuel wood and NTFPs, and infrastructure development (roads, mining, urban pressures, housing). More assessment needed on scale of each.	Complete lack of land use policies and governance, enforcement, resources, poverty and lack of income-generating alternatives, lack of agricultural and pastoral reforms.
CHILE (FCPF R-PIN January 2012)	Fuel wood extraction, illegal logging, livestock production.	Weak institutions, socio-cultural and economic barriers- land tenure and rural poverty.
COLOMBIA R-PP (FCPF September 2011)	Agricultural expansion (legitimate and illicit) and livestock (90% of deforestation), settlement, infrastructure, mining, illegal logging (may be 42% of timber production).	Population growth, migration, market trends, land speculation, low perceived value of forests, political / institutional-weak policies and governance, poor land management.
COSTA RICA R-PP (FCPF August 2010)	Economic development policies promoting agriculture and cattle ranching, with livestock expansion having greatest deforestation impacts.	Lack of competitiveness of forest use in comparison with alternate uses, weak enforcement of laws and ability to control illegal logging, macroeconomic, political, demographic or technological elements.
DEMOCRATIC REPUBLIC OF CONGO R-PP (FCPF July 2010)	Smallholder farming, charcoal and firewood use, commercial and informal logging, infrastructure and related incursions.	Poverty and subsistence due to conflict, unclear property rights, institutional weaknesses.
EL SALVADOR (June 2012)	Agricultural expansion, particularly unsustainable practices, sugar cane production (for commodity sugar and ethanol), urban growth, livestock production, firewood, mangrove clearing.	Urban pressures, poverty, tax policies, incentives and government-driven development of projects outside the forest sector that drive deforestation.
ETHIOPIA R-PP (FCPF May 2011)	Agriculture and fuel wood consumption. 80% of new agric land converted from forests, woodlands, shrub lands (2000–2008).	Weak regulatory environment and institutions, demographic growth, unclear user rights, low empowerment of local communities.
GHANA R-PP (FCPF December 2010)	Degradation linked to agricultural expansion, wood harvesting.	Weak incentive structures, regulatory mechanisms, tenure and rights regimes, demographic changes.
GUATEMALA R-PP (FCPF March 2012)	Agricultural land use change and urban growth, land speculation, illegal logging, wood energy.	Structural issues such as economic growth models, population, tenure, policy weakness and lack of coordination.
GUYANA R-PP (FCPF April 2010)	Mining and agriculture, road development (particularly transnational highway linking Guyana and Brazil).	Policy and institutional weakness, interagency coordination (mining and infrastructure).

Country	Direct drivers	Indirect drivers
INDONESIA (UN-REDD May 2009) (MOFOR 2008)	Planned and unplanned deforestation, mostly clearance for oil palm and pulpwood plantations in Kalimantan and Sumatra, smallholder agriculture in Sulawesi (R-Plan); in addition, unsustainable harvests, illegal logging, encroachment (MOFOR).	Corruption, governance factors (Source: R-Plan) Resolving land issues between central and local governments, need for certainty between forest land and non-forest land (MOFOR).
KENYA R-PP (FCPF August 2010)	Agriculture (link to poverty); timber harvesting, charcoal production, grazing; poor governance/ institutional failures in forest sector.	Weak governance, enforcement, lack of private ownership, economic and policy drivers.
LAO PEOPLE'S DEMOCRATIC REPUBLIC R-PP (FCPF October 2010)	Commercial/industrial agriculture (over 2x impact of smallholder, based on future % of emissions), smallholder cash crops and expansion (sometimes due to FDI), mining infrastructure.	Weak monitoring, governance and enforcement, insecure land tenure, vague boundaries.
LIBERIA R-PP (FCPF June 2011)	Shifting cultivation and agricultural expansion, affecting roughly 45% of forest areas.	Inter-sectoral conflict and power of revenue-generating ministries, unclear land rights and allocation, tribal/cultural conflicts.
MADAGASCAR REVISED R-PP (FCPF October 2010)	Conversion to agriculture, firewood, expansion of legal or illegal small-scale mining.	Inadequacies of forest governance, tenure insecurity, rapid population growth, unsustainable agricultural practices, unstable livelihoods for households.
MEXICO R-PP (FCPF June 2011)	82% due to agriculture and grazing, 8% to illegal logging, 6% due to forest fires and pests.	Forest governance and enforcement, low income from forests, poverty, lack of security regarding rights of forest users.
MOZAMBIQUE R-PP (March 2012)	Subsistence and commercial agriculture, biomass energy, illegal logging, fire is main source of degradation. Biofuels increasing (2 million ha in 2009, increasing to 7 m ha).	Population increase and poverty, weak forest governance and enforcement, high demand for food and wood products, unclear plan to manage FDI (Brazilian farmers serving Chinese soy market) in agriculture.
NEPAL R-PP (FCPF October 2010)	High dependency on forest and forest products (timber, firewood and other NTFPs), Illegal harvesting, unsustainable harvesting practices, fire, encroachment, overgrazing, infrastructure development, resettlement.	Governance, population increase, poverty, unclear land tenure, market failure, cross-border demand for forest products.
NICARAGUA R-PP (June 2012)	Livestock production biggest driver of natural forest conversion, agricultural expansion, illegal forest products (wood and firewood), fires and agricultural expansion with fire, natural disasters, social pressure on resources for poor families, expansion of settlement into indigenous territories.	Tenure, beef market pressure (Venezuela, US, Mexico, other Central American countries), Institutional weakness, inability to control the informal market, market failure, financial weakness, value-chain weakness.
PANAMA R-PP (FCPF May 2009)	Traditional and mechanized agricultural practices, extensive livestock production, poor planning of urban expansion, unsustainable environmental culture.	Uncontrolled approach to development; extreme poverty, a paddock mentality, and incorrect valuation of forest resources, strong Agrarian Code.
PERU R-PP (March 2011)	Agricultural expansion (including oil palm, soybean and illegal crops) and cattle raising; slash and burn clearing and logging; transportation, energy, mining infrastructure. In future: investment plans and the pressure of illicit activities.	Indirect impacts from infrastructure expansion, population increase, poverty, social exclusion, lack of management control in forest concessions and in wood value chain.
REPUBLIC OF CONGO R-PP (FCPF September 2011)	Unsustainable shifting cultivation, unsustainable fuel wood production and consumption, unsustainable and illegal logging, urban development.	Population growth, macroeconomic factors, illegal activity (assessments of underlying factors part of readiness).
SURINAME DRAFT R-PP (FCPF January 2010)	All scales of mining for bauxite, oil, gold, kaolin, hard core + population growth, agric plantations, biofuel production, logging, mining, slash and burn activities, energy, infrastructural developments, mangrove clearing.	Lack of land use information, coordination and planning across sectors, monitoring, no ESIA.

Country	Direct drivers	Indirect drivers
TANZANIA R-PP (FCPF October 2010)	Settlement and agricultural expansion, overgrazing, firewood and charcoal production, uncontrolled fires, timber extraction, development of infrastructure/ industry, refugees, large scale bio-fuel production.	Market and policy failures, rapid population growth and rural poverty, the state of economy, climate change, insecure tenure, absence of land use planning.
UGANDA R-PP (FCPF June 2011)	Agricultural expansion in forested land, charcoal production (domestic + Sudan, Rwanda and Kenya), firewood harvesting, livestock grazing, timber production, human settlement and urbanization.	Agrarian population increasing, socio-economic dynamics, increased demand for forestry resources with few alternatives or substitutes, weak extension system.
VIETNAM R-PP (FCPF November 2011)	Conversion for industrial perennial crops and export commodities, infrastructure, hydropower, unsustainable and illegal logging, fires, shifting cultivation, fuel wood use.	Rapid economic growth; unclear tenure; weak policy, planning and enforcement; poverty; forestland classification; timber quote system. (Assessments of underlying factors, degradation, rubber expansion, and more as part of readiness planning).
ZAMBIA (UN-REDD March 2010)	Charcoal and wood fuel use (for domestic, commercial and industrial uses); timber production; and unsustainable agricultural methods (slash and burn with increasingly shorter rotations) and mining.	Past and current development processes in energy, forestry, agriculture and water sectors; poverty; dependence on charcoal and firewood and lack of alternative energy sources in urban areas; dependence on imports and national indebtedness; weak policy environment, lack of planning and consultation, lack of secure tenure.

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FUNDING AND SUPPORT PROVIDED BY:

NORWEGIAN MINISTRY OF THE ENVIRONMENT
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