
wissenschaftsplattform nachhaltigkeit 2030

Hintergrundstudie

Forests as a Global Commons: International governance and the role of Germany

Prof. Dr. Benno Pokorny, Dr. DI Metodi Sotirov, Prof. Dr. Daniela Kleinschmit, Prof. Peter Kanowski, Universität Freiburg



Zur Studie

Hintergrund

Wie können Global Commons besser geschützt und nachhaltiger genutzt werden, insbesondere im Rahmen der Deutschen Nachhaltigkeitsstrategie:

Unter anderem diese Frage bearbeitet die Wissenschaftsplattform Nachhaltigkeit 2030 mit dem Ziel, wissenschaftlich basierte Handlungsempfehlungen für politische Akteure zu entwickeln. Zu diesem Zweck hat sich 2017 über die Plattform die Arbeitsgruppe „Global Commons“ formiert, geleitet von Prof. Martin Visbeck (Co-Vorsitzender der Wissenschaftsplattform) und Prof. Aletta Bonn (Deutsches Zentrum für integrative Biodiversitätsforschung). In diesem Rahmen wurden unter anderem vier Hintergrundstudien zu vier Global-Commons-Bereichen von der Plattform in Auftrag gegeben (Süßwasser, Meere, Wälder, Biodiversität/Böden). Das vorliegende Papier „Forests as a Global Commons: International governance and the role of Germany“ ist eine von ihnen. Maßgeblich für die weitere AG-Arbeit ist ein breiter interdisziplinärer Austausch mit der Wissenschaft sowie transdisziplinärer Austausch mit Politik, Wirtschaft und Zivilgesellschaft in mehreren Schritten.

Zitierhinweis

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**Study IV:
Forests as a Global Commons:
International governance and the role of Germany**

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***International Forestry
Faculty of Environment and Natural Resources
University of Freiburg, Germany***

Prof. Dr. Benno Pokorny¹
Forestry and Rural Development

Dr. DI Metodi Sotirov¹
International Forest Governance

Prof. Dr. Daniela Kleinschmit
Forest and Environmental Policy

Prof. Peter Kanowski
Forestry, Environment and Society

¹Address of the corresponding authors

Coordination of MSc Course International Forestry
Chair of Silviculture
Faculty of Environment and Natural Resources
University of Freiburg
Tennenbacherstrasse 4
79106 Freiburg, Germany

e. benno.pokorny@waldbau.uni-freiburg.de and metodi.sotirov@ifp.uni-freiburg.de
f. +49 761 203 3680 (Pokorny) or 3723 (Sotirov)

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SUMMARY

Forests as global commons provide ecosystem services crucial for local forest users as well as the survival of humanity. At the same time, agricultural frontiers are steadily expanding into natural forests, particularly in the rural tropics still covered by large forest areas. Deforestation and forest degradation provoke enormous social, environmental and economic costs at the local, national and global level. Against this backdrop, a myriad of initiatives at all levels have been directed into improving forest governance to protect the remaining natural forests, to restore degraded forest land, and to properly manage the old and new forests for the benefit of the next generations. This study reviews the main elements of International Forest Governance (IFG), including the role of Germany, to promote the sustainable management and protection of natural forests, and analyses their impacts on tackling deforestation, forest degradation, biodiversity loss, climate change, and illegal activities. Based on international relations and global governance literatures, six basic types are derived that the IFG elements are clustered into: (1) multilateral intergovernmental treaties (CBD, ITAA, UNFCCC, failed forest convention), (2) non-legally binding multilateral agreements (IAF), (3) transnational hybrid governance regimes (FLEGT/timber legality regime), (4) public-private-partnerships (e.g., REDD+ initiatives), (5) non-state market driven governance (FSC/PEFC forest certification), and (6) private sector partnerships (deforestation free initiatives). These processes are reviewed in terms of their effectiveness and analysed with regard to the involved state and non-state actors including their positions, mind-sets and coalitions, as well as their specific policy aims, tools, management concepts, monitoring and control mechanisms, and main pathways of influence. This allowed to identify important challenges in the design and implementation as well as in the coordination, integration and coherence of all these governance elements, including the consideration of forest adverse governance arrangements outside the forest sector (e.g., agriculture, bioenergy, mining). Based on this analysis, this study critically reflects about the need and possibilities for transformative changes to secure the global commons function of forests. We conclude that the following possibilities have a realistic potential to at least strengthen global forest governance: (1) alignment of the International Forest Governance Regime, (2) promotion of the private sector within a strong regulatory framework; (3) intensification of bilateral action on the ground, and (4) an honest reflection on the own ambivalent role, on assumptions and expectations.

1 INTRODUCTION

This study analyses International Forest Governance encompassing all international policies and processes, including state-led, market-based and civil society initiatives involving state and non-state actors from multiple governance levels, aiming at implementing policy objectives, actions and behavioural changes to address transnational forest issues. We also consider influencing actions outside the forest sector thereby recognizing the importance of coordination, integration and coherence of actions from all forest affecting sectors and actors to secure the global commons function and sustainable development of forests.

In accordance with the analytical approach outlined in figure 1 below, the main aim of the study is to identify and describe the need and space of action to reach a global forest governance that guarantees the forests' essential contributions to achieve sustainability in the Anthropocene. The scope of the study comprises: (1) the assessment of the existing, probable and needed functions of forests as global commons; (2) the analysis of policies, governance processes and other actions affecting the drivers and global contributions of forests; (3) the description of the role and contribution of Germany to these actions, and (4), a critical reflection about the need and possibilities for transformative action.

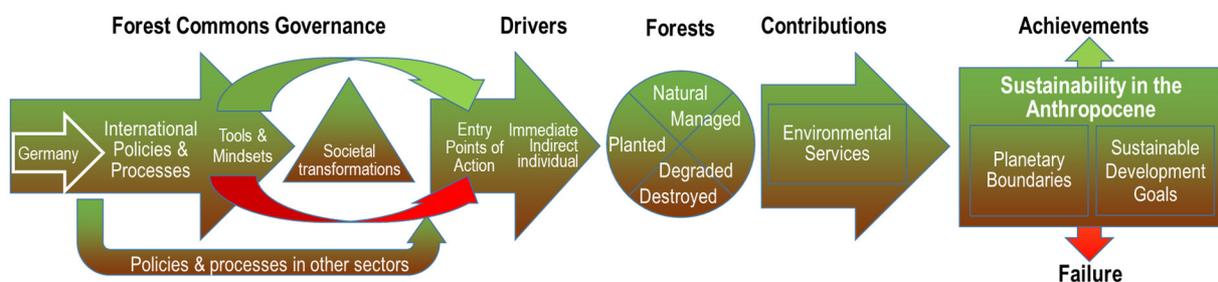


Figure 1. Analytical approach for the review study

This study builds on an in-depth review, comprehensive analysis and policy-relevant synthesis of the literature and expert evidence. The analysis of the data was structured around four main questions and related sub-questions that fall within the scope of the study as summarised above. The main sources for this review include recently published scientific books and papers including those with participation of the authors' team (e.g. Cashore et al. 2010, De Jong et al. 2018, Pokorny 2015, Katila et al. 2017, Kleinschmit et al. 2016, Rayner et al. 2010, Sotirov et al. 2016, Sotirov et al. in press), as well as reports, communications and data bases of international (e.g., UN, FAO, EU, ITTO, CIFOR, ICRAF, WWF, Greenpeace, Transparency International, Human Watch, etc.) and national (e.g., BMEL, BMU, BMZ) organisations, and accessible Overseas Development Aid statistics. These sources are complemented by interviews with experts selected due to their specific thematic and/or geographical expertise, including evidence from recent research projects and policy-science initiatives that the authors' team has actively participated in (e.g. BMEL Project on Future of Global Forest Governance, EU-Global Forest Study, EU-INTEGRAL/Global Governance Track, BMEL Study on global SFM C&I and SDGs). The gathered information and analysis was subject to triangulation and internal peer review to guarantee the relevance, validity, reliability, and resilience of the data analysis and study results.

2 FOREST AS GLOBAL COMMONS

2.1 Commons functions

2.1.1 Definitions

Terrestrial ecosystems are subdivided in biomes representing an assemblage of plant and animal life and defined by the dominant vegetation type. The **forest biome** is primarily characterized by the presence of trees that form a closed, or at least partially closed, canopy. In practice, definitions of forest and forest land vary in dependence of the geographical, institutional and functional context. A commonly used definition stems from the FAO Forest Resource Assessment, which, since the 1990s, every 10 years invests in providing an overall picture of global forest resources. These assessments use generally forest definition thresholds of 10% canopy cover and 5 metres tree height. In the tropical and subtropical zones, a 10%-40% canopy defines open forest, and 40%-100% canopy cover classifies as closed forest (FRA 2015).

Forests require a certain availability of water and nutrients, penetrable substrates, and a sufficiently long moderately warm season. As such conditions are naturally widespread, forest ecosystems are the single largest terrestrial ecosystem. Pre-agricultural closed forests once covered nearly 50 million km² (Matthews 1983). However, throughout geological times, forest coverage drastically varied –for example, just during the last 15.000 years, the extent of forest widely oscillated widely in response to colder and warmer phases (Figure 2).

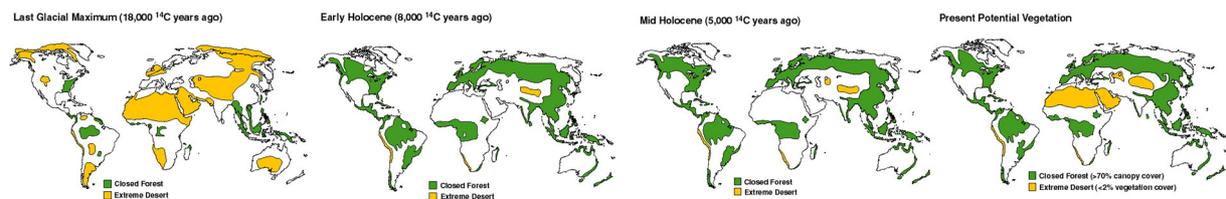


Figure 2. Global change of forest cover and extreme deserts during the last 18.000 years in response to changing climate (adapted from Adams, 1997; Adams and Faure 1997)

The forest biome can be further differentiated into **forest types** with a specific biocoenosis and ecology, which evolved on course of time due to differing abiotic conditions, particularly regarding climate and soils. At a gross level, six major forest types can be named (Figure 3): cool conifer forests, temperate mixed forests, warm temperate moist forests, tropical moist evergreen forests, tropical moist deciduous forests, and dry forests.

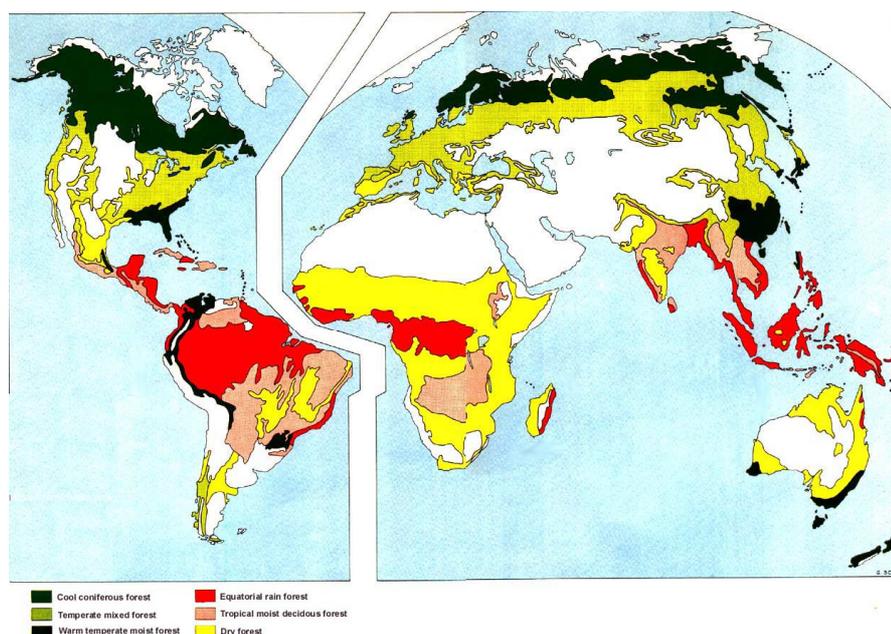


Figure 3. Major forest types of the world (FAO 1966)

Naturally, such categorization of forests into discretely distinguishable forest types is artificial, as in nature, within a complex mosaic of vegetation types, a certain forest type shades gradually into other forest types or other ecosystems such as woodlands or savannah, or land uses, such as pastures and agricultural lands. Such transition zones at the forest borders show a strong dynamic, and make up a significant and increasing fraction of forest ecosystems in many parts of the world.

Ownership of and access rights to forests considerably vary throughout the world. Ownership is a major source of contestation around the globe, affecting prospects for rural economic development, human rights and dignity, cultural survival, and environmental conservation. A legal forest owner is an entity that has the legal rights to freely and exclusively use, control, transfer or otherwise benefit from a forest, regardless of whether or not the owner of those trees also owns the land on which they grow (FAO 2015). Secure tenure to land tends to support economic development, local livelihoods, and conservation of ecosystems. In general terms, four ownership situations can be distinguished: (1) Public ownership, when forests are owned by the state or lower-levels of government; (2) Private individual ownership, when forests owned by persons or families, business entities and other private institutions exercising 'private' rights; (3) collective ownership, when forests are collectively owned and used by groups of users, families or communities; and (4) uncertain ownership, in the case that ownership is unclear, unknown or disputed.

Historically, most rural lands were owned and governed by local communities and Indigenous People under customary tenure systems. Often, the well-established local institutions and practices have historically helped to sustain large, intact ecosystems such as tropical forests, rangelands, and large-scale rotational agricultural systems. Nowadays, the estimates of world's land area held by local people around the world varies depending on the sources. RRI estimates that 1.5 billion local resource users manage as much as 65% of the world's land area on the basis of customary, community-based tenure systems (RRI 2015). In contrast, only a quarter of these customarily managed areas are formally recognized, because the state has claimed large areas of these lands under statutory law, being the basis for the government issuing concessions for forestry, industrial agriculture, large-scale mining, and oil and gas production. This process has led to the reallocation of community lands to the state, households and corporations as private property, often resulting in a situation of overlapping claims to lands.

In comparison to agricultural land, forest tenure (Figure 4) is even less clearly defined (RRI 2018). Governments assert legal and administrative authority over more than 70% of forestlands (FAO 2015), much of which is claimed by Indigenous Peoples and local communities. Public ownership is particularly high in boreal and tropical domains, and in lower income countries. A large proportion of government administered forest is either managed as protected areas or committed as state-issued concessions, licensing agreements, or untapped resources claims held for the benefit of private companies, local elites, or other investors. Some 12% is under private forest ownership by individuals and firms (excluding concessions), and this proportion is increasing slightly (FAO 2015). Around 15% of forests are cumulatively designated for and owned by Indigenous Peoples and local communities. At a regional level, the rate of statutory forest tenure recognition for Indigenous Peoples and local communities has progressed modestly over the last 15 years in Asia and Latin America, with China accounting for most of the gains achieved, but Africa continues to lag behind despite positive steps by some countries (RRI 2018).

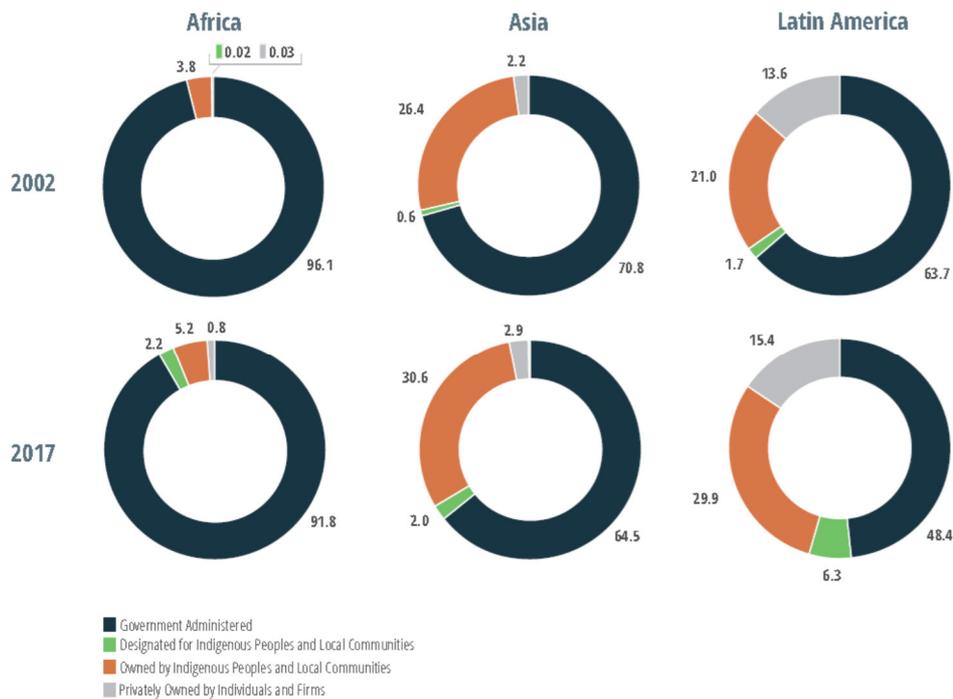


Figure 4. Regional trends of forest ownership in 41 “forest countries” around the world 2002-2017 (adapted from RRI 2018)

Loosely related to the forest ownership category is the **protection status** of the forest. In general terms, countries specify in their forest regulations restrictions and rules to forest owners and users. Another common denominator is that the commercial use of forests requires an authorization from governmental authorities. Most regulatory frameworks request a formally authorized management plan for the sustainable use of forest products, and prohibit degradative uses. Also, the conversion of forests into other land uses is restricted, whenever allowed for specific purposes. In addition, there are more rigorous protection categories. Legal protection schemes may strongly differ between countries, but can be aligned to one of the protection categories defined by IUCN (Dudley 2008). Forests that are aligned to a prohibition or at least strong legal restrictions of commercial uses fall under the category of Protected Areas. As shown in Figure 5, the area of such strictly protected forests has continuously increased. Nowadays, nearly 17% of remaining natural forests belong to this category, with South-America showing the highest, and West and Central Asia and Europe the lowest percentages.

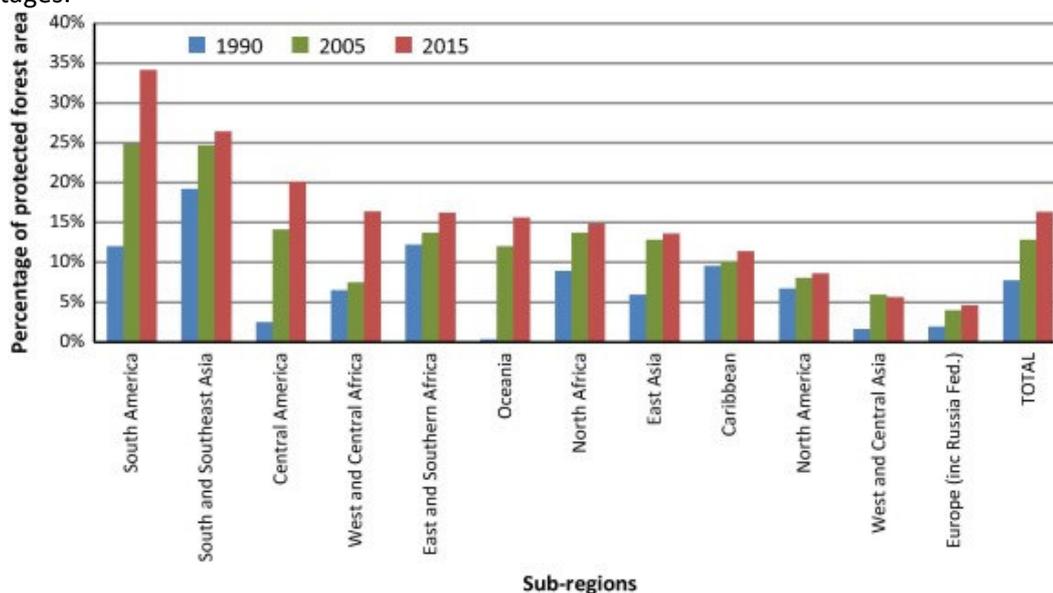


Figure 5. Change in forest area in protected areas by sub-region and over time according country data reported to FRA 2015 (adapted from Morales-Hidalgo et al. 2015)

Another aspect that differentiates between forests is the **level of manipulation** and the way forests are used. At a gross level, natural forests that originate from natural regeneration can be distinguished from planted forests. Natural forests include old-growth, pristine, or primary forests that have developed over long time horizons, and re-growth or secondary forests that re-grow after former use, degradation, or destruction by humans or due to natural reasons such as fire. In accordance with this definition, old-growth forests may demonstrate impact of past hunter-gatherers, agriculturalists and urban settlement (Roberts et al. 2017). In this sense, the line between old-grown and re-growth forests is fluid. Also planted forests, after longer growing periods, may become similar to the originally stocking natural forests. In addition, trees could be grown outside forests, for example in agroforestry and silvipastoral systems, or as single trees in and around agricultural fields. Younger re-growth forests, in comparison to the originally stocking forests, tend to show less complex biological and physical structure (Chokkalingam and De Jong 2001). Complexity is even lower in plantations often composed by one or only few species. All three types of forests can be used in planned or unplanned manner in different intensities. Typical uses include the extensive gathering of non-timber forest products, collection of fuel wood, selective and reduced impact logging in tropical natural forests, clear cutting of boreal forests for timber, and intensive management of high yield tree plantations. Uses can be sustainable in yields and volumes, but always have additional impacts to be considered as for example with regard to naturalness, biodiversity, or carbon storage. While the area of tree plantations is growing strongly in response to policies and markets, natural forests (in the tropics) and managed forests with native species (in temperate and boreal regions) are still by far the most dominant in terms of extent (Figure 6). Accordingly, unplanned extensive uses of forest are much more widespread than careful forest management. In 2015, similar proportions of the world's forests were designated primarily as production forest (31%), and for multiple use for the provision of a wide range of products and services simultaneously (28%). The conservation of biodiversity represents the primary management objective for 13% of the world's forests, although 31% of the forest area also is designated for protection of soil and water (FAO 2015)

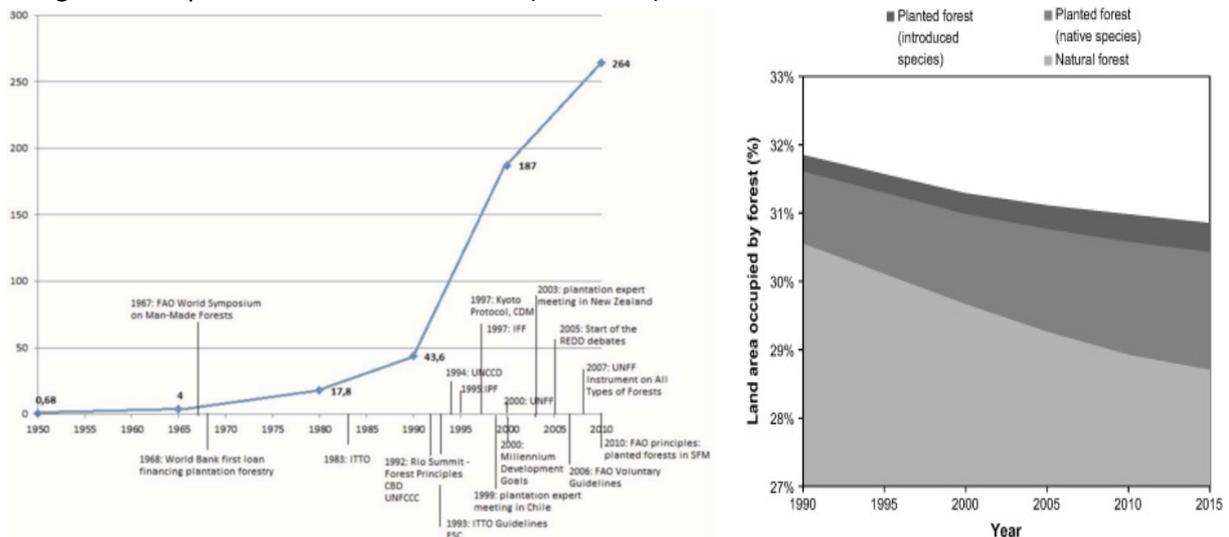


Figure 6. Evolution of plantation areas (in Mha) and proportion of forest types (adapted from Szulecka et al. 2014, Payn et al. 2015)

Finally, forests can also be classified with regards to their **level of degradation** along a gradient from fully intact to completely destroyed or replaced. Forest degradation can be understood as a state of anthropogenically induced arrested succession, where ecological processes that underlie forest dynamics are diminished or severely constrained, and management intervention is necessary to recover successional trajectories (Ghazoul et al. 2015). Degradation has an ecological as well as functional dimension. In ecological terms it affects the level of naturalness, in the sense that the ecological processes that run the ecosystem corresponds to those that would potentially appear without human interference including indirect effects from climate change and pollution. The functional perspective refers to the ability of forest ecosystems to generate the sum of environmental

goods and services to be expected from the originally stocking forests. In this sense, degradation may range from the extraction of one single tree to a larger scale change in structure and composition through management, including sustainable management. The ultimate form of forest degradation results from the destruction and replacement of forests by other land uses. While this land use change might be temporary, increasingly it is not. Depending of forest type, duration of non-forest land use, and the intensity and frequency of fire use, temporarily converted land could re-grow to forests through natural succession or planting. Globally, 30 million km² of forests are considered degraded¹.

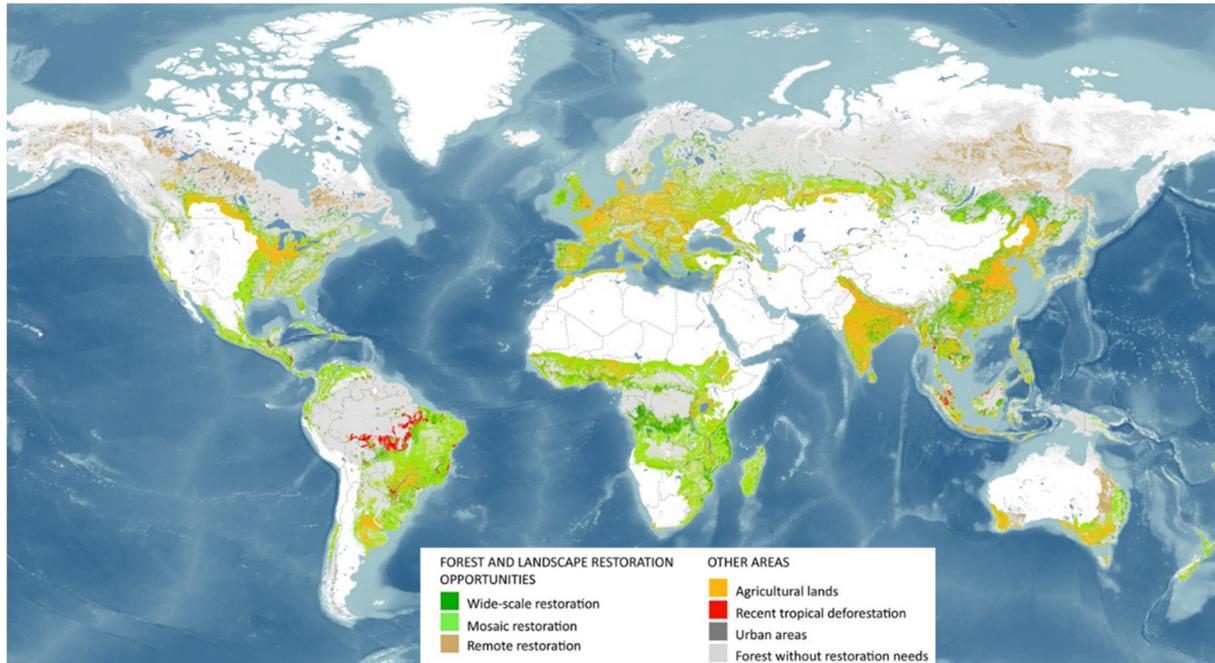


Figure 7. Map of the world's degraded land (adapted from The Bonn Challenge)

The degree of degradation determines the challenges for restoration² (Figure 7). On up to 5 million km² of degraded land closed and continuous forests could be re-established as a result of *wide-scale* restoration. The vast majority of the degraded land, around 15 million km², offer opportunities for so-called *mosaic* restoration, in which forests are combined with other land uses incorporating trees, including agroforestry, small-holder agriculture, and buffer plantings around settlements. Only a comparatively smaller proportion of 200 million hectares of unpopulated lands, mainly in the far northern boreal fire degraded forests would be difficult and costly to restore through *remote* restoration techniques, but nevertheless could regain health and function naturally without assistance.

2.1.2 Functions

Due to their expansion and ecological capacity, forests provide essential ecosystem services at local, regional and global scale. In accordance with the Millennium Ecosystem Assessment (2005), ecosystem services are the benefits people obtain from ecosystems. These include *provisioning services* such as food, water, timber, and fibre; *regulating services* that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and *supporting services* such as soil formation, photosynthesis, and nutrient cycling (Figure 8).

¹ <https://data.worldbank.org/indicator/AG.LND.FRST.K2> (accessed on 30.12.18)

² <http://www.bonnchallenge.org/what-our-global-restoration-opportunity>

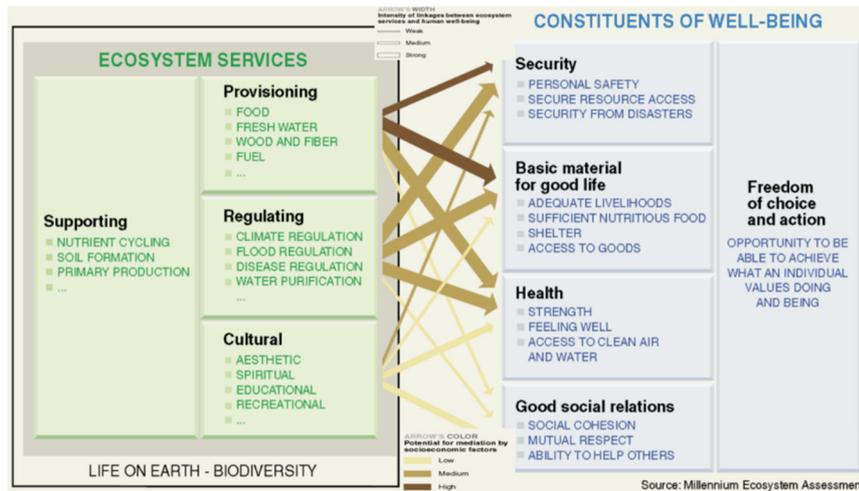


Figure 8. Linkages between ecosystem Services and human well-being (adapted from MEA 2005)

The contributions of the above outlined forest types strongly vary regarding the type, quantity and quality of contribution of ecosystem services in dependence of their specific ecological features, the level of degradation, and the socio-economic context in which they stock. At the global scale, forests provide ecosystem services essential to mitigate the continuing trajectory away from the Holocene to a very different state of the Earth System as captured in the Planetary Boundary Framework (Rockström et al. 2009). Figure 9

Figure 9 exemplifies some key contributions of forests to the processes that are suggested as the basis of the Planetary Boundary framework.

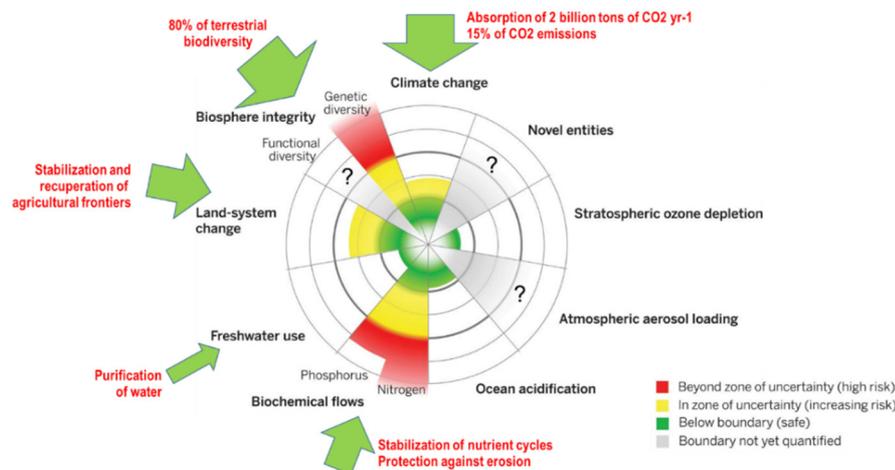


Figure 9 Current status of the control variables for the planetary boundaries, and contributions of forests (adapted from Steffen et al. 2015).

Forests make major contributions to five of the nine processes defined in the Planetary Boundary Framework, particularly with regard to the core boundaries, climate change and biosphere integrity, that has the potential on its own to drive the Earth System into a new state (Steffen et al. 2015). With 80% of terrestrial biodiversity, the contribution of forests to biosphere integrity is critical, even more so given that the variable genetic biodiversity is already in the red high-risk zone, indicating that action is urgently required to avoid approaching a tipping point and consequent abrupt or risky change (Steffen et al. 2015). Regarding climate change, forests capture a significant proportion of carbon. Yearly, forests act as an overall sink for 2.1 Gt CO₂ yr⁻¹. Reversely, the conversion of forests into other land uses releases up to 11% of CO₂ emissions (IPCC 2018). While the net contribution of forests to anthropogenic emissions decreased slightly to 2.9 Gt CO₂ yr⁻¹ to 2011–2015, CO₂ emissions from forest degradation increased significantly, from 0.4 Gt CO₂ yr⁻¹ in the 1990s, to 1.0 Gt CO₂ yr⁻¹ in 2011–2015 (Federici et al. 2015). In this sense, forests can play a crucial role to mediate land system change dynamics, through stabilization and recuperation of agricultural frontiers. In practice, however, the

role of direct, human-driven land-system change in biophysical climate regulation is primarily related to changes in forest biomes (Steffen et al. 2015).

Forests also provide indispensable services to guarantee provision and quality of freshwater, as they are intimately linked to rainfall and water availability. Forests transport water locally and globally and fulfil important regulatory functions, by capturing fog and cloud water, infiltrate and recharge groundwater, and mitigate floods (Ellis et al. 2017). Forests, and forest soils play also an important role in local and global biochemical flows. Forests slow down the massive increase in atmospheric nitrogen with grave impacts on biodiversity, global warming, water quality, human health, and even the rate of population growth in developing nations (Fields 2004). They transform and store atmospheric nitrogen in the form of biomass, which, due to their spatial extension, results in enormous quantities. However, this is related to a process of eutrophication, which negatively affect biodiversity. Regarding the problem of global phosphorus flows, and possible effect on agricultural production in phosphorus exporting low-income countries (Nesmeabc et al. 2018), the role of forests is less, as they are generally considered being poor of phosphorus (Yang et al. 2014). However, forest ecosystems, because of their complex hierarchies and interactions within living communities, effectively mobilize tight phosphorus and transform it into biomass. This makes forest extremely effective growing on sites poor in mineral bound phosphorus, which are adequate for agriculture. Thus, forests allow mobilization of phosphorus that is otherwise difficult to access and may also re-mobilize phosphorus from abandoned ex-agricultural soils, where it remains unused (Lang et al. 2016). In addition, forests have a vital function in stabilizing biochemical flows at local and global level, as they prevent nutrients from being mobilized by protecting the soils from erosion and their fixation in local nutrient cycles.

Considering the magnitude of essential ecosystem services that forests provide, they contribute – directly or indirectly– to nearly all Sustainable Development Goals (IIED 2014, UN 2017, FAO 2018). Forests are explicitly named in SDG 15, strongly related to the discussion on Planetary Boundaries presented above. In accordance with the integrative character of the SDG model and the conceptual understanding of ecosystem services, SDG 15 is intrinsically interlinked with all other SDGs (Figure 10).



Figure 10. Major contributions of forests to the Sustainable Development Goals along the 5 P's of Agenda 2030 (adapted from UN 2015c)³

Considering the role of forests to store and capture carbon and to positively influence water and nutrient flows, the relevance of forest becomes most immediately clear regarding SDGs, which themselves refer more explicitly to environmental issues such as SDG 6 (Clean water & Sanitation), SDG 13 (Climate Action), and even SDG 14 (Life below Water) in terms of improving the conditions of coastal waters (Seymor and Busch 2016). But forests are also linked to SDGs targeting socio-economic

³ A more detailed visualization of forest contributions to SDGs is available under <https://nydfglobalplatform.org/forests-and-sustainable-development-goals/> (accessed, January 2019)

development goals, which essentially relates to two facts. First, nearly one and a half billion people in the world depend on forests as a contribution to meeting livelihood needs (UN⁴, Chao 2012). Even more strikingly, it is the remotely located forest areas where the poorest segments of global society live (Barbier and Hochard 2018). This makes forests fundamental for the survival of millions of poor people, including 70 million indigenous people partly belonging to highly threatened ethnic minorities (De Jong et al. 2018). Particularly poor rural women depend on common pool resources and are especially affected by their depletion (UN²). Second, forests serve as a source of food and materials of both plant and animal origin, including medicines, fuel, construction materials, fodder for animals, and fibre and dyes for various purposes (Angelsen et al. 2014, Bhaskar et al. 2015). Particularly, wood is considered a key resource because being the primary source of energy for millions of households (more than 90% of the people) in Africa (Angelsen et al. 2014), and input for a wide range of value chains (Nambiar 2015). Considering that wood can be a renewable energy source, it has also a great potential to contribute to SDG 7 (Clean & Sustainable Energy) (Katila et al. 2017). Nowadays, the shift towards bioeconomy boosted by more than 40 countries globally demands as well for renewables to replace fossil based resources. Forests do play an important role as a producer of these resources already now but probably as well in the future. The harvest processing, refinement and trade of forest products generate income for tens of millions of households in rural areas, mainly through small and medium-sized forest enterprises, largely operating in the informal economy (Macqueen 2008). Globally, the forest sector generates an estimated 13.2 million formal jobs and an additional 41 million informal jobs (FAO 2014), which indicates the relevance for SDG 8 (Decent Work & Economic Growth). In addition, the value of the flow of the forests biome ecosystem services has been estimated to be nearly USD 5 trillion annually (Saito et al. 2017). Considering the volume and diversity of materials, including the still unexplored genetic wealth of flora and fauna, forests have a connection to SDG 9 (Industry, Innovation and Infrastructure). Finally, considering the intrinsic relationships between forests and people, particularly forest communities collectively managing their forests, the management and protection of forests are strongly related to SDG 16 (Peace & Justice Strong Institutions) and SDG 17 (Partnerships for the Goals). Thus, there is agreement that the effective conservation of forests as a common good requires agreement and collaboration of all relevant stakeholders. This is a challenge, but efforts for sustainable management and conservation of forests may serve as a vehicle to achieve such a collective forest governance.

2.1.3 Challenges

Despite their critical importance, the extent of natural forests has been contracting under human pressure, most dramatically during the last four decades (Figure 11). Just between 2010 and 2015, the world lost 3.3 million hectares of natural forest areas. Thirteen million hectares of natural forests are being lost every year while the persistent degradation of drylands has led to the desertification of 3.6 billion hectares (UN⁵). Natural forests in the tropics are most strongly affected (Keenan et al. 2015). Accordingly, the largest area of net tree canopy⁶ loss occurred in the tropical dry forest biome (95,000 km² since 1982), closely followed by tropical moist deciduous forest (-84,000 km² since 1982). In parallel, the area of tree canopy in major forest biomes outside the tropics has increased over the past 35 years with temperate continental forest showing the largest gain (+726,000 km²), followed by boreal coniferous forest (+463,000 km²) and subtropical humid forest (+280,000 km²) (Song et al. 2018). Most of the new tree cover occurred in previously barren places such as in deserts, tundra areas, in mountains, in cities and in other non-vegetated land; 60% was the result of human efforts, such as reforestation efforts in China and parts of Africa, and the remaining 40% due to a range of factors, including global warming, which has raised timberlines in some mountainous regions, and allowed forests to creep into tundra areas; and large areas of naturally regrown forest vegetation on abandoned agricultural land, particularly in Russia and the U.S.A. Thus, while natural forests have greatly declined, particularly in low-income countries in Africa, Latin-America and South-East Asia,

⁴ <https://www.un.org/sustainabledevelopment/biodiversity> (accessed, December 2018)

⁵ <https://www.un.org/sustainabledevelopment/biodiversity/> (accessed December 2018)

⁶ as a proxy for forests

overall net tree cover has increased by 2.24 million km² (+7.1% relative to the 1982 level). The net forest loss in the tropics is being outweighed by a net gain in the extra tropics (Song et al. 2018).

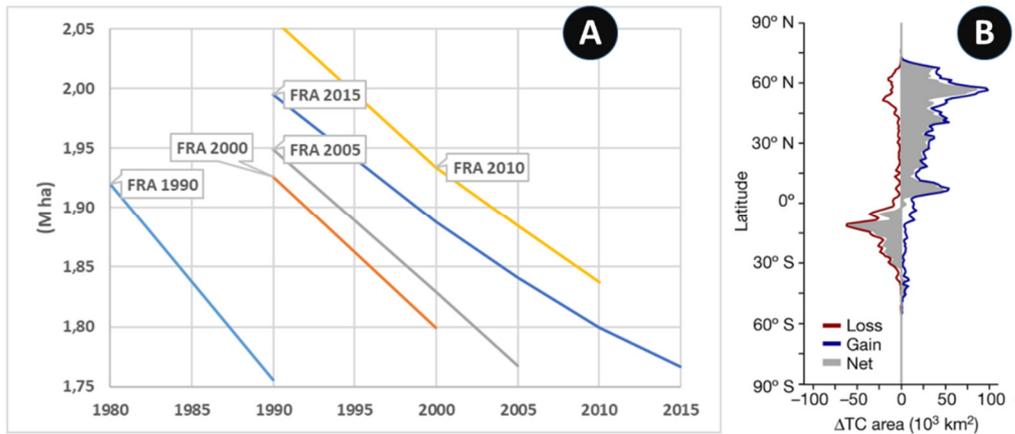


Figure 11. A: Trends in natural forest area (from 1980 to 2015) as reported by Forest Resource Assessments (FRA) for 90 countries (adapted from Keenan et al. 2015) and B: Tree canopy cover change from 1982 to 2016 (adapted from Song et al. 2018)

Hence, the challenges regarding the “forest problem” are threefold: (1) the **fight against the destruction and degradation of natural forests**, particularly in the tropics and boreal areas, associated with a serious loss of ecosystem services, (2) the **restoration of deforested and degraded land**, and (3) the **proper management of re-grown and planted forests** to compensate for natural forest losses.

Following the UN’s (2017) assertion of the need of progress in conserving and sustainably managing and protecting forests, we reflect below on the drivers of deforestation and forest degradation as a basis to interpret and assess the manifold governance initiatives. Destructive forest use is driven by several mutually reinforcing factors. The literature basically distinguishes between, on the one hand, direct or proximate drivers representing human activities that directly affect forests, such as harvesting of timber and other forest products, agricultural expansion and the construction of roads, and, on the other hand, indirect, enabling or underlying drivers. The latter comprise the complex interactions of economic, political and institutional, technological, cultural, socio-political and demographic factors that affect the proximate drivers (Geist and Lambin 2001, MEA 2005, Kissinger et al. 2012, FAO 2016, Sotirov et al. 2017). An additional layer of immediate individual drivers refers to the rationalities and decision parameters of land users (Kaimowitz and Angelsen 1998, Perz, 2002, Walker 2004, Sotirov et al. in press). From this perspective, forest governance is interpreted as a bundle of measures to shape and mediate the effects of societal contexts on economic and political actors and their decisions, whilst at the same time being influenced by this very same reality (Figure 12).



Figure 12. The conceptual framing of forest governance in the context of deforestation drivers (adapted from Pokorny et al. 2016)

2.1.3.1 Immediate individual drivers

Land use decisions are made by people. If at least one person or a group of people has a sufficiently high interest, opportunity and capacity for an action that negatively affect forest, there is high probability that this action will be sooner or later realized. Thus, to design effective forest governance mechanisms require to understand how people make decisions. It is commonly agreed that individuals make decisions to maximize individual benefits (Rittenberg and Trigarten 2009) and insufficiently consider externalities. Their decisions are subjectively framed on the basis of reference points constructed on the basis of their own experiences (Kahneman and Tversky 1979) and a specific cultural and social imprinting induced by knowledge, belief, art, morals, law, custom and any other capabilities and habits that the surrounding society has developed over time (Berg 2003, World Bank 2015, James 2015). Accordingly, individuals behave to maximize their interests based on shared expectations about the behaviour of others (Ostrom 1998), and they perceive relative changes rather than absolute values. Outcomes of decisions below the reference point are considered as losses and hurt more than gains feel good (Thaler 1980, Kahneman and Tversky 1979). In consequence, people tend to maintain their daily practices even if they are not meaningful from a more objective standpoint. To change behaviour, thus, requires strong incentives to change (Kahneman et al. 1991) and effectively working institutions for the promotion of collective action (Ostrom 1998).

2.1.3.2 Direct drivers

Land uses present opportunities for resource users to satisfy their demands and expectations outlined above. Land uses in forested landscapes comprise a wide range of activities, most of them related to deforestation and degradation, because sustainable forest uses show a comparatively high level of financial risk and low achievable profit margins, at least in the short term, compared to other land uses. This is backup by the common practice to convert forest into agricultural land uses without using the timber (Pokorny and Pacheco 2014) (Figure 13).

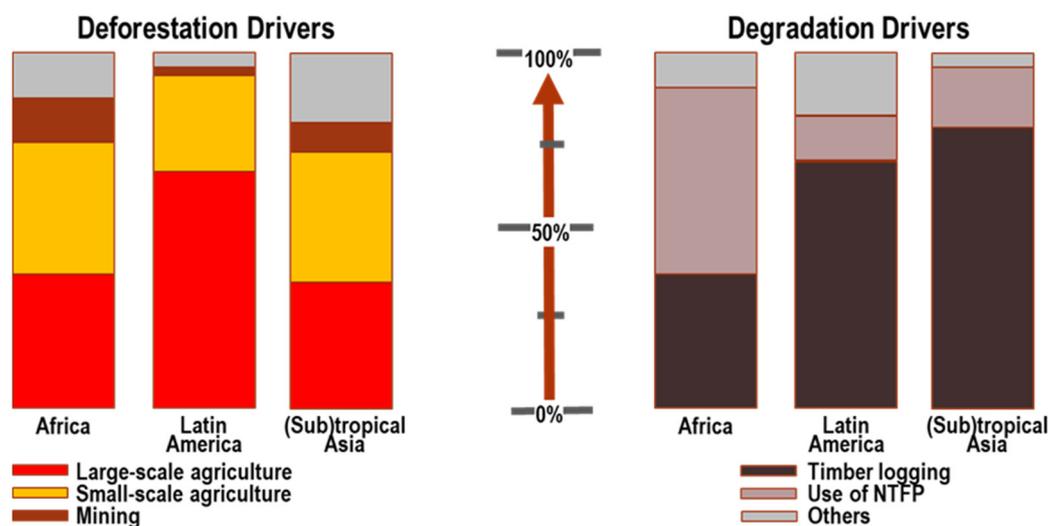


Figure 13. Direct drivers of destructive uses of natural forests (adapted from Kissinger et al. 2012)

Agro-industrial production of commodities for global markets requires significant investments in land and technologies as well as a good integration into international value chains, but promises large profits in short time periods (Börner et al. 2010). In the case of cattle ranching, investments costs, management intensities but also profit margins are lower compared to agro-industrial uses, but, particularly if realized at a larger scale, are attractive because profits are generated at a comparatively low risk due to cheap land and credit programmes, as well as indirectly, through subsidies, notably for energy and materials (e.g. fertilisers and pesticides). Large-scale agriculture including cattle ranching is most importantly in Latin America. In particular, in the Amazon region but also in Southeast Asia, agribusinesses producing meat, soybean and palm oil for global markets play an increasing role (Rudel et al. 2009, DeFries et al. 2010). It is estimated that the expansion of these production schemes is

responsible for up to 80% of **deforestation** worldwide (Geist and Lambin 2001, Gibbs et al. 2010, FAO 2016). In some regions, the extensive production of non-timber forest products (NTFPs) also plays a role, as for example in the case of rubber plantations in mainland Southeast Asia and Southwest China (Warren-Thomas et al. 2015). Small-scale agriculture is comparatively more important in much of Africa and Asia (DeFries et al. 2010, Fisher 2010, Silva et al. 2011). While many small farms are effectively managed over the long term, others suffer from gradual degradation due to poor management and marginal size and properties (Barbier 2012). Particularly, the widespread practice of using fire to prepare agricultural fields poses an enormous threat to forests (Cochrane 2009). Finally, there are large investments in the exploitation of minerals, oil and gas as well the construction of dams for the generation of energy in many forested regions worldwide (Kissinger et al. 2012). While the industrial exploitation of gold and diamonds often happens at a smaller scale, the surface mining of high bulk, low value commodities like coal and iron ore can affect very large areas. This is also the case regarding dams built for the generation of hydro energy (Edwards et al. 2014).

Regarding **forest degradation**, the harvest of wood and non-wood products plays a key role, particularly that realized by local dwellers lacking formal authorization. While some NTFPs are used on the basis of well-defined traditional norms (Shanley et al. 2002), others, such as fuelwood collection and charcoal production in semiarid Africa, often in combination with livestock grazing in forests, ignore social or environmental thresholds (e.g., Ahrends et al. 2010, Kissinger et al. 2012). Selective logging of timber, often illegally, of high value trees in tropical forests, is seen as a first step for the subsequent conversion of forests into other land uses (Asner et al. 2006, Fisher 2010, Laporte et al. 2007). Organization of logging, transport and trade of timber requires elevated know-how and capital, and thus mainly relies on capitalized, well-connected actors. Even the use of timber in forest concessions managed on the basis of authorized management plans in accordance with the principles for sustainable forest management, in practice, do not necessarily comply with the technical standards outlined in regulations, and thus fail to effectively protect forest areas in the long-term (Sabogal et al. 2007, Pokorny 2015).

2.1.3.3 Underlying drivers

Drivers for deforestation and forest degradation are stimulated by prevailing contexts shaping the decision of land users (Kissinger et al. 2012, FAO 2016). This includes the specific local configurations of land tenure, regulatory and institutional frameworks, markets, finances and public services as well as broader processes such as demographic and economic dynamics, conflicts and crises, as well as (now) climate change (Geist and Lambin 2001, Obersteiner et al. 2009, FAO 2016). Centuries of exploitation, colonisation, settlement and exploration in many rural regions worldwide have shaped a societal structure characterized by historically **inequitable power structures** where changes in land use respond to the interests of powerful political and economic elites rather than local needs and priorities (Bryant and Bailey 1997, Bryant 1998, Blaikie 1999, Neumann 2008, Nygren and Rikoon 2008). These remotely located forest regions suffer from high poverty rates (Chen and Ravallion 2011, Green and Hulme 2005, Harriss 2007), and limited access to public services (Barbier 2012, Green and Hulme 2005). Although about 86% of the world's forests are formally owned by the state (Siry et al. 2010), the land tenure situation is often unclear and conflicting (Larson et al. 2008, RRI 2015). This particularly includes large tracts of land managed on the basis of customary rules, as customary land users dispose official land titles for less than a fifth of their land (RRI 2015).

Over the last few decades, **newly constructed roads** have made many forested landscapes more accessible (Walker et al. 2013). On the one hand, roads have made markets and public services accessible for a larger part of rural populations, opening up new economic opportunities (Barber 2014) and creating new urban-rural networks (Padoch et al. 2008). In parallel, roads act as entry points for other economic actors who use their resources, capacities and social connections to appropriate land and resources, widely ignoring customary rights (RRI 2015, De Schutter 2011). It is common that improved accessibility of remote forest areas promotes over-use and conversion of forests into

agricultural land uses (Laurance et al. 2014). It is estimated that at least 25 million kilometres of new roads will be built by 2050, mostly to improve access to rural production areas (Laurance et al. 2014).

Land use dynamics are affected by a still **growing population** and **improved levels of economic well-being** among large parts of particularly urban populations in most economically less developed countries (UNDP 2015). Both processes typically induce a significantly growing demand for food, mineral resources, energy for transport, electricity and heating (UNDP 2015), including a two - to three-fold increase in demand for both food products and biofuels by 2050 (OECD/FAO 2015). This will exacerbate the further expansion and intensification of agro-industrial production (FAO 2009), much of which takes place through encroachment in forest areas. In parallel, a nearly 50% increase in worldwide energy demand by 2040 is expected. Considering the reduction in fossil fuel consumption agreed in Paris, governments will likely invest in the construction of large-scale hydro-energy dams (IEO 2016). Equally, many new mining areas will likely be established or enlarged in pristine forest areas, regardless of any pre-existing legal protection status (Rademaekers et al. 2010). In parallel, rising prices will stimulate small-scale, informal mining operations (Swenson et al. 2011, Schueler et al. 2011). Pushed by cost-sensitive consumers in economically-developed regions and urban centres, the private sector will most likely use their increasing control over resources and markets to enforce highly productive technology packages for the production of a limited number of standardized goods (FAO 2016, Rademaekers et al. 2010, Pacheco and Pocard-Chapuis 2012, Boucher et al. 2011, Rudel et al. 2009). This will further discriminate against small-scale producers of agricultural and forest products. Also, the demand for forest products is expected to increase, primarily for pulp and timber (Rademaekers et al. 2010), while consumption of fuelwood may stabilize as a result of economic development and the related switch to other energy sources (Klenk et al. 2012). However, the demand for charcoal is likely to increase because of the growing number of urban inhabitants. Consequently, the pressure on already-diminishing natural forest areas is likely to increase in the near future (Lapola et al. 2010), even though an increasingly larger share of forest goods will be produced in intensively-managed tree plantations (FAO 2016).

Climate change will exacerbate these problems by causing shifts in land uses in response to climate and ecosystem change (HLPE 2012). In combination with an increasing number of **economic and political crises** (IFAD 2010), this is likely to mobilize millions of rural families who will leave their land in search of new economic opportunities (Burrows and Kinney 2016).

2.2 Global forest governance initiatives

This section reviews international forest policies and governance processes of key relevance for steering forests as global commons. They emerged within the context of the 2030 Agenda being a universal, collective responsibility that covers all levels: global, national and territorial. Such policies and processes can be understood as a “regime complex” (Rayner et al. 2010, Glück et al. 2010) composed by a set of **specialised regimes** and **other governance arrangements** that are loosely linked together, sometimes mutually reinforcing but at other times overlapping and conflicting (Keohane and Victor 2010). **International forest governance regimes** are “...sets of implicit or explicit principles, norms, rules and decision making procedures around which actors’ expectations converge in a given area of international relations...” (Krasner 1982: 186). **Forest governance arrangements** are rules, policies, instruments and strategies through which state and non-state actors coordinate their actions to achieve policy (*output*), behavioural (*outcome*) and on-the-ground (*impact*) changes towards common goals and issues (Sotirov et al. 2015, Sotirov and Arts 2018), for example to reduce deforestation and forest degradation, to ensure sustainable forest management, to conserve forest biodiversity and to mitigate climate change through forestry.

The following three sub-sections present, (1) the main international forest governance approaches and their principle features, (2) their contributions to the forest-related goals of Agenda 2030 regarding

policy effectiveness (e.g., outputs, outcomes, impacts) and policy coherence, and (3) an analysis of deficits, shortcomings and challenges.

2.2.1 The initiatives

The bewildering variety and complexity of the international forest regime complex can be structured along two axes: first, the arrangements’ degree of compulsion (“hard - soft law”) and, second, the key role of state and non-governmental actors in the governance process (“public - private - mixed”). Accordingly, **six basic types of international forest governance** can be derived (Table 1): (1) multilateral intergovernmental treaties, (2) Non-legally binding multilateral agreements, (3) transnational hybrid governance regimes, (4) Public-Private-Partnerships, and, (5) Non-state market driven arrangements, and (6) Private sector partnerships. Each of these types consist of specific governance elements. These elements are described and analysed in terms of their policy aims, tools, management concepts, monitoring and control mechanisms, intervention logics, and mindsets.

Table 1. Global Forest Governance: Main Types and Elements

SUSTAINABLE DEVELOPMENT		
<i>Brundtland Report - UNCED in Rio / Rio+ Process – Millennium Development Goals, Agenda 2030 and Sustainable Development Goals</i>		
Key Actors	Degree of Compulsion	
	Legally-Binding	Non-Legally Binding
Nation states	Type I: Intergovernmental treaties (International hard law)	Type II: Non-legally binding agreements (International soft law)
Key Actors	<ul style="list-style-type: none"> • UN Conventions - Failure to agree a Global Forest Convention - <i>International Tropical Timber Agreement (ITTA)</i> - <i>Convention on Biological Diversity (CBD)</i> - <i>UN Framework Convention on Climate Change (UNFCCC)</i> - <i>UN Convention to Combat Desertification (UNCCD)</i> - <i>Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES)</i> 	<ul style="list-style-type: none"> • <i>International Arrangement on Forests (IAF)</i> - <i>Chapter 11 Agenda 21, Forest Principles, 1992</i> - <i>IPF (1995-1997), IFF (1997-1999)</i> - <i>UN Forum on Forests (UNFF, 2000-to date)</i> - <i>UN Forest Instrument (NLBI/UNFI), 2007/2015</i> - <i>UN Strategic Plan for Forests 2017-2030</i>
Nation states and non-state actors	Type III: Transnational regulatory governance (Transnational hybrid regimes)	Type IV: Public-private partnerships (PPP)
Key Actors	<ul style="list-style-type: none"> • <i>Global Timber Legality Regime</i> - <i>EU FLEGT VPAs</i> - <i>EU Timber Regulation; US Lacey Act; Australian Illegal Timber Prohibition Act</i> 	<ul style="list-style-type: none"> • <i>New York Declaration on Forests 2014</i> • <i>Amsterdam Declaration 2015</i> • <i>REDD+ initiatives</i> • <i>The Bonn Challenge</i>
Without nation states	Type V: Non-state market driven governance (International private law)	Type VI: Private sector partnerships (Corporate social responsibility)
Key Actors	<ul style="list-style-type: none"> • <i>Forest sustainability certification</i> - <i>FSC, PEFC, etc.</i> • <i>Food sustainability certification</i> - <i>RSPO (palm oil) and equivalents in beef & soy</i> 	<ul style="list-style-type: none"> • <i>Business led deforestation-free supply chain initiatives</i> - <i>Tropical Forest Alliance 2020; Nestle & Airbus Supply Tracking Partnership;</i>

2.2.1.1 Type I: Multilateral intergovernmental treaties (International hard law)

The failure to agree a Global Forest Convention

The launch of international forest governance can be traced back to the 1980s and early 1990s, a time of accelerating trade globalization coupled with a globalizing environmental movement and science concerned over the loss of tropical forests (Humphreys 2006). In the 1987, the Brundtland Report to the World Commission on Sustainable Development promoted a vision of sustainability as a “three-legged stool” with environmental, social and economic legs (WCED 1987). The 1990s marked a turning

point in the development of international environmental governance, with the launch of three new global conventions at the UNCED Earth Summit in Rio in 1992 (see below). At this time, several national governments particularly of developed (OECD) countries were also pushing for a **legally binding Global Convention on Forests** that would provide a centralized, normative authority over the forest sector as a whole, thereby reducing the adverse transboundary impacts of deforestation and forest degradation (Rayner et al. 2010). However, the majority of developing countries (the G77 and China) were opposed so that **no such agreement was reached** at the UNCED in 1992 nor later. In 1995, the Commission on Sustainable Development (CSD), which had been created in 1992 under the United Nations Economic and Social Council (ECOSOC) to ensure effective follow up to UNCED, established the Intergovernmental Panel on Forests (IPF). In 1997, the CSD established the Intergovernmental Forum on Forests (IFF), to continue the work of the IPF. The forest convention debate resumed at the CSD meeting in 1995 and was taken up once again at the fourth and final session of the IFF in 2000. Country positions shifted at both meetings, with many developed and developing countries now in favour of a convention. However, key countries, including Brazil and other members of the Amazon Cooperation Treaty Organizations (ACTO) and the United States remained sceptical of the benefits of a convention. The treaty opponents were even joined by environmental NGOs. After failure to find an agreement, the compromise was the creation of the **UN Forum on Forests (UNFF)**. Until 2005, national governments under the UNFF again found no global consensus, with more countries, including African and many EU countries, moving away from the idea of a global forest convention (Rayner et al. 2010).

Several **sticking points** prevented agreement. One is the absence of reliable scientific knowledge about the transboundary impacts of deforestation and forest degradation (Dimitrov et al. 2007). Opposing countries also argued that developed countries were pressing for a convention as a way to influence the management of tropical forests leading to adverse socio-economic consequences, while refusing to acknowledge (sustainability) problems in their own forests (Rayner et al. 2010). This argument relates to the issue of North-South compensation for “opportunity costs”. Developing countries claimed that many developed countries had already exploited their forests as part of their economic development and that it was inequitable to ask developing countries to forego the same opportunities without adequate compensation. Another sticking point was the issue of “national sovereignty”, or the unwillingness of many national countries to subjugate a degree of national control to global authority (McDermott 2014). Finally, NGOs did not support a global forest convention as they feared that negotiations could lead to levelling down forest management practices for the economic benefit of the forest sector and at expenses of socio-ecological values (Dimitrov 2005, Rayner et al. 2010).

International Tropical Timber Agreement

The International Tropical Timber Agreement (ITTA) is a succession of **intergovernmental legally binding agreements** negotiated under the UN system. This international law is agreed between developing countries that produce tropical timber and timber commodities (“producer countries”) and developed countries that consume these products (“consumer countries”). The first ITTA was signed in 1983 and entered into force in 1985. A second ITTA was negotiated in 1994 and entered into force in 1997. The third and actual ITTA was agreed in 2006 under the United Nations Conference on Trade and Development. It is valid until 2021 after it had entered into force in 2011. The ITTA is administrated by the International Tropical Timber Organisation (ITTO). It comprises of “producer” and “consumer” member countries. The highest decision-making authority of ITTO is the International Tropical Timber Council (ITTC), which consists of all the members of the Organization. The main **policy goals** of the 2006 ITTA is to promote the expansion and diversification of international trade in tropical timber from sustainably managed and legally harvested forests and to promote the sustainable management of tropical timber producing forests. To achieve this goal, a mix of information and economic **policy tools** are used. They include demonstration and “know-how” transfer projects, guidance and information, timber trade monitoring and statistics, the encouragement of forest certification, and the promotion of tropical timber and non-timber forest products (UN 2006). A core strategy pursued by the ITTO is to develop Criteria and Indicators (C&I) based on expert-driven processes, and to assist tropical countries

on voluntary basis, from national to project levels, to measure and report on SFM (ITTO 2006: 11). The main **pathways of influence** are (i.) direct access through providing producer countries with information, direct funding, and capacity building, and (ii.) markets through positive economic incentives (certification, trade promotion) rather than through hard law rules of compliance and sanctions (e.g., penalties, market boycotts, trade bans) (Winkel et al. 2009, Glück et al. 2010).

Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international environmental legally binding treaty agreed by national governments at the Earth Summit in Rio de Janeiro in 1992. It entered into force in 1993. Inspired by the global political momentum towards sustainable development, it formulates three main **policy goals**: (i.) the conservation of biological diversity; (ii.) the sustainable use of its components; and (iii.) the fair and equitable sharing of the benefits arising from the utilisation of genetic resources. These integrative policy goals are further specified as set out in the Convention or agreed upon at meetings of the Conference of the Parties (COP) to the CBD. The most important are the 2020 Aichi Biodiversity Strategic Goals and Targets that are included in the Strategic Plan for Biodiversity 2011-2020 as adopted at COP-10 in Nagoya, Japan in 2010. National biodiversity strategies, plans or programmes (NBSAPs) and the programme of work (POW) on forest biological diversity are the main CBD **policy tools** that directly address global forest conservation and sustainable forest management issues. These tools need to be integrated into other policy sectors (e.g., forestry, agriculture) and across sectors (e.g., sustainable development), and facilitated by consultative mechanisms for implementation, monitoring, evaluation and periodic revision (UNEP/CBD 2002). The expanded POW contains 27 objectives, 12 goals and 129 actions arranged around three priorities: (i.) conservation, sustainable use, and access and benefit sharing; (ii.) institutional and socio-economic enabling environment (governance), and (iii.) knowledge, assessment, and monitoring. One of the most forest-relevant CBD policy targets refers to establishing, maintaining and developing forest set-asides and Protected Forest Areas (PFA) networks, including ecological connectivity, that shall effectively conserve at least 10% of the earth's forest types. Further targets are the development of a global classification system for forests and the further development and implementation of C&I for forest biodiversity and SFM in order to improve the assessment of conservation status and ecological trends of forest biodiversity. Periodic national reporting is the only CBD mechanism for monitoring the national-level implementation of NBSAPs and the POW. The Global Environment Facility (GEF) can provide financial funding for (forest) biodiversity projects with direct relevance for the implementation of the CBD. The application of Ecosystem Management approach to all types of forests and PFAs are the particular **management tools** to conserve and restore forest biodiversity worldwide. The CBD's main **pathways of influence** rest on (i.) soft international norms, knowledge, and discourses mediated by (ii.) international rules through legally-binding goals without compliance mechanisms and (iii.) voluntary cross-sectoral biodiversity policy integration (Winkel et al. 2009, Glück et al. 2010).

UN Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental legally binding treaty adopted by national governments at the Earth Summit in Rio de Janeiro in 1992. It entered into force in 1994. The main **policy goal** is the stabilisation of greenhouse-gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The Convention sets legally non-binding GHG reduction targets for individual countries and contains no direct enforcement mechanisms. However, specific additional legally-binding multilateral treaties, called "protocols" or "agreements" are negotiated and adopted by national governments to enforce the UNFCCC. The main **pathways of influence** are (i.) international hard law accountability rules and monitoring of compliance and (ii.) international norms, knowledge, and discourses on climate change mitigation/adaptation (Glück et al. 2010, Rayner et al. 2010).

The **Kyoto Protocol**, adopted in 1997 in Japan and which entered into force in 2005, puts for the first time legally binding obligations on national states' signatories to reduce GHG emissions. The Kyoto

Protocol (KP) is based on the principle of “common-but-differentiated responsibilities”. It acknowledges that individual countries have different capabilities in combating climate change, owing to economic development. It hence puts the main obligation to reduce current emissions on developed countries on the basis that they are historically responsible for the current levels of GHG in the atmosphere. The KP’s first commitment period started in 2008 and ended in 2012. The second commitment period, known as the Doha Amendment to the KP, was agreed on in 2012 and ends in 2020. According to the KP, forests and forestry play a key role in climate change. They can be both (i.) sinks sequestering carbon, for example through afforestation, forest growth, close-to-nature and continuous cover forest management, and timber products and (ii.) sources of carbon dioxide emissions, for example through deforestation, forest degradation, and forest fires (IPCC 2007). Therefore, the main **policy tools** of the KP to implement the UNFCCC include legally binding accounting, monitoring and reporting of GHG emissions/sinks from the Land Use, Land Use Change and Forestry (LULUCF) sector. This is related to “direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation” (Decision 1/CP.3, 1997). Accounting for GHG emissions/sinks from forest management is optional tool. Including forestry activities in developing countries as a **management tool** to offset GHG emissions under the Clean Development Mechanism (CDM) has been a contentious issue (Glück et al. 2010).

The **Paris Agreement** (PA) was adopted in 2015 and entered into force on 4 November 2016. It is the new multilateral environmental instrument with a legal force on all participating countries for the Post-Kyoto implementation of the UNFCCC after 2020. According to the PA, “...each party should take action to conserve and enhance, as appropriate, sinks and reservoirs of GHG, including **forests...**” (UN 2015). The PA aims to enhance the mitigation ambitions of countries to keep the increase of global warming below 1,5°C, not least through a significant contribution of the LULUCF sector. The PA changes the **policy tools** of the KP. In a bottom-up approach, signatory countries are obliged to implement their intended nationally determined commitments (INDCs), including the LULUCF sector. They include **management tools** such as quantifiable information on reference point (base year), time frames and periods of implementation, scope and coverage, planning processes, and methodological approaches of how countries consider their INDC as fair and ambitious given national circumstances, and contribute towards the UNFCCC goal. The Green Climate Fund was also set up by the countries as a key financial mechanism to implement the UNFCCC and the PA (UN 2015).

Other elements of this type include the **UN Convention to Combat Desertification (UNCCD)** and the **1975 Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES)**. Both govern international, albeit specific issues with different forest relevance, UNCCD with a focus on desertification understood as ecosystem degradation and mitigation of drought effects in Africa, and CITES, that deals with the conservation of endangered species traded globally. Both conventions also differ in their governance approach; UNCCD oriented towards strategic goals and participatory action plans for rehabilitation, conservation and sustainable management of land and water resources, and CITES working on an improved permission region for the commercial trade of endangered species (Glück et al. 2010, Rayner et al. 2010).

2.2.1.2 Type II: International non-legally binding agreements (International soft law)

International Arrangement on Forests (IAF)

Following UNCED and the repeated failures to agree on a Global Forest Convention, the so called “International Arrangement on Forests” (IAF) has developed. It consists of several sub-elements that are based on **international soft law on forests** adopted over time. In the early stage, national countries participating in the 1992 UNCED adopted two documents directly related to forests: the “Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests” (known as the “Forest Principles”), and Chapter 11 (“Combating Deforestation”) of Agenda 21. The latter highlighted forest loss as a

recognised concern but contained no goals committing national countries to its reversal (Glück et al. 2010, Rayner et al. 2010). In 2007, the participating countries adopted the UN Non-Legally Binding Instrument on all types of forests (NLBI) which was renamed as the United Nations Forest Instrument (UNFI) in 2015. In 2017, the UN Strategic Plan for Forests (UNSPF) was adopted as the most recent international soft-law on forests. The main **policy aim** of the IAF, as specified in the “Forest Principles”, NLBI/UNFI, and UNSPF refers to strengthening political commitment and action at all levels to effectively implement sustainable management of all types of forests (SFM). To enhance the contribution of forests to internationally agreed development goals - including the SDGs - in particular with respect to poverty eradication and environmental sustainability, four global objectives and six goals on forests are formulated (Table 2).

Table 2. Global forest objectives and goals until 2030 under the UNFF (UN 2008; 2017) (italics = changes in text)

NLBI/UNFI (2007)	UN-SPF (2017)
Global objective 1 Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation	Global forest goal 1 Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation <i>and contribute to the global effort of addressing climate change</i>
Global objective 2 Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest-dependent people	Global forest goal 2 Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest-dependent people
Global objective 3 Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests	Global forest goal 3 Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests
Global objective 4 <i>Reverse the decline in official development assistance for sustainable forest management and mobilize significantly increased, new and additional financial resources from all sources for the implementation of sustainable forest management</i>	Global forest goal 4 Mobilize significantly increased, new and additional financial resources from all sources for the implementation of sustainable forest management <i>and strengthen scientific and technical cooperation and partnerships</i>
n/a	Global forest goal 5 <i>Promote governance frameworks to implement sustainable forest management, including through the United Nations forest instrument, and enhance the contribution of forests to the 2030 Agenda for Sustainable Development</i>
n/a	Global forest goal 6 <i>Enhance cooperation, coordination, coherence and synergies on forest-related issues at all levels, including within the United Nations system and across member organizations of the Collaborative Partnership on Forests, as well as across sectors and relevant stakeholders</i>

The NLBI specifies also seven Thematic Elements of SFM based on common understanding among various C&I processes: (i.) Extent of forest resource; (ii.) Biological diversity; (iii.) Forest health and vitality; (iv.) Protective functions of forest; (v.) Productive functions of forests; (vi.) Socio-economic functions; and (vii.) Legal policy and institutional framework. The IAF, based on the NLBI/UNFI and the UNSPF, reinforces two main principles: (i) the sovereign right of national states to exploit their forest resources with the responsibility to avoid transboundary harm, (ii) the principle of “common but differentiated responsibilities” of national states (also expressed by Principle 7 of the Rio Declaration on Environment and Development, and Article 3.1 of the UNFCCC). In terms of **policy tools**, the IAF recommends countries, only on a voluntary basis, to present national implementation progress reports towards SFM. The IAF suggests the elaboration and implementation of National Forest Programmes (NFPs) as well as Criteria and Indicators (C&I) for SFM. NFPs strive to render forest policy decision-

making participatory, more rational, more oriented to the long term, and better coordinated across sectors (Glück et al. 2003) to make national states accountable to both other states and diverse stakeholders (Humphreys 2004). Like the ITTA, the IAF's core strategy to develop C&I has been based on expert-driven processes, and technical assistance to tropical countries to measure and report on SFM on voluntary basis. In the context of the IAF as a political compromise for a missing global forest convention, regional processes of C&I for SFM have flourished. The main **pathways of influence** of the IAF are the soft powers of non-binding (i.) international norms, knowledge, and discourse on SFM and (ii.) voluntary cross-sectoral forest policy integration.

2.2.1.3 Type III: Transnational regulatory governance (Transnational hybrid regimes)

Global Timber Legality Regime

Since 1990s, international attention began to narrow in focus down from the contested concept of SFM to the issue of illegal logging and associated timber trade (Kleinschmit et al. 2016), and to re-embrace the main role of governments while offering economic operators and NGOs important role to play (McDermott 2014). The Global Timber Legality Regime (GTLR) is made of initiatives to curtail the global issue of illegal logging and associated timber trade (Bartley 2014, Overdevest and Zeitlin 2014, Sotirov 2014). They started emerging primarily at the regional, bi-lateral and (supra-)national levels, rather than at the global level, and thus bypassed UN requirements for global consensus (Cashore et al. 2010). The GTLR consists of supply side and demand side elements. Their main **policy aim** is to address illegal forest practices particularly in producer countries (supply side), driven by poor forest law enforcement (e.g., breaches of applicable law, corruption) and weak governance (e.g. non-participation and disempowerment of non-state actors) that are both connected with international trade with consumer markets (demand side) (Sotirov 2014, Leipold et al. 2016, Sotirov et al. in press). One of the first transnational **policy tools** to fight illegal logging and associated trade were defined in 2003 by the EU through its Forest Law Enforcement Governance and Trade (FLEGT) Action Plan and the EU's FLEGT Regulation adopted in 2005. The EU FLEGT is a **supply side policy tool** based on bilateral trade agreements, called Voluntary Partnership Agreements (VPAs), between the EU as consumer and willing producer countries. The FLEGT Regulation and the VPAs, similar to CITES, establish licensing and verification systems for ensuring the legality of timber exports, but also offers a green lane for licenced timber products to be traded on the EU market. In 2008, the USA amended the 1900 Lacey Act with the adoption of the Legal Timber Protection Act (LTPA). This was followed by the adoption of the EU Timber Regulation in 2010 and the Australian Illegal Logging Prohibition Act (ILPA) in 2012. These three **demand side policy tools** (i.) prohibit the placing on the consumer markets of illegally sourced timber products where legality is defined as any activity in breach of applicable laws in the supply side countries (EUTR, ILPA, LTPA) or both supply and demand side (LTPA) countries; (ii.) oblige economic operators to assess and mitigate risks in global trade with illegally sourced timber products by the exercise of due care (LTPA) or due diligence (EUTR, ILPA) along global supply chains. They also (iii.) empower state authorities to control and sanction non-compliant economic operators and (iv.) third parties (NGOs, economic operators) to invoke regulatory controls based on substantiated concerns and evidence (Sotirov et al. in press). These policies reassemble hybrid governance arrangements as they work with three **pathways of influence**: (i.) trans-national hard-law rules and compliance mechanisms and (ii.) market mechanisms (EUTR/FLEGT VPA, ILPA, LTPA), as well as (iii.) direct access through capacity building, funding, and participatory co-governance (FLEGT VPAs) (Cashore et al. 2016).

2.2.1.4 Type IV: Public-private partnerships (PPP)

REDD+ initiatives

Reducing Emissions from Deforestation and Degradation (REDD), or REDD+ as now labelled, is the first global governance process that promises to directly address the cross-sectoral drivers of forest destruction (McDermott 2014). The basic premise of REDD+ is that forest loss accounted for some 17%

of global anthropogenic GHG emissions (IPCC 2007) and that developed countries would be prepared to pay developing countries and their forest users for reducing their forest emissions as part of their commitments to climate action. REDD was officially adopted in the 2010 Cancun Agreements under the UNFCCC (UNFCCC 2011). While the REDD+ establishes a global forest protection **policy objective** in the name of climate protection, the clarity of its problem solving approach obscures enormous ambiguity surrounding how it will be operationalized and prioritized among all other global (environmental and social) forest goals (e.g., biodiversity, water, sustainability, local rights) and coordinated with other international forest governance arrangements (e.g., legality, sustainability). The REDD+ has pursued a “phased approach” as main **policy tool** to displace these challenges over time. The first two phases are to involve project and national-level “readiness” activities. These activities are to resolve the issues of carbon accounting, governance and safeguards in preparation for the final phase of “results-based” payments for additional units of carbon stored (McDermott 2014). Displacing decisions about REDD+ over time has led to their de facto displacement across the numerous organizations outside the UNFCCC that are involved in REDD+ readiness activities. These include a number of multilateral organizations that have funded REDD+ countries for national-level readiness. Among these are the World Bank’s Forest Carbon Partnership Facility (FCPF) and Forest Investment Programme (FIP) with already existing rules on safeguards. Likewise, the UN-REDD programme, hosted by the Food and Agriculture Organization of the UN (FAO), the UN Environment Programme (UNEP) and the UN Development Programme (UNDP), supports REDD+ readiness activities subject to various pre-existing institutional rules and agreements of the UN organizations involved. There are also many regional and bi-lateral REDD+ funding initiatives each of which are subject to their own rules of operation (HuMa 2010). In addition, NGOs and the private sector are involved in designing and investing in individual REDD+ projects, developing certification schemes to verify carbon and non-carbon performance, as well as working with governments on voluntary standards for REDD+ (McDermott et al. 2011). REDD is based on the principle of national sovereignty: voluntary participation of national countries, national level measurement of progress in achieving REDD, and channelling compensation payments to non-state and state actors through national governments. The underlying **pathways of influence** is based on a combination of (i.) economic (financial, market) incentives, (ii.) international rules of compliance mediated by phased approach of (iii.) direct access through capacity building, funding, and participatory co-governance. The intervention logic is to make the maintenance of tropical forests (economically) more valuable than their conversion to alternative land-uses such as agriculture, food production and bioenergy (e.g. palm oil, soy bean, beef, biofuels) - hence deterring deforestation and forest degradation – by creating a financial value for the carbon stored (UN-REDD 2010: 4). In return for avoiding emissions by reducing deforestation and forest degradation, countries participating in REDD would receive payments for verified/certified emission reductions and removals, either through a market-based or governmental-based mechanism, or a combination of these (Glück et al. 2010).

The UNFCCC Cancun Agreements expand the range of developing countries who might potentially be compensated for REDD activities by shifting “REDD” to “**REDD+**”. The “+” signifies that REDD+ includes low deforestation and low forest cover countries engaged in forest enhancement, SFM and biodiversity conservation. The Cancun agreements also promote “safeguards” - as stated in the main text and elaborated in an appendix. They should address controversies over and risks in the prioritization of carbon forestry over environmental and social values and forest ES (McDermott 2014). These concerns refer to issues whether REDD+ would incentivize the centralization of state authority, fuel corruption, favour intensive forestry and fast-growing tree plantations over biodiverse natural forests, lead to land grabbing by the state and private sector at the expense of indigenous and local community rights (Angelsen 2008, Kelly 2010).

The Bonn Challenge, launched in 2011 by the government of Germany and the IUCN, has gained strong momentum when endorsed and extended by the **New York Declaration on Forests** at the 2014 UN Climate Summit. The main **policy aim** of the Bonn Challenge is a global effort to bring 160 million

hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. Its main **policy tool** is a High-level Forest Landscape Restoration initiative involving several public and private partners from both developing and developed countries. The main **management tool** underlying The Bonn Challenge is the forest landscape restoration approach (FLR), which aims to restore ecological integrity at the same time as improving human well-being through multifunctional landscapes. The Bonn Challenge is not a new global commitment but rather a practical means of realizing many existing international commitments, including the CBD Aichi Target 15, the UNFCCC REDD+ goal, and the Rio+20 land degradation neutrality goal. It is seen as an implementation vehicle for national priorities such as water and food security and rural development while contributing to the achievement of international climate change, biodiversity and land degradation commitments.

2.2.1.5 Type V: Non-State Market Driven Governance (International Private Law)

Forest certification

Sustainability certification of forest management, later to include also sustainability certification of timber supply chains, emerged in the 1980s as a **supply-side non-state market driven governance** for ensuring SFM at the management unit level. It was designed by non-state actors such as environmental NGOs, forest-based industries and scientists with the main **policy goal** to address deforestation mainly in the tropical and Boreal regions as well as global forest degradation. The main **tools** include a voluntary or NGOs pressure invoked choice for third party auditing against a private law consisting of SFM standards, principles and C&I that leads to eco-labelling of economic operators (e.g., public and non-state forest owners, timber and forest industry companies). The auditing is carried out by experts accredited by the non-state rule-setting organisation, but who financially depend on the economic operators to be certified. In return, certified companies *would* receive positive incentives such as privileged access to (ecologically sensitive) consumer markets in developed countries including price premiums as well as improved firm reputation and social licence to operate granted by NGOs (Cashore 2002). The main **pathway of influence** of the supply-side forest certification is to change management behaviour and practices towards SFM through (i.) market mechanisms (NGO pressure, eco-labelling and marketing) and (ii.) private rules of compliance without a (direct) role of governments. Forest certification appears to be more compatible with the General Agreement on Tariffs and Trade (GATT)/WTO norms and rules on free trade than direct actions such as market boycott campaigns (Bartley 2014). Ever since, **two main approaches to forest certification** have emerged. The first is the Forest Stewardship Council (FSC) that was launched in 1993 by a coalition of NGOs and business actors seeking to advance the inclusive goal of "responsible" forest management worldwide (Elliott 2000). The second is the development of country-level certification schemes, which emerged to pre-empt regulation and in reaction to the FSC, which many forest companies, forest owners and governments saw as a threat because of its standards and the decision-making power it granted to social and environmental interests (Cashore et al. 2004). Many of these country-level initiatives were consolidated as a global alternative to the FSC, particularly after 2002 when the Programme for the Endorsement of Forest Certification (PEFC), which was established (as Pan European Forest Certification) in 1998, broadened its acceptance criteria (Auld 2009).

Forest-risk food commodity certification

Sustainability certification of forest-risk food commodities (e.g., palm oil, soy, beef) also belongs to the type of non-state market driven governance. While they share **similar governance designs and pathways of influence** with the ones of forest certification, important differences remain noticeable. The **Roundtable on Sustainable Palm Oil (RSPO)** certification prohibits the conversion of primary forests but not of other forest types. Palm oil plantations cannot be established on lands with primary forests, but secondary or degraded forest can be converted to plantations as long as plantings leave out high-conservation-value areas and avoid peatlands. Certification by the **Round Table on Responsible Soy (RTRS)** prohibits the conversion of both primary and secondary forests while using a narrow definition of forests. The scheme excludes the conversion of 'native' forests, including both

primary forest and disturbed and secondary vegetation. Any vegetation less than 10 metres in height can be converted as long as areas with high conservation value are avoided. Most countries have much lower thresholds for the height of 'forests'; the high threshold ensures that soy can be grown with little restriction in woodlands (e.g. the Brazilian cerrado woodlands). The **Global Roundtable for Sustainable Beef (GRSB)**'s principles and criteria call for the protection of native forests. However, the scheme does not include indicators or means of verification, which would be required to underlie certification. Rather, indicators and related practices would be developed through regionally based processes (Neeff and Linhares-Juvenal 2016; Lambin et al. 2018).

2.2.1.6 Type VI: Private sector partnerships (Corporate social responsibility)

Deforestation free supply chain initiatives

An increasing number of private companies get involved in deforestation-free initiatives. They voluntarily commit to the **main goal** of eliminating or reducing deforestation from their business operations and supply chains, especially as regards agricultural (e.g., palm oil, soya, beef) and forestry (e.g., timber, pulp and paper) commodities, including their bioenergy use. The number of private commitments has greatly increased in recent years, with at least 760 public commitments by 447 producers, processors, traders, manufacturers and retailers as of March 2017 (Donofrio et al. 2017). These pledges are supported by the Consumer Goods Forum representing 400 companies across 70 countries, which collectively employ nearly 10 million people and have sales of more than US\$3 trillion. Its Tropical Forest Alliance 2020 includes many of the same companies, as well as governments and civil-society organizations. The Soft Commodities Compact (between the Banking and Environment Initiative, WWF and the Consumer Goods Forum) accounts for approximately 50% of global trade finance. State and non-state actors led momentum around UNFCCC, INDCs and REDD+ provides a context for companies' zero deforestation work. The 2014 New York Declaration on Forests that aims to halve natural forest loss globally by 2020 and reach zero natural forest loss by 2030, was endorsed by 36 national governments, 53 companies and 54 civil-society organizations (UN 2015b). Private companies use three common **policy and management tools** for implementing zero deforestation: (i.) certified commodity procurement, (ii.) procurement from low-risk jurisdictions, and (iii.) direct forest area observation and monitoring systems (Neeff and Linhares-Juvenal 2016). The sustainability pledges are part of corporate social responsibility (CSR) strategies that have been embraced by companies to meet society's expectations and of economic growth strategies to improve branding and consumer loyalty, reduce reputational risk, increase market shares and profits, mitigate potential losses of critical environmental services and ensure long-term supply (Lambin et al. 2017). As such, the main **pathways of influence** include (i.) market mechanisms and (ii.) soft private norms of industry self-regulation.

2.2.2 Synthesis: Goals, approaches and instruments

The manifold governance initiatives presented above all aim at conserving natural forests so to sustain their ecosystem services and related benefits at the local, national and global level. To achieve this, they promote a range of actions for the sustainable management and protection of natural forests, or, their restoration in the case of degradation or destruction. Initiatives may also work for the establishment and proper management of tree plantations as well as the integration of trees in agricultural systems. Partly, they foresee the combination of different land and forest uses, as, for example, in the case of integrated landscape approaches.

The analysis also showed that, although ambitious in discourses, the arrangements of the international forest governance regime represent the lowest common denominator between the countries with its often diverging interests, ideas, and power. Accordingly, they count on voluntary commitments of the participating actors and seldom show mechanisms to effectively enforce them by sanctions. In the best cases, monitoring procedures are foreseen to guarantee transparency and visibility thereby creating publicity and external pressure. It became also obvious that global forest governance initiatives are

based on partly different, partly similar intervention logics and pathways of influence partly in line and partly at odds with their specific degree of compulsion and key actors engaged (Table 3).

Table 3. Overview of the main pathways of influence of major elements of the International forest regime complex

	Intervention logic and impact pathways				
	Rules and compliance	Norms and discourse	Market mechanisms	Direct access	Policy integration
International Tropical Timber Agreement			X	X	
Convention of Biological Diversity	(x)	X			X
UN Framework Convention of Climate Change (Kyoto Protocol, Paris Agreement)	X	X			
International Arrangement of Forest		X			X
Transnational Timber Legality Regime (EU FLEGT, EUTR, ILPA, LTPA)	X		X	(X)	
REDD+	X		X	(X)	
Forest certification (FSC, PEFC)	X		X		
Deforestation free supply chains initiatives (business led)		X	X		

2.2.2.1 Approaches

The intervention logics and pathways presented in Table 3 could be attributed to three general approaches to stimulate land users adopt the desired forest uses (Table 4): (1) Regulations; (2) Markets; (3) Local Empowerment. As shown above, most governance initiatives led by governments self-evidently follow the regulatory approach. Market approaches increasingly gaining popularity embody a tight collaboration, or even, leadership by the private sector. In contrast, the local empowerment approach, although present in discourses and aspirations, is generally less supported if at all. In the last decades, a general shift from governmental to more hybrid, governance approaches has taken place.

The **regulatory approach** is grounded in the belief of the functionality of legal and institutional frameworks that follow good governance principles and enforcement by strong formal organizations and governmental mechanisms at local, national and international levels. It aims to strengthen state control and the management capacities of administrative institutions to sustainably manage and protect forests. This is primarily expected to guarantee the economic and environmental functions of forests, while social considerations are considered indirectly. The **market approach** emphasizes the regulating power of free markets and the generation of societal benefits by competitive entrepreneurs and companies. It is grounded on the observation that industrialized countries, pushed by the private sector, have, for the most part, succeeded in halting the destruction of forests. Resulting policies for deregulating markets, privatization, and the commodification of forest goods and services have been developed. They count on the professional know-how and capital of forest users from the private sector. The economic returns are expected to trickle down to local people by direct or indirect employment opportunities or infrastructural investments. Finally, the **local empowerment approach** is based on the conviction that sustainable solutions for achieving the conservation of forests relies predominantly on the local families and communities that depend on forests. Hence, this position is determined by society's actors and recognizes the diversity and particularity of local forest managers. It promotes communal self-determination and control over resources to achieve forest protection, sustainable livelihoods, and more equitable societies.

Table 4. The three approaches to stimulate action for the sustainable management and conservation of forests (adapted from Pokorny 2015)

	Regulations	Markets	Local Empowerment
Underlying mindset	Effective control of users of forests and forest lands is of utmost importance to avoid mismanagement of forests	Professional working companies exploring (created or existing) market opportunities are best to ensure development and efficient resource allocation	Local people whose livelihoods and cultural identity relate to forests are most appropriate to ensure sustainable use and conservation of their forests
Key agents	Governmental agencies and institutions	The private sector including companies and entrepreneurs	Local communities and civil society institutions
Key strategy	Strengthening administrative agencies and their capacities to control and manage forests	Supporting competition and privatisation, commodification of forest ecosystem services	Increasing communal self-determination and capacities for sustainable forest use
Priority field of action	Strong forest administration	Timber concessions for sustainable forest management and markets for carbon and other ecosystem services	Community forestry and protected forests
Impact pathway	Stimulating public policies in combination with effective control of forest managers and other land users guarantee the continuous provision of forest ecosystem services	Professional working companies effectively manage and protect their concessions and service generating forests	Local people taking care of their forests and benefit from a continuous income flow that stabilizes their source of livelihood and energizes markets

The three approaches show particular affinities regarding certain actor groups that act as agents and respond to key strategies, but are not exclusively tied to their ‘related’ social domains. Thus, while the regulatory approach is closely related to state institutions and government agencies, it may likewise stimulate professional companies to invest in the commercial exploitation of forests and recognize the rights of local forest users. The market approach is crucially linked to the economic sphere but may also serve to strengthen the forest administration, legitimize state control over forest lands and resources, improve local livelihoods and empower forest dependent communities. Thus, policies grounded in this approach may also strengthen forest agencies, set up competitive community enterprises or involve external agencies in ensuring safeguards. Finally, the local empowerment approach, although primarily addressing social organizations, may also call for better state governance and emphasize the importance of providing income generating options.

2.2.2.2 Instruments

To translate these approaches into practice, the governance initiatives directly or indirectly support the application of an array of instruments. These instruments can be, at least to a certain degree, attributed to the three approaches, when pairing the key agents addressed by the approach with the principle actor group targeted by the instruments (Table 5).

Instruments primarily targeting government forest agencies and institutions are generally used to support and strengthen the administrative body and its capacity to control and manage forests. The various instruments applied may be differentiated into (1) those aiming at the configuration of policies, (2) those strengthening the enforcing administrative body, and (3) instruments dedicated to the generation forest relevant information. An instrument targeting the policy level is the development of National Forestry Programs, and, affiliated to this, other instruments for strategic planning such as zoning and land use planning as well as the conceptualization and planning of protected area networks and integrated conservation schemes. Also, the design of forest laws and regulations, policies and mechanisms for their implementation falls in this category. Instruments to strengthen administrative

agencies and institutions need the support of governmental agencies responsible for the demarcation and administration of concessions and protected areas, the authorization and audit of forest management operations, forest surveillance, patrolling, and fire-fighting, by providing facilities such as buildings and the education and training of foresters and administrative staff. These measures provide the basis for effectively addressing the other key agents, the private sector and communities. Important instruments of the third category include the compilation of forest and biodiversity inventories, forest monitoring systems and the collection, analysis, and presentation of data according to scientific standards. Such instruments include aerial surveys, satellite imagery, GIS mapping, surveys, socioeconomic and ecological studies and climate change modelling. A special segment of this category is support for academic and educational institutions. Since 2002, efforts for strengthening the national forest administration have been particularly supported by the EU Action Plan for Forest Law, Enforcement, Governance and Trade (FLEGT). More recently, international efforts for Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement (REDD+) have induced the emergence of a special array of instruments such as for the introduction of Payments for Environmental Services (PES), diverse REDD+ preparation and pilot projects, studies to assess and map actual and potential carbon storage, as well as the determination of Reference Emission Levels (REL) and the development of Measuring, Reporting and Verifying (MRV) systems as a prerequisite for the establishment of the carbon market in the context of REDD+.

Table 5. Instruments targeting key agents of the approaches of international governance initiatives (adapted from Pokorny 2015)

Governmental agencies and institutions
<ul style="list-style-type: none"> • Formulation of strategic plans, policies and regulations • Strengthening of governmental agencies • Generation of information and monitoring • Implementation of the REDD+ framework (in all three categories)
Private sectors particularly companies and entrepreneurs
<ul style="list-style-type: none"> • Timber concessions • Restoration concessions • Carbon forestry • Re and afforestation • Certification • Safeguards
Local communities and civil society institutions
<ul style="list-style-type: none"> • Capacity building and support for income generation through community based forestry, agroforestry and ecotourism • Demarcation and legal recognition of customary lands • Empowerment through awareness building, social organization and political advocacy • Protected areas • Application of participatory tools.

Instruments targeting the private sector support companies and entrepreneurs in the commercial use of timber and other forest goods and services generated in professionally managed concessions. Concessions are large areas of public forests given to private timber companies for a certain period in exchange for royalties that relate to the size of the area, the volume harvested, or a mixture of both. Normally, concessions are several ten thousand hectares in area to allow the concessionaire a continuous supply of wood during rotations requiring 20 to 40 years. Concessionaires are also supported with the application of Reduced Impact Logging (RIL) and the proper organization of logistics and finances to ensure conformity to laws and standards of international markets as set by the FLEGT and certification schemes. Beyond timber instruments for accessing carbon markets also play a role; most of them are based on voluntary agreements. To avoid the possibility of environmental and social side effects of profit-oriented companies, the use of safeguards has become an important instrument, particularly in the framework of REDD+. Safeguards define social and environmental standards to be fulfilled by the forest user to ensure ongoing access to the land and resources. In response to growing efforts among transnational conservation organizations the idea of conservation concessions given to

logged-out or otherwise degraded forest lands to counter prevailing deforestation and degradation processes while simultaneously restoring forest ecosystems as carbon sinks have recently emerged. While given to large-scale companies due to significant capital requirements required, such concessions may foresee that over the medium term local communities become shareholders in the concession. Occasionally re- and afforestation projects for commercial purposes are also supported.

Instruments targeting communities and local forest dwellers aim at income generation and empowerment. Instruments addressing the improvement of local income opportunities include technical and financial support for community based forest management, the development and implementation of improved agricultural techniques, and the development and improvement of market access for processing and commercialization of timber, non-timber forest products and agricultural products, as well as the development of ecotourism. Also included is technical training, legal advice to overcome bureaucracy and the development of business capabilities for negotiating with commercial actors. Tools, such as participatory village mapping additionally support awareness building and the empowerment of local communities in their efforts for the legal recognition of customary rights to lands and resources. In the same vein, communal inclusiveness, democratic institutions and equality in communities and gender mainstreaming at the local as well as the national level are supported. Local representative organizations and civil society organizations are supported in networking on the regional, national and international level. Some instruments foster partnerships with business actors. The identification and demarcation of customary land and other community areas is an important instrument too. Also in this category are specific instruments that have emerged for using opportunities provided by the evolving REDD+ framework. A special form of community-oriented instruments deals with protected forests, considering that nowadays, in contrary to the past, this includes the integration of local forest users, particularly indigenous groups. Accordingly, protected forests are not only expected to effectively contribute to biodiversity conservation but also to traditional livelihoods.

2.2.3 Effects

The identified core international forest policy and governance processes are seen as crucial to guarantee the continuous provision of forest ecosystem services. Accordingly, they are designed to address similar and interrelated issues with a transboundary or 'global commons' character such as deforestation, forest degradation, climate change, biodiversity loss, global water cycles, indigenous people rights, and forest related global commodity trade (Winkel et al. 2009, Glück et al. 2010). Despite or precisely because these core forest governance processes pursue different global norms (e.g., sustainable management of all types of forests, forest biodiversity conservation, mitigation of climate change through forest sinks), partly with (in-)compatible rules (e.g., national sovereignty, hard law), all of them can substantially and positively contribute to implementation of various SDG goals (FAO 2018), especially as regards the **forest related targets of SDG 15**.

In accordance with the importance given to the regulatory approach, international governance initiatives have resulted in major progress with regard to the setting up and strengthening of national forest administrations (Pokorny 2015). These achievements have been complemented by the various arrangements for a **Global Timber Legality Regime** that managed to strengthen the governmental capacity for enforcing their legal frameworks and to effectively run the related bureaucracies. Achievements include improved regulatory frameworks, clearer organizational structures, the building of human capacity, professionalizing procedures, including those for financial administration, improved law enforcement capacities and decentralization. On the ground, the improved national forest governance in combination with market oriented initiatives have been mainly translated in a massive increase of concessions for the sustainable management of timber, and a massive expansion of protected areas. However, evidences for the positive effects of these in terms of reduced deforestation and economic development of remote forest regions, are, at best, ambivalent.

Regarding **concessions**, employment figures for local people do not get much of a boost compared to those associated with small-scale agriculture and informal logging (Pokorny 2015). Additionally, large logging concessions often conflicts with other land uses, even more because the agreements between the State and private operators – often a foreign company – do not always consider eventually existing customary rights. In the extreme, the human rights of local people, most critically those of indigenous forest users, may end up being violated. Furthermore, corruption continues to play a crippling role, and concessionaires may lack the know-how or the inclination to practice sustainable forestry. Even if the concessions are carefully managed, the licenses are ultimately temporary, so the likelihood that they are properly managed in the long run are not good. In many cases, when logging operations commence, many concessions are invaded by farmers. Very few companies are prepared to pay the costs for protecting logged-over forest management units. In the long run, even well designed timber concessions face the danger of being converted into other land uses once the trees are logged, because the access roads built serve as conduits for secondary land users, or because mining, hydropower and/or agro-industrial uses emerge. Even less stable is the situation in most **protected areas**. While protected areas have proved their potential to function, at least temporarily, as barriers against deforestation, only a few of them have sufficient human resources and equipment to be adequately managed. In many cases, the rights and interests of the local population remain insufficiently addressed and existing conflicts are often settled with the local people having to bear the costs. Local employment opportunities are rare and buffer zone management is seldom successful at larger scales. Further, resettlement and compensation policies have turned out to be highly problematic by contributing to cultural marginalization and misery. Accordingly, for many protected areas, encroachment and the ongoing illegal harvest of forest products is the rule rather than the exception. Governments themselves tend to ignore the protection status of protected areas when more lucrative economic opportunities such as mining, energy and agro-industrial uses emerge. The few efforts to improve the **participation and consultation of local forest users** were only partially successful. It remains the case that national forest authorities and concessionaires show little respect and interest for local concerns. In most countries, poor forest dwellers are still discriminated against, and local rights to lands and territories are frequently abused.

Despite improvements of national forest administration, ineffective bureaucracies, incompetence and corruption still play an incapacitating role in many cases. Further, traditional forest users have often been negatively affected by strengthened regulation, due to competitive disadvantages and lack of capacity to comply with the additional bureaucratic requirements. In parallel, the legal frameworks set in place created new entry points for corruption and worsened the situation of millions of forest dwellers involved in the much larger local and national markets for forest products such as timber and fuel wood. The companies with the financial and human capital required to successfully implement the regulations and standards have also to come to grips with the limited profit margins of sustainable timber management. The margins are smaller compared to illegal logging and much smaller compared to agro-industrial land uses.

REDD+ has injected substantial amounts of new funding into national forest sectors, that has been used for improving the institutional framework, for scientific studies, and instruments for Measurement, Reporting and Verification (MRV) to be established. However, action has concentrated on the fulfilment of essential requirements to access larger amounts of funding for mitigation and adaptation measures promised by the international community. The long-term perspective of REDD+ funding is mainly lacking. Initiatives for climate change mitigation and adaptation are thus far limited to pilot projects. These continue in particular with the classic (not too successful) integrated approach of parallel achieving local development and forest conservation through sustainable forest management. For the few innovative approaches in use, the regulatory and financial frameworks are far from what would be needed to successfully scale them up. Thus, aside from the establishment of plans and monitoring procedures, little progress has been achieved on the ground. In the assessment of indigenous groups, the global efforts to address deforestation through market mechanisms such as

REDD+ are seen in an even more critical light. They indicate that REDD+ initiatives will fail, not only due to the lack of attractive carbon markets, but also because existing efforts don't take into account the multiple values of forests, the remaining problem of benefit sharing, or even more critical, the disrespect of internationally recognized indigenous and local rights despite existing standards. These groups caution that REDD+, as any development schemes imposed by economically powerful countries do, will even promote the take-over of indigenous lands and territories thereby further undermining national and global initiatives aiming at protecting indigenous rights (see for example, the Palangka Raya Declaration 2014).

The effectiveness of **multi-stakeholder agreements** representing non-state market driven governance, such as the Soy Moratorium or the Round Table on Sustainable Oil Palm (RSPO), is hotly debated, as the functionality of such agreements depends on the voluntary commitment of powerful economic actors. Here, as in other areas, **safeguards** to ensure the social and environmental compatibility of land uses has experienced a renaissance. The UNFCCC, World Bank and FCPF all put a strong emphasis on safeguard policies. Safeguards, for example those obligatory for the REDD Readiness Preparation process, are closely monitored by NGOs and academic observers at the national and international level. However, although safeguards are generally perceived as important to ensuring good governance, respect for indigenous people, and to guarantee stakeholder engagement, their translation into practice has turned out being highly challenging. NGOs and forest-dependent people addressed by these safeguards are largely unsatisfied with their implementation, effectiveness and adequacy. Robust national regulation to guarantee the respect of the standards are still lacking. Established monitoring mechanisms are dominated by non-local actors, and little progress has been made in developing adequate mechanisms for applying sanctions. Thus, in cases where violations or when safeguards are ignored, it is very difficult to sanction the responsible land user in a way that puts a stop to the violations and adequately compensates those suffering damages.

Recent experiences with **deforestation free supply chain policies** suggest that they are insufficient to achieve broader positive impact on halting tropical forest destruction (Lambin et al. 2018). The zero deforestation movement has focused on certain commodities and geographies over others. Most of the zero-deforestation pledges are by consumer-facing companies in Europe and North America, but not by local/domestic operators relevant for tropical deforestation. Zero-deforestation initiatives have initially focused on palm oil and have had some traction for soy, timber, pulp and paper, but were less relevant for beef being still the by far most direct driver of deforestation in Latin America. The supply of certified forest-risk commodities does not currently appear to match potential demand from companies aiming to comply with zero-deforestation pledges. Major concerns are that these initiatives fall short on several aspects. Company pledges vary in the degree to which they include time-bound on-the-ground interventions with clear definitions and criteria to achieve verifiable outcomes. Positive impacts remain not unfold due to leakage, lack of transparency and traceability, selective adoption and smallholder marginalization.

2.2.4 Challenges

Despite some successes of global forest governance initiatives, principally regarding improved regulatory and institutional frameworks to promote the sustainable management and protection of natural forests, the restoration of degraded forest and landscapes, and the effective management of planted forests, the destruction and degradation of natural forests continues relentlessly. This fact indicates that existing initiatives are ineffective in achieving their goals. This lack of success on the ground has several reasons that can be attributed to two major categories: (1) reasons within and between the forest governance initiatives themselves, and, (2), reasons in the socio-institutional context in which the initiatives are embedded.

2.2.4.1 Deficits within the forest governance regime complex

Various deficits within the global forest governance regime complex seriously hamper progress towards fully unfolding their potential contribution to the SDGs and their policy effectiveness. They can be generally structured into two major stumbling blocks: first, limitations in the design and implementation inherent in each of the forest governance processes, and, second, institutional competition and functional trade-offs and overlaps between the forest governance processes.

2.2.4.1.1 Limitations in the design and implementation of forest governance processes

Type I: Multilateral intergovernmental treaties (International hard law)

The ITTA was the first international legally binding instrument to use SFM terminology. Ever since, the ITTO has developed a series of SFM tools and technical norms that can be used by its member countries. The methodological tools include management guidelines, principles and C&I for SFM (ITTO 2006). ITTO also plays an important role as a sponsoring body by financing projects and studies in various tropical-timber producer member countries towards the goals of promoting timber trade and SFM. However, the very definition of SFM has been a moving target framed as a “dynamic and evolving concept”. Article 2 of the 2006 ITTA says that “...Sustainable forest management will be understood according to the Organization’s relevant policy documents and technical guidelines...”. Further, the voting structure that the ITTC applies when making decisions might also limit the effective promotion of SFM by the ITTA/ITTO. This is because while a country’s forest size is a consideration, most voting powers are allocated according to a country’s share in the international tropical timber trade. Critics argue that these institutional rules have often impeded normative, policy and behavioural changes among the participating countries. In an assessment of the progress that had been made towards SFM in tropical forests since the first such assessment in 1988, the former Executive Director of ITTO stated: “... The data indicate that significant progress has been made since 1988 towards the sustainable management of natural tropical forests, but the extent of such progress remains far from satisfactory...” (ITTO 2006: 3). The differentiation of producer and consumer countries within the ITTO is another factor partly hindering effective goal attainment simplifying the situation of tropical timber trade diminishing the situation of intermediate countries.

The effectiveness of the **CBD** has been often hampered by the inability of the parties to implement their own agreements. For example, a review of actions towards implementing the main CBD instrument, namely the NBSAP (national biodiversity strategies and action plans) shows that by the deadline of December 2015, almost half of all parties have not submitted their post-2010 NBSAP at all (94 out of 185) or did submit NBSAP but without consideration of the 2020 Aichi Targets according to the new Strategic Plan for Biodiversity (8 parties out of 185).

Similar observations can be made for the **UNFCCC and its implementing treaties**, which to date have not helped reduce GHG emissions from human land use in both developing and developed countries. For example, for technical and political reasons, CDM projects under the KP included only afforestation/reforestation (A/R) projects, but not (avoided) deforestation or forest degradation. While the CDM was considered a success in terms of the number of projects and volume of Certified Emission Reductions in non-forestry sectors, it has been unsuccessful in the forestry sector in raising funds for A/R projects. Only 16 of the 2191 registered CDM projects were A/R projects (CDM 2010). The effectiveness of the Paris Agreement remains to be seen. But it is clear that the contribution of the LULUCF will be a controversial issue given inherent conflicts between agriculture and forestry sectors on the one hand side and between these two sectors, and other sectors such as biodiversity conservation/nature protection, infrastructural development etc.

Type II: International non-legally binding agreements (International soft law)

The IAF remains characterised by decade-long disputes regarding the adequate institutional framework for dealing with issues associated with deforestation and SFM. None of intergovernmental negotiations under the UN system has resulted in a legally binding international agreement on forests.

The processes and outputs of the IAF within the UNFF/IPF/IFF are often described as “international non-regime” that is hollow and ineffective in committing actors to any policy or practice-oriented action (Dimitrov 2005). As the NLBI, NFPs and C&I for SFM are all forms of soft law, no state has any obligation at all to take any action. Additionally, those standards agreed in the soft law are mainly vague and watered down not raising the level above the lowest common denominator. As shown in the next chapter, the C&I process have faced important challenges leading to their limited policy effectiveness. Empirical evidence suggests even that NFPs – as core instruments to implement the IAF - have been elaborated either symbolically or redesigned to serve traditional sectoral interests (e.g. timber use) rather to improve inter-sectoral policy coherence and to achieve comprehensive sustainability goals (Howlett and Rayner 2007), even in first-mover countries such as Germany (Winkel and Sotirov 2011). On the positive side, supporters believe that the IAF has developed mutually agreed upon normative and discursive frames for policy action that institutions and actors at nested regional, national and local levels could consider when developing their policy framings (e.g., problem understandings, need for action, and adequate problem solutions) and thus for delivering different rationales for policy action (Glück et al. 2010).

Type III: Transnational regulatory governance (Transnational hybrid regimes)

The evidence about the policy effectiveness of the numerous transnational **timber legality verification policies** and governance regimes to promote SFM and sustainable trade is mixed. There is little evidence that either timber legality verification or forest sustainability certification has slowed deforestation and forest degradation worldwide. The compliance with applicable forest law is just one step in the long road to SFM. Indeed, legality compliance constitutes a minimum requirement towards sustainability (Cerutti et al. 2008). In effect, the verification of legality based on supply side VPAs or demand side policies alone may be inadequate if the desired objective is to ensure global sustainability, since much of the deforestation and forest degradation drivers are not rooted in illegal forest management but in legal, or illegal conversion of forests for agricultural and bioenergy production (see next chapters). Nevertheless, the transnational timber legality regime can still contribute to the fight against illegal activities and deforestation, which can contribute to the SDGs (Glück et al. 2010, Cashore et al. 2016, McDermott and Sotirov 2018). However, the effectiveness of the Global Timber Legality Regime remains limited, as key countries targeted in the EU FLEGT Action Plan have not entered into VPAs with the EU, including Brazil, China, India, Russia, and countries in tropical Africa, Asia and South America. In addition, growing political concerns have been raised about the protracted, misdirected and/or failed processes of negotiation and implementation of FLEGT VPAs. For 15 years, the EU could only sign VPAs with 6 countries including Ghana (2010), followed by the Republic of Congo, Cameroon and the Central African Republic and Liberia (2011), and Indonesia (2014). The EU also concluded negotiations on a VPA with Vietnam in 2017. So far, only Indonesia is issuing FLEGT licences (on 15 November 2016) required to place timber products on the EU market. Negotiations are still ongoing with eight other producer countries such Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Guyana, Honduras, Laos, Malaysia, and Thailand. The national VPAs differ from one another in both substance (timber legality verification systems, definitions of timber legality, policy and governance actions etc.) and procedure (participation of state vs. non-state actors). Thus, VPAs may contribute to a fragmentation and lowering of the rules governing international timber trade, which ultimately provoke market distortions that provoke leakage effects (Cashore et al. 2016). The evidence about the effectiveness of the more promising transnational timber legality laws has also been mixed. For example, evidence shows that since its entry into application, the EU Timber Regulation has encouraged more responsible sourcing policies and, therefore, demonstrated its potential to change operators' market behaviour and establish supply chains free of illegally harvested timber, thus contributing to the achievement of the overall objectives. At the same time, the EUTR entails compliance costs for the implementing Member States in Europe. In many cases, human and financial resources dedicated to checks on operators appear disproportionately low compared to the number of operators in those countries, limiting the deterrence effect of the enforcement activities, and partly contributing to market shifts towards environmentally less sensitive import/export markets (e.g.,

China, India) or local markets. The EUTR seems to have increased awareness of the problem of illegal logging, but has led to uneven implementation, and hence to lower effectiveness (Schwer and Sotirov 2014, McDermott and Sotirov 2018). Similar mixed experiences can be noticed with the timber legality laws in US and Australia (Cashore et al. 2016).

Type IV: Public-private partnerships (PPP)

Likewise, and despite being very high on the international climate policy agenda for more than a decade, the policy effectiveness of **REDD+** to invoke a positive transformative change to halt tropical forest loss has been hampered, and is likely to remain so in the future, by the following unresolved governance issues. First, monitoring, measuring, reporting and verifying (MRV) changes in forest carbon has been challenged by issue of (non-)credible “reference levels”. In practice, countries have financial incentives to inflate their estimates of business as usual (BAU) deforestation rates, or even increase deforestation in practice, since this would allow countries to claim greater reductions in these rates than with more conservative/realistic estimates hence to sell “hot air” or reap “double funding”. Second, there is still significant controversy about whether the REDD+ funds should come from private/market or public sources (Humphreys 2008, Glück et al. 2010, McDermott 2014). As a result of its phased approach displacing decision making authority across public and private actors, REDD+ is subject to institutional complexity, ambiguity and fragmented decision-making. Overall, these challenges reduce the coherence of its activities and complicates any efforts to measure its effects (McDermott 2014). Ultimately, the lack of an agreed global market framework for carbon emissions reductions has de facto limited emission trade to a voluntary level, insufficient to address the problem as originally envisaged by the architects of REDD+.

Type V: Non-State Market Driven Governance (International Private Law)

After 25 years of transnational efforts, the policy effectiveness of **forest sustainability certification** on tackling deforestation and forest degradation and driving changes towards SFM has been limited. Despite unsustainable tropical forest management being the major impetus behind its creation, the most significant support for, and battles about, forest certification have occurred in “less problematic” developed countries of North America and Europe. More than 30% of total forest lands in North America and 56% in Western Europe have been certified according to one or another sustainability system, while in Eastern European emerging economies, including Russia, active efforts to support the FSC certification were tied to attempts to gain a foothold in Western European markets. In contrast, forest certification has had limited uptake (below 5%-10%) in most developing countries, both in absolute numbers of hectares certified and as a percent of the forest estate - despite assertions that it is in these very countries where, if supported, forest certification could have its biggest positive impact (Cashore et al. 2006, 2016). Even the impacts of certification on SFM have yielded mixed policy and on-the-ground results. While both the FSC and the PEFC cover similar forest management issues, they compete with each other since they serve the interests and identities of traditionally opposed target groups (environmental NGOs vs. forestry managers). In general, the FSC generally has more stringent socio-ecological requirements (e.g., deadwood and forest set asides for biodiversity conservation, water protection) and restricts certain commercial forestry activities, such as the use of genetically modified organisms or use of fertilizers that are permitted by PEFC schemes. Variations and regulatory changes such as “race to the bottom” or “race to the top” within the FSC and PEFC standards, often triggered by competition for members and regional uptake, make not only comparisons but also progress towards SFM and hence positive contribution to SDGs difficult to identify (McDermott et al. 2008, 2009, Cashore et al. 2016).

Despite most **food commodity certification schemes** not being designed to guarantee zero deforestation (see section 2.2.1.5), and despite these commodities being the major drivers of deforestation and degradation (see section 1), food certification has been widely adopted by companies to help meet their targets linked to deforestation-free supply chains (Lambin et al. 2018). The guidelines of the Consumer Goods Forum point to the major certification standards (FSC, PEFC,

RSPO, etc.) and lesser-known standards alike as sufficient means of verification as if they all had largely similar requirements. Still, not all food certification standards are equally relevant to zero deforestation or ecological sustainability. While companies consider certification under the leading schemes, in particular RSPO, FSC, PEFC and RTRS, as good evidence of zero deforestation, certified commodities often include products originating from converted secondary forests, degraded forests, or forests with low height. The use of a variety of certificates defeats the idea of universally applicable production standard. Not discriminating between different sustainability certification standards for forest-risk commodities ultimately undermines the credibility of zero deforestation as a whole (Neeff and Linhares-Juvenal 2016).

Type VI: Private sector partnerships (Corporate social responsibility)

Deforestation free supply chain initiatives

The translation of companies' zero deforestation pledges into time-bound on-the-ground actions is lagging. As of 2016, only 20-25% of the member companies of the Consumer Goods Forum with sustainability commitments had developed their own quantified and time-bound action plan to reduce deforestation and had put in place measures to ensure compliance in their business processes or suppliers. In 2016, the status of implementation within the Sustainability Consortium, whose 43 corporate members include General Mills, Mars and Walmart was below 50% in any commodity. In most places, the private and public sectors continue to work independently, and a lost opportunity for bringing zero deforestation to scale has been widely diagnosed (Neeff and Linhares-Juvenal 2016). Overall, there is a lack of evidence on the effectiveness of approaches such as approved supplier lists in changing suppliers' practices (Lambin et al. 2018). There is also confusion on definitions, with major implications for the feasibility and stringency of zero-deforestation commitments. Pledges refer to net or gross deforestation, to supply chains or landscapes, and to some level of 'acceptable deforestation'. Imprecise definitions create confusion between those who commit to pledges and those who aim to assess or implement them. The terminology, therefore, has massive implications for the stringency and feasibility of pledges. Ultimately, a lack of clear, agreed definitions compromises the zero-deforestation movement. Most momentum is around zero net deforestation, which means no change to the total forested area, with new forests compensating for converted forests. Operationalizing zero net deforestation requires defining 'acceptable deforestation' – that is, what types of standing forests are off-limits for conversion, and what types of new forests can compensate for converted forests. To verify zero-deforestation commitments, company pledges often refer to standard agricultural and forest certification schemes, which imply definitions of 'acceptable deforestation'. Producers and processors are marginalised or only mostly indirect participants in the zero-deforestation initiatives of downstream off takers that procure zero-deforestation products. Nonetheless, it is producers who carry most of the burden for complying with zero-deforestation pledges. There is hence a risk of excluding small producers (e.g., forest and land owners) when supply chains reorient to comply with downstream zero-deforestation pledges (Neeff and Linhares-Juvenal 2016). Zero-deforestation policies by companies are insufficient to achieve impact due to leakage. Leakage occurs when interventions with a limited geographic scope restrict the production of commodities in one place, therefore decreasing supply of those commodities and encouraging displacement of production to other locations (Lambin et al. 2018).

2.2.4.1.2 Institutional competition and functional trade-offs between the forest governance processes

In the absence of a Global Forest Convention, global forest-related environmental policies, which are mostly regulated by international conventions on 'global commons' (e.g., biodiversity, climate) and economically-focused international policies (e.g., trade policies) provide the foundation of most global forest action, and hence are related to the SDGs. It is however telling that, despite the integration of SDGs into the IAF's main instruments (UNSPF and the NLBI), the **ITTA** (Type I) and **IAF** (Type II) are not mentioned as a relevant governance process on the official UN website as regards SDG 15. The same is true for the other forest specific processes such as **timber legality verification** (Type III), **REDD+** (Type

IV), forest sustainability certification (Type V), and commitments to deforestation free supply chains (Type VI). Rather, the **CBD** and **the UNFCCC** (Type I) are directly mentioned as the main international policy frameworks that are expected to contribute to the SDGs. This illustrates that there is no single institutional locus for managing forests as a global common. The situation is further complicated because all international forest policy and governance processes have not only synergetic, but also conflicting, functional and institutional overlaps (Table 6).

Table 6. Types of institutional overlap in international forest governance (adapted from Rosendal 2001, Winkel et al. 2009, Glück et al. 2010, Sotirov and Storch 2018)

	Compatible norms (design)	Diverging norms (design)
Compatible rules (implementation)	International Arrangement on Forests / Convention on Biological Diversity	Convention on Biological Diversity / Reducing Emissions from Deforestation and Degradation
Diverging rules (implementation)	Convention on Biological Diversity / Global Timber Legality Regime	Convention on Biological Diversity / International Tropical Timber Agreement

For example, the Rio environmental sustainability conventions and related governance processes have been under way for decades. However, the need to enhance cross-sectoral policy coordination between them is still high on the political agenda, indicating persistent coordination problems (Wildburger 2009). Reviews and research evidence indicate that national implementation is often hampered by a range of obstacles, such as a lack of data and capacities, and insufficient cross-sectoral coordination (UNEP/CBD 2007, Rayner et al. 2010). For example, the COP requested the CBD’s Executive Secretary to increase collaboration with the UNFF Secretariat and members of the Collaborative Partnership on Forests (CPF) for more effective implementation (Winkel et al. 2009, Glück et al. 2010). Further, the CBD promotes the implementation of protected areas as well as sustainable (forest) land use, following the Ecosystem Approach and the principle of cross-sectoral environmental policy integration. Although the parties have legally committed to achieving the overall objectives of the CBD, the means are only vaguely formulated. The Expanded Programme of Work (POW) on Forest Biodiversity, for instance, is a process in which states commit in a non-legally binding manner to work together to achieve the CBD objectives and to conduct joint activities formulated in the Programme. Conclusions should find their way into national forest policies; however, respective reporting to the CBD is not obligatory and non-compliance is not sanctioned. From a policy integration perspective, it can be concluded that the issue around effective implementation of a protected area network and integration of biodiversity conservation in forestry and agriculture reflect difficulties at the CBD level to effectively integrate its Ecosystem Approach into the other policies.

There is one underlying explanation for the challenges that the core international forest policy and governance processes are commonly facing. All aim to resolve international forest issues in which at least two **different sets of actors and institutions with their conflicting mind-sets** are involved. If global sustainability in the context of forests is to be achieved, these need to be addressed, managed, and ideally reconciled. They include powerful economic actors who use forest areas for timber, other biological resources and agricultural commodities, and actors who defend various environmental and social concerns that often as global commons are negatively impacted by economic activities (Winkel et al. 2009, Glück et al. 2010, McDermott 2014, Sotirov et al. in press). Hence, well-intended forest positive processes can remain ineffective. Often, the use of biological resources such as forests is the productive foundation of powerful economic sectors (e.g. agriculture, forestry, mining) which tend to resist the effective integration of environmental concerns into their sectoral policies. This can be done by rejecting the formulation of operational targets, time frames for implementation and monitoring procedures, or by promoting ‘business as usual’ targets, or symbolic/counterproductive integration of goals, instruments and practices (Glück et al. 2010, Sotirov and Storch 2018). These challenges hint at important needs for action towards better mutual coherence, a greater visibility of forest issues in the SDG agenda, and addressing and managing underlying trade-offs between environmental protection, social equity and economic development in the quest for global sustainability.

2.2.4.2 Forest-adverse processes and policies

Efforts for improved forest governance have to be understood within the broader context of rural poverty, growing population and improved levels of economic well-being and power *imbalances* in favour of economic and political, mostly urban, elites (see Figure 12 in Section 2.1.3). In fact, most actor groups in both low and high income countries are motivated by priorities other than the protection of forests. Entrepreneurs, companies and consumers are more interested in profits, affordable prices and good quality of materials, and poor forest dwellers in remotely located forest regions search for possibilities to generate urgently required income, and prioritize better access to consumption markets and public services (IFAD 2010). Policymakers generally favour power and economic rather than environmental aspects in their calculations (Beniers and Dur 2007), and, thus, tend to ignore the long-term economic costs of soil erosion, water quality and quantity impacts or greenhouse gas emissions when setting policies, if there is reason to fear unpopular consequences such as loss of income, tax revenue or jobs. This context dramatically limits the political and institutional space available for pro-forest action and achievements on the ground to address deforestation and forest degradation.

Even worse, powerful governance initiatives in non-forest sectors such as agriculture, infrastructure, trade, finance correspond to these societal needs, problems and priorities, and thereby accelerate the problem of deforestation and forest degradation. Accordingly, a multitude of institutions, processes, and actions from governments, corporations and entrepreneurs as well as from the international cooperation at international through to local levels in both high and low income countries are the driving force behind decisions in favour of mining and energy installations and the construction of roads into protected forest areas, the establishment of settlements in inadequate forest settings, and the attraction of agro-industrial investors (Ledec and Quintero 2003, UNEP 2016, Pokorny 2015).

Examples for influential global initiatives that principally aim at promoting economic growth to improve economic and social well-being of people around the world by establishing the conditions for corporate investments¹ include the International Monetary Funds (IMF), the World Bank and International Development Banks, the World Trade Organization (WTO), the Organization for Economic Co-Operation and Development (OECD). All these institutions support countries in setting up national structural development programs, the facilitation of global trade and global monetary cooperation, and the provision of credits for infrastructural large-scale investments and private investments.

The success of such economic growth oriented initiatives that count on trade and the private sector as motor of economic development, depends to a large degree on the interest of these economic actors naturally stimulated by attractive profit expectations. Here, forest-based options, particularly those related to the sustainable management of natural forests, are far less attractive than the agro-industrial production of commodities, minerals or energy (Pokorny and Pacheco 2014, Pokorny et al. 2016) for which demand, markets and logistics exist at global scale (Kilian and Zhub 2018). For example, the net present value of oil palm plantations ranges between USD 6,000 and USD 9,000 per hectare in comparison to carbon credits for standing forests hardly reaching 1.000 per hectare (Pacheco et al. 2012, Fisher et al. 2011). In consequence, institutions promoting economic development and trade⁷ all tend to promote non-forest land uses in forested landscapes. This includes that national laws of most forest countries include the possibility for legally authorized clearing of large tracts of forest land (i.e. ClientEarth 2015, Ardiansyah et al. 2015, Alarcon-Diaz 2012).

This is not to say that environmental aspects are ignored. In contrary, all intergovernmental organizations, processes and mechanisms recognize the principle of environmental sustainability and explicitly share the Sustainable Development Goals. However, given the costs and challenges of making the protection and sustainable management of forests financially competitive for the private sector,

⁷ for example, the World Bank and Regional Development Banks; international trade-related agreements

they principally suggest accompanying measures such environmental assessments and certificates to ensure compliance with environmental standards. These measures, however, tend to ignore the indirect and long-term effects of such investments. This is particularly well documented for the case of newly build roads that, nearly unavoidably, provoke a strong economic dynamic resulting in deforestation of accessible land (Barber et al. 2014). Too often, the deals for such investments also include high-level corruption that allow violating eventually existing regulations for forest protection (Edwards et al. 2014, León Moreta 2015).

At the level of the European Union, another good example of influential forest-adverse frameworks is the *Common Agricultural Policy (CAP)*⁸ that spends nearly three quarters of a total budget of around 60 billion Euros (in 2018) as direct payments to farmers on the basis of the size of their operation, thereby prioritising large-scale intensive agriculture, including the production of meat relying on the import of 60% of the required proteins mainly as soy produced in tropical countries. These imports alone account for the around 10 million hectares of arable land formerly covered by tropical forests (Muller and Bautze 2017). Also, the *EU Bioenergy Policy* that foresees that by 2020, 20% of the EU's final consumption of energy should come from renewable sources, and a 10% minimum share of the energy consumed in the transport sector has to come from renewable sources (Wunder et al. 2012), has major indirect effects on forests. The total land use change caused by the EU 2020 biofuel mandate is estimated to 8.8 million hectares, of which 8 million hectares is new cropland. 2.9 million hectares of conversion took place in Europe by less land abandonment, and 2.1 million hectares of land has been converted in Southeast Asia under pressure from oil palm plantation expansion, half of which occurs at the expense of tropical forest and peatland (Valin et al. 2015). In total, the EU-27 imported and consumed 7-10% of the global consumption of crop and livestock products associated with deforestation in the countries of origin, including palm oil (17%), soy (15%), rubber (25%), beef (41%), maize (30%), cocoa (80%), and coffee (60%) (EC, 2013). Further, Europe's metal demand for the fabrication of export goods is met mainly by imports, including from mines established in environmental sensitive areas in the producer countries (Schüler et al. 2017).

In consequence, an existing collective interest in environmental protection is overruled by the cumulative sum of individual interests, or, in more general terms, by the goal of short term economic gain and development. A broad phalanx of actors interested in individual benefits creates an unfavourable context for good forest governance, and may, at least partly, explain why contemporary measures are so hesitant to tackle the "real" reasons for destructive forest use, both legal and illegal, including road construction into forest areas, the expansion of commercial agriculture, an inequitable global economy, power imbalances, aspirations for consumption and unregulated financial markets (Kissinger et al. 2012). Against this backdrop, the urgency for improved forest governance is also camouflaged by unrealistic expectations regarding the possibility to control and repair the environmental damages caused by exploitation of nature. Discourses still proliferate the idea that effective control, technical innovations and professional management can make the exploitation of forests and other natural resources compatible with the lifestyle and societal systems of modern mass consumption societies (Weizsäcker et al. 2009), despite evidence to the contrary (MEA 2005). In parallel, there is an assumption that the internalization of environmental costs is possible in the decisions of economic and political elites, although research suggests the contrary (Beder 2011).

2.3 The role of Germany

The role of Germany in global forest governance is twofold. On the one hand, Germany is one of the most active countries in the above-described initiatives, and, in addition, has implemented a large number of relevant bi-lateral programs. On the other side, Germany is a highly industrialized export oriented country showing extremely forest-adverse consumption patterns, which has serious implications on the effectiveness of own efforts for good forest governance.

⁸ https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/cap-glance_en (accessed January 2019)

2.3.1 Champion of forest-relevant environmental governance processes

Since the outstanding Pilot Program to conserve the Brazilian rain forest (PPG-7), Germany is internationally perceived as forerunner and champion of natural forest conservation. This positive image is further supported by the long and successful history of sustainable forest management. Germany has championed the initial stages of action against climate change, the funding of forest relevant multilateral processes and mechanisms, and massive support of several international forest programs such REDD+ and the legal timber trade initiatives under FLEGT.

Globally, Germany is the second-largest donor country, spending US\$23.8 billion on net official development assistance in 2017, which corresponds to 0.66% of GNI. Accordingly, the Ministry of Economic Cooperation and Development's (BMZ)'s budget, representing about 30% of total ODA, has significantly increased, and will further grow to €8.7 billion by 2021. However, since 2015, Germany's ODA contribution is largely driven by refugee-related expenditures and the fight against the root causes of displacement. Yet, rationally viewed, investments related to climate change and forest conservation with around 100 million Euros yearly represents a rather marginal proportion of the budget (BMZ 2014). This holds true even considering that a larger proportion of funding for international environmental initiatives is managed by the Ministry of Environment. Nearly half of the 2 billion Euro budget for 2018 is dedicated to nuclear safety, whereas environmental protection accounts for less than 150 million Euros, largely dedicated to reduce pollution and related research, and not forest conservation. The ministry also contributes with around 25 million Euros to co-finance international organizations and processes within the environmental sector⁹.

The share of German multilateral ODA is significantly higher compared to other donor countries (Pokorny 2015), which indicates the relative importance Germany gives to international processes managed by the European Union, the World Bank, Regional Development Banks, GEF and other international institutions. However, the major share of German ODA remains bilateral. Germany provides technical and financial assistance through GIZ and KfW. The BMZ has the legal mandate to negotiate with the partner countries and provides almost 90% of the funding for the ongoing forest-related programs, however, due the international role of the BMUB, particularly via its International Climate Initiative (ICI), is increasing. All German funded bilateral initiatives are in the final responsibility of the partner countries. They are supported, in their efforts, by the two major German development organizations, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the KfW Development Bank. While GIZ disburses mostly non-repayable grants for the provision of advisory services and capacity building under the label 'Technical Cooperation', the KfW, under the label 'Financial Cooperation', provides the partner countries with funds for programs laid out in contractual agreements.

Germany's forest action plan for sustainable development authored by the BMZ (2017) is comprehensive and far-reaching. The plan focusses on forest protection and reforestation, and lists 12 fields of action, including strengthening forest governance, combatting illegal logging, and continued support for international initiatives. All stated goals are well established and are generally undisputed in international forest policies and discourses. Statements from both German and international development organizations suggest that there is a close and mutually supportive interdependence between them. However, in practice these stated goals are not necessarily mutually supportive or may be even contradictory. It is also clear that the available funds are by far insufficient to work at all ends of the ambitious agenda outlined in the action plan. In consequence, there is an uneven allocation of resources showing a specific emphasis for regulatory and market action to foster sustainable forest management and, however to a minor degree, the management of protected areas. Only a small proportion of funding is prioritising improvement of local livelihoods of forest dwellers. In addition, the policies to achieve certain goals, frequently change and are strongly influenced by political power

⁹ <https://www.bundeshaushalt.de/#/2018/soll/ausgaben/einzelplan/1601.html> (accessed on 04.01.2019)

relations and public disputes in the donor and receiver countries. Thus, the contents and activities of the forest related program funded by Germany show strong alignment with the priorities of the national partners (Pokorny 2015), with may indicate that the funded programs finally agreed on, may reflect more pragmatic political considerations rather than the implementation of strategic goals.

Compared to other donors, Germany more intensively channels its bilateral ODA to governmental agencies. In many forest countries, the German forest cooperation has managed to establish close relationship with the governmental forest agencies and has gained enormous influence, often grounded in long-term personal relationships. Thus, in many cases, progress in establishing and strengthening the national forest administration can be attributed, at least in part, to German support (Pokorny 2015). These achievements to a large degree are manifested in the improved governance of large-scale concessions for the production of timber, and the demarcation and better management of protected areas. Accordingly, German bilateral forest cooperation focuses on large-scale forest management schemes. Efforts to empower local forest users remain marginal; potential to work with the informal forest sector are nearly completely ignored (Pokorny 2015). In the project countries, Germany generally prefers to act at a non-local level, leaving the responsibility for implementation to governmental agencies little interested in supporting local people or to NGOs who are frequently overcharged. The German Forest Cooperation widely ignore an intensive cooperation with science.

With regard to the positive role of Germany in shaping international environmental treaties and negotiations with relevance to global forest issues, the following examples could be named:

- As regards international **forest policy** geared towards **SFM**, the German Government has been the mastermind and champion of the adoption of the 2007 **NLBI** and the 2017 **UNSPF** under the UNFF. While both soft-law instruments are seen as key to link the UNFF forest goals to the SDGs, important challenges as regards the integration of both forest instruments into the SDG process remain. Since 2010, the German Government provides funding for international initiatives and projects related to the main objectives of the UN Global Forest Agreement such as the NLBI. These projects aim to support *forest use* worldwide towards SFM. Through its different sectoral ministries (international development; agriculture and forestry; environmental and nature conservation), the German Government has funded many international forest-related development cooperation projects and programs in Africa, Asia, Latin America, China, Russia/Eastern Europe. Their main logic has been that of a direct access (see above for more details).
- Among other relevant topics, the German Government has promoted the use of C&I as tools for strengthening SFM in policymaking and practice across global, regional, national and local scales worldwide. In particular, a key German-funded initiative dealt with Strengthening Criteria and Indicators for SFM and their applicability in policy and practice (SCI-SFM) (GCP/GLO/503/GER). This project was coordinated by the FAO in cooperation with international organizations (e.g., UNFF), regional C&I processes (e.g., ITTO, the Montreal process, FOREST EUROPE) and regional forest-relevant processes (e.g., COMIFAC, ACTO), and national governments. This initiative aimed to harmonize regionally different C&I for SFM and to formulate a global and regional visions and roadmaps for implementation to their further development and use agreed at the technical level, not least as an important contribution to evaluation of progress towards the SDGs. Special emphasis was put on the development and promotion of socio-economic and governance indicators of SFM. The initiative run for 2.5 years and expired in 2016. As described earlier, the effectiveness of this initiative has remained mixed. This was partly due to similar issues that have prevented a global agreement on forest convention, and partly due to lack of capacities and broader political support (Sotirov et al. 2016).
- Since 2014, the German Government has acted as a mastermind and main supporter of transnational inter-governmental and public-private initiatives on **deforestation-free supply chains** (2015 Amsterdam Group), including the organisation of high-level conference in Berlin

in 2017. Germany also co-authored, championed and supported the **Amsterdam Declaration** “Towards Eliminating Deforestation from Agricultural Commodity Chains with European Countries” representing the same innovative landscape perspective that tries to overcome the limitations of sectoral approaches.

- As regards global **biodiversity policy**, at the COP-9 in Bonn in 2008 the German Government proposed the **LifeWeb Initiative**. The main mission is to facilitate financing that helps supporting the implementation of the Strategic Plan for Biodiversity 2011-2020 and the CBD Programme of Work on Protected Areas. The initiative was adopted by all parties, but the funding comes mainly from Germany, and eight other developed countries (Austria, Belgium, France, Spain, Italy, Netherlands, Norway, and the USA) and the EU. The main idea is to bridge funding gaps between \$14 to \$21 billion/year that cannot be provided by the GEF for existing or newly established protected areas, including in forests.
- As regards international **climate policy**, the secretariat of the UNFCCC has been based in Bonn since 1993. The Bonn location of the UNFCCC has not only been supported by the German Government, but also used as a strategic resource to influence global forest related climate policy. Though Germany stands back behind its own climate goals, the German Government is still seen as one of the masterminds and acts as the main donor of the Green Climate Fund (GCF). The GCF launched its initial resource mobilization in 2014, and rapidly gathered donors’ pledges worth USD 10.3 billion. These funds come mainly from Germany and other developed countries.
- Germany, together with IUCN, co-chairs **The Bonn Challenge** and is host country of the secretariat. Thereby, the German government has a strong stake in the currently most dynamic global forest initiative.
- During its **G20 presidencies** in 2015 and 2017, Germany has demonstrated strong leadership on global health by setting this issue on the G20 agenda for the first time. This induced also debates about forest as important provider of health relevant ecosystem services (e.g. biodiversity, clean air, clean water). Germany also spearheaded discussions on increased public and private investments in Africa particularly through two major initiatives: the ‘Compact with Africa’, launched in 2017, and the ‘Marshall plan with Africa’, an initiative which focuses on stimulating private investments in Africa and supporting countries which implement good governance reforms. It is expected that these initiatives will also stimulate investments in sustainable forestry, protected area tourism and afforestation project, thereby supporting forest conservation and restoration.

2.3.2 Germany’s role in forest destruction and degradation

More recently, the forerunner position of Germany in promoting forest governance has experienced serious drawbacks. Germany lags behind internationally agreed commitments in terms of funding and implementation, hinders progressive environmental initiatives at the European level, and re-adjusted their sectoral priorities. Although ambitious discourses on forests and forest conservation continue (Winkel and Sotirov 2016, Sotirov et al. in press) whenever with a shift in attention towards bioeconomy, new topics such as the refugee problem and nuclear safety dominate the political agenda, in addition to the classic sectoral issues in the domain of energy, health and infrastructural development.

There are many internal ideological and goal conflicts between the involved governmental authorities (sectoral ministries), as well as between the governmental and non-state actors in Germany, and among NGOs and some economic businesses. The main ideological divides relate to the normative legitimacy and strategic priority given to the use versus conservation of forests globally. Often, inter-sectoral blockages and administrative issues in policy coordination take place between the ministries and administrative units in charge of internal climate, biodiversity and forestry issues (Bush 2014, Sotirov and Storch 2018).

Critical is also that there is little cross-sectoral coordination of agriculture and forestry within the overall political domain, despite growing evidence that agricultural commodity trade and policies are the most important direct drivers of deforestation and forest degradation. Though agriculture and forestry are often in the responsibility of one ministry, the coordination is lacking, or, agricultural interests dominate the agenda. Similarly, there seems to be little cross-sectoral coordination between the bioenergy, agricultural and forestry sectors at the EU level, again despite the growing evidence of the negative role of EU agricultural and bioenergy policies on global deforestation. Likewise, the promulgated goal to better coordinate and integrate biodiversity conservation and climate mitigation and adaptation has only been little supported by a cross-sectoral coordination within the German government institutions (Bush 2014).

Germany played an ambivalent role in the negotiations for a Global Forest Convention when it acted as a leader of the EU countries and the pro-coalition of developed countries. The German government, despite a general positive discourse, was not willing nor prepared to suggest, positive incentives (e.g., innovative compensation mechanisms such as REDD+) to developing countries. Instead, Germany and its allies tried to impose global legally-binding rules potentially infringing national sovereignty in the use of natural resources (Dimitrov 2005, Humphreys 2005). The second face/level has been marked by a traditional strategy of the German government to prevent international/EU hard-law obligations for SFM, or even timber legality for the wellbeing of its own domestic forest sector. More recently, Germany is pressing for a regional agreement at the Pan-European level which is often criticized as a strategy to neutralise “adverse” effects of global and EU environmental regulations on the forest sector (Winkel and Sotirov 2016, Sotirov et al. in press, Sotirov and Storch 2018).

Most critical however is the effect of Germany’s acting outside the forest sector. This particularly include the country’s significant contribution to the policies and processes focusing economic growth and the generation of jobs as promoted in the bioeconomy and discussed in section 2.2.4.2, p. 39), and the forest-adverse positions in the discussion at the level of European Union. Indirectly, Germany strongly contributes to global deforestation and forest degradation because being a major consumer of foods and materials such as biofuels, soy, meat, ores, timber etc. produced in forest regions on the cost of large forest conversions. In fact, Germany’s per capita **ecological footprint** overshoots its national productive capacity more than two times (234%) (Table 7).

Table 7. Germany’s per capita footprints as percentages of per capita biocapacities at national and global levels (GFN 2013)

	Germany	Global
Ecological footprint	234%	254%
Forest footprint	37%	54%

In contrast, Germany’s **forest footprint** remains within both national and global biocapacities. It is expected that Germany’s forest production will grow faster than commodity consumption, despite some effort to establish or expand protected forest areas (Jonsson 2012). Independent from this, potential domestic timber sources, such as from private forests or secondary products such as timber waste or cascading use of timber, will remain unused. Given the strong emphasis on the bioeconomy, the positive balance is unlikely to continue in the future. Instead, a growing dependence on the import of wood products is projected facilitated by lower sustainability standards in the production of wood products in the exporting countries (Hagemann et al. 2016). Already nowadays, Germany is a major importer of higher risk wood products needed as material for its export oriented (forest) industry (Mantau 2012). In 2012, Germany was the largest (by volume) European importer of primary processed wood products from Russia (FAO 2015), and the fourth largest importer of primary processed tropical wood products (ITTO 2014).

2.4 Transformation processes

The above sections demonstrated that a range of direct and indirect factors establish contexts in which resource users have a propensity to opt for destructive forest uses. This holds for the majority of a

continuously increasing urban and rural population as well as for land users such as cattle ranchers, agro-industrial corporates, illegal loggers, and investors, that dispose on the capacities and societal standing to enforce their interests at the cost of natural forests. In parallel, demographic change, enhanced well-being and, related to this, changing consumption pattern induce the need for more food, particularly meat, and higher consumption of all types of goods and materials. This process of economic growth thus is consistently related to environmental harm, including the destruction of natural forests, particularly in the tropics but also elsewhere. So far, it has not been possible to decouple economic growth from environmental destruction to a degree that comes close to sustainability on any meaningful global scale (WWF 2014).

In view of the importance of forests for humanity, a myriad of initiatives at all levels have been directed into improving forest governance to protect the remaining natural forests, to restore degraded forest land, and to properly manage the old and new forests for the benefit of the next generations. While restoration, due to support by natural processes, and management efforts motivated by attractive financial returns, have been quite successful in some countries and regions, efforts to halt the destruction of natural forests have generally not been effective. Thus, it is particularly in this arena where transformative changes are needed.

Accordingly, for decades, scientists, consultants, policy makers, and civil society organisations have intensively been working on ideas and recommendations to address the ongoing process of deforestation and environmental forest destruction. Nearly all of the studies and papers cited in this report add to this stock of recommendations. More explicitly, this study considers the statements in individual and focus groups interviews undertaken as part of recent science initiatives in which members of the authors' team have actively participated in, more particularly, the project on *Future of Global Forest Governance (FuGo)*¹⁰, and the study on *Global Sustainable Forest Management, Criteria and Indicators, and Sustainable Development Goals*¹¹ both funded by the German Federal Ministry of Food and Agriculture, as well as the *EU supported Global Forest Study*¹², and the project *Global Governance Track (EU-INTEGRAL)*¹³. Our study considers expert opinions expressed in the course of these projects in accordance with the Chatham House rule¹⁴.

Compiling the enormous stock of ideas alone could be the basis for an extensive publication, outreach and dissemination. However, while recommendations may have shifted in focus, over the years they have continued to repeat the very same essential points: (1) inter-sectoral policy integration, (2) the inclusion of local forest users, (3) mobilization of the private sector, and (4) concerted actions on the ground. The section ends with a reflection on the role of science in the outlined transformation processes.

2.4.1 Inter-sectoral integration

There is agreement that an ***inter-sectoral, integrative approach*** is needed to effectively address the problem of deforestation and forest degradation. This includes integration at a conceptual level, of policy sectors and in the practical implementation.

- ***Conceptually***, decision makers, lobbies, land users, and scientists have to be open to **leave tight interest and disciplinary boxes**, and make an effort to understand forests as part of socio-ecological systems. There is a need to take into account conflicting goals within forest and non-forest sectors such as mining, energy, infrastructure and agriculture. Honest reflection is particularly useful regarding consumption and well-being levels possible without threatening

¹⁰ <https://efi.int/projects/fugo-new-frontiers-global-forest-governance-lessons-learnt-future-options>

¹¹ <https://www.unique-landuse.de/referenzen,3>

¹² https://ec.europa.eu/agriculture/forest_en

¹³ <https://cordis.europa.eu/project/rcn/99823/reporting/en>

¹⁴ "...anyone who comes to the meeting is free to use information from the discussion, but is not allowed to reveal who made any comment..."

planetary boundaries. Awareness should be built to demonstrate the mutual linkages between pressing societal challenges such as climate change, poverty, food security, economic crises, wars, violence, and degradation, to create an intrinsic understanding that they cannot be meaningfully treated in isolation. For the forest community, in the same vein, this means to leave the comfort zone and to make a real effort in tackling the real and known drivers for deforestation and forest degradation. Such thinking is behind the development and promotion of the 'landscape approach' as an appropriate way of framing the broader contexts of forests.

- At the **political level**, it is important to expand the networks and to **bring forests on the agenda of all relevant actors and sectors**. At the international level, particularly the Paris Agreement and the SDG framework provide a window of opportunity to put forests more centrally on the international agenda. In fact, in most countries' calculations forests are already part of the Nationally Determined Contributions. It could also be established a clearer link between the United Nations Strategic Plan for Forests 2017–2030 and the Agenda 2030/SDGs through the High-Level Political Forum. This may require efforts for greater consistency and quality of reporting of the international forest initiatives, and concrete joint initiatives among Collaborative Partnership on Forests members. It might be particularly meaningful to strengthen the United Nations Strategic Plan for Forests 2017–2030 and the mandate of the UNFF to improve global forest governance. At the government level, this implies a stronger cross-ministerial collaboration, especially with the financial, economic, environmental and agricultural sectors. It is crucial to achieve coherence at both a strategic policy level and at the level of implementation. This may require new forms of management and institutions. Curtailing forest adverse policies by reducing subsidies and tax related forest conversion is critical. Thus, to address global policy challenges in a complex and interconnected world, cross-sectoral policy coherence will be key. Setting up a more coherent multilateral system will be essential to reconcile and deliver the economic, social and environmental transformations needed. Well-thought suggestions to achieve this are available (see for example OECD 2018)
- For **implementation**, it is necessary to work at the landscape level with forest and tree management combined with agriculture and cultural and environmental heritage, and considering urban-rural interlinkages, and where production needs are combined with conservation elements. In addition to the integration of land use, actors from all relevant groups need to be recognised and their interests addressed. Integration also relates to the parallel use and combination of different instruments and tools including regulatory and market tools to create an enabling environment, the development of value chains, as well as capacity building, technological innovation and finance. The potential of jurisdictional approaches should be systematically explored. Special emphasis should be given to fight corruption (Sotirov et al. 2013, 2015).

2.4.2 Inclusion of local forest users

An important lesson learnt is that any successful approach to forest conservation needs the **active involvement of the families and communities living in and around forests**. Particularly, indigenous and traditional groups should not be perceived as potential threat to forests, but as a potential to achieve the global forest agenda due to their direct dependency on forest ecosystem services, their intrinsic cultural relationship to forests, and, most important, the relatively low interest rates regarding land uses that favour sustainable forest management as a sufficiently attractive land use option. Although local forest users are part of existing governance arrangements, they are underrepresented, often lack on legitimacy, and are often dominated by their conveners (Gilmour 2016). This is one of the reasons for the strong distance between global forest governance initiatives and the local levels of implementation.

- To institutionalize and enhance the **participation of forest dwellers is challenging** and requires reforming existing institutions and their initiatives and their participatory elements, and to establish new or strengthen existing instruments such as public hearings, local/rural councils, network approaches of NGOs and local farmers. Mechanisms are needed to guarantee

relevance, representativeness, legitimacy and accountability of the local participants. States need to set up mechanisms to guarantee finance. It might be useful to look on processes that already achieved a stronger participation of local stakeholders, such as the Committee on World Food Security and processes for the devolution of tenure rights including the Rights and Resources Initiative and the Tenure Facility.

- A key element is the devolution and actualization of **(forest) tenure rights** because this is an important precondition and enabling factor for more local participation in global forest governance. Securing rights of **local communities** and smallholders to access forests and trees, thus making women, youth and other entrepreneurs effective agents of change. To effectively target this hot topic requires strong political action and pressure on national governments, the support of existing initiatives such as the Rights and Resources Initiative (RRI) and the RRI Tenure Facility, as well as community ownership associations, investment in the generation and diffusion of transparent information, and knowledge transfer and capacity building about relevant tenure aspects at the international, national and local level.
- Also at the program level, the work with local forest users should become a priority. This includes measures which: (1) support the social organization and empowerment of local people; (2) actively involve local people and their representative organizations early on in the program planning stages; (3) facilitate the mediation and resolution of forest-related conflicts particularly in and around timber concessions and protected areas; (4) support community forestry regimes in accordance with local capacities and interests, and, related to this; (5) systematically explore opportunities to improve the informal forest sector. To tap the potential embedded in these actions requires a much more explicit commitment regarding the rights and capacities of local people, even if this goes against the interests of national governments and influential economic actor groups.

2.4.3 Mobilization of the private sector

The private sector has played and is playing a highly ambivalent role in contemporary land use dynamics, causing harm to environment and people as well as generating economic activity and income. But, the private sector, due to its financial and human resources can also play, and partly already does, a positive role in the sustainable use and conservation of forests. Accordingly, the importance of meaningfully integrated the private sectors that are mobilized in the efforts for sustainable forest use is undisputed, and, latest since the SDG process, has become a central strategy of the international cooperation and environmental NGOs.

- States should create an **enabling governance environment** to stimulate the private sector to engage and invest in pro-sustainability activities by providing the operating framework for investors, multinational companies and medium sized enterprises. This requires setting norms and connecting financial and legal regulations, as well as effective non-compliance sanctions. This should be combined with parallel fiscal incentives to penalize non-sustainable resourcing, at best at a global scale. It is meaningful to discuss the possibility a globally agreed right of nature as a basis for bi-multilateral or transnational global forest governance and constitutional changes in individual states. To discuss appropriate regulatory frameworks requires the collaboration with the private sector, economic organisations such as the World Trade Organization and the International Monetary Fund, as well as NGOs. A reengagement of the private sector into the UNFF is meaningful, too.
- Combining state regulation and markets through **multilateral agreements** signed by governments may have a strong impact on the ground. FLEGT is mentioned as a promising initiative in this way. Global bodies such as the CPF and common reporting tools may facilitate such initiatives to overcome the problem of scattered competence between states and the different ministries. A critical assessment and a new spirit of joint work on forest neutral or even forest conserving value chains, and building of required capacities within the private sector is also suggested. Deforestation free supply chain initiatives (Tropical Forest Alliance

2020, Consumer Goods Forum) and related declarations (Amsterdam, New York) can enhance the cooperation between different non-state actors and governments.

- **Multi-stakeholder partnerships and voluntary private sector commitments** and initiatives can make important contributions. However, such voluntary commitments depend on the continuous interest of all relevant actors, which, in view of rapidly changing markets and political conditions, is difficult to guarantee. Another problem is that such initiatives provide the private sector with the possibility to enter into areas of governmental competencies, such as tenure aspects, without legitimacy. Transparency initiatives, supported by Social Media and big data instruments, can provide checks and balances on corporate behaviour.
- **Standards and certification** can be important instruments to foster sustainability and link consumer demand to corporate practice, but they are most effective in conjunction with strong enforcement mechanisms and sanctions by the state beyond simple consumers' decision. This requires well-functioning **transparency and traceability** mechanisms. States should promote more transparent instruments and initiatives, and provide citizens with a right of access to information, public participation in decision-making, and access to justice in environmental matters as agreed in the Aarhus Convention¹⁵.
- Multinational companies, in particular, should commit themselves to transparency, traceability and access to information. Verification and independent monitoring with the involvement of civil society organisation is important. However, it is not clear whether and to what degree consumer pressure will continue to grow in developed countries, in contrast to the substantial latent potential in developing countries.
- **Green finance** plays a key role in promoting desired investments of as well as to effectively influence the private sector. Thus, banks, pension funds and other sources of capital have to be mobilized, due to their high monetary leverage and power connected to it. States should formulate a demanding claim to business and trade, for developing sustainable finance, Corporate Social Responsibility and due diligence for sustainable agricultural commodities. In the long term, a corporate charter approach could be developed as an instrument of supporting environmental welfare public interests against private profit interests.
- To more effectively involve local resource users and the actors in local value chains, such market based approaches have to consider **informal markets**, which in many countries largely reflect the realities on the ground. To do this requires new approaches, new ideas and significant investments.

2.4.4 Concerted actions on the ground

As mentioned, existing international forest governance initiatives often strongly rely on agreed intentions, voluntary commitments or soft regulations without clear and effective enforcement mechanisms. It is obvious that to make sustainable forest use and forest conservation happen on the ground, substantial efforts beyond the effects of the current international forest regime are necessary:

- Regulatory approaches are necessary and have strong potential to play a stronger role, but must become coherent and effective to do so. This requires robust national regulations, and **rigorous enforcement mechanisms**, including effective sanctions. Big data and social media facilitate monitoring and the identification of environmental crime but also carry a risk of remote control mechanisms substituting for, rather than supporting, field presence.
- While it is logical that governmental efforts should concentrate on controlling capitalized profit-seeking actors because of their high impact and the likelihood of influencing them, **customary forest users and actors also require support**.
- The agencies of the international cooperation, NGOs and other organisations involved in societal transformation should avoid focussing exclusively on cooperation with decision makers and other actors in the urban centres and leaving only to them the responsibility for implementation. Sustainable forest management and forest conservation require highly

¹⁵ <http://ec.europa.eu/environment/aarhus/index.htm> (accessed, January 2019)

qualified personnel **working, in particular, at the local level** on the side of the local resource users. A greater presence and the long-term engagement of the organization's staff at the local level are crucial for success. This requires staff training and the development of capacity and facilities at the local level. Experts are needed who are willing and qualified to work under the difficult conditions of the rural tropics.

- Individuals and institutions engaged in initiatives in governance and implementation of forest conservation require regular contact with the contexts the work about, as well as **space and support for continuous reflection**. This includes the possibility to learn about the effects of their work on the impacted socio-ecological systems. This can be facilitated through partnerships with local grassroots and academic organizations.

2.4.5 Role of science

This study grounds on a review and analysis of a large stock of information and evidence generated by numerous studies of social and natural scientists worldwide. We are convinced that the available stock of knowledge and expert evidence is sufficient to back-up the above listed recommendations. Even though there might be different opinions and discourses possibly communicated by single persons or groups for personal or idealistic reasons, there is overwhelming evidence for the pressing need and the different scope of positive transformative action presented. There is no justification for policy makers, businesses and citizens to further postpone urgently required action with the argument that we have to wait for new scientific and practical insights. The facts are on the table!

Nevertheless, science has vibrant possibilities to accompany and push forward societal transformation processes, and to become a valuable resource for the Germany's Sustainability Strategy. The wide range of themes and topics calls for concerted action of social and natural scientists in tight collaboration with policymakers, businesses and all societal groups. Doubtlessly, this integrated approach to environmental governance includes the need for adjustments and transformation of the scientific sector itself (Nilssona and Perssona 2017; Clarka et al. 2016; Visseren-Hamakers 2015). Accordingly, we recommend four areas of action located along a temporal gradient from immediate to long-term: Contribution to reflection, generation of facts, understanding transformation, and advocacy.

- Researchers and research organisations should invest more in **generating information and documentation about programs and projects and their impacts**. They can also play a role in contributing to transparency to enable participation and to advocate for tenure rights. They should more intensively collaborate with NGOs like Global Witness and Global Forest Watch, and play a complementary role in advocacy and making big data accessible.
- The **generation of facts** is the vested field of classic science. Science has already generated a rich stock of evidences and insights on forest dynamics, its driving forces and global common's function as a basis to draw meaningful conclusions for societal action. Scientifically generated facts provide legitimacy and frames the call for societal transformation. Thus, the continued generation of facts on forests, ecosystem services, and influencing processes is important. This includes monitoring and assessment research to learn about the safe operating space of action in the use of forests as global commons, and the functions and interlinkages between processes, functions and planetary boundaries, as well as to better understand and to improve the effectiveness, impacts and interplay of policy and governance processes and the socio-economic system, including the drivers of problems and their causes, and possible pathways to address drivers and causes. But science has to channel the way to new knowledge systems capable to support environmental policy integration. Intensive interdisciplinary collaboration of natural and social scientists, as well as transdisciplinary cooperation between scientists and policymakers, business and societal groups may allow to better understand the linkages and interdependencies of social and environmental systems as a basis to identify new possibilities for action.

- The **systematic scanning and analysis of promising and successful initiatives** for the needed societal transformation is a pragmatic approach to learn lessons with the potential to guide policy makers, businesses and other societal groups. There is agreement that the needed level of societal transformation aggregates from a myriad of smaller actions in a large diversity of fields including all actor groups and different spatial and temporal scopes. Science can play an important role to detect these actions so to find synergies and possibilities for extrapolation, diffusion and expansion. This includes the application of pure analytical approaches as well as action research in collaboration with relevant actor groups. Most importantly, science should search collaboration with innovative actors interested in transformation on the one side, and those economic actors with positive socio-environmental balances on the other, particularly including poor forest dwellers.
- The notorious lack of uptake and consideration of scientific knowledge, evidence, and science-based recommendations for societal transformation indicates the need to invent and explore possibilities to become more relevant in the policy arena. Classically, this includes investments in better communication to the relevant actor groups. But, science should go beyond that by systematically combining analytical with practical actions. Scientists themselves have to learn how to become actively engaged in societal transformation in both governance and practice. This implies to give up the role of simple providers of “objective” data, and to **become an advocate and motor of meaningful action and actor groups**.

Naturally, such an approach for inter- and transdisciplinarity, policy integration and relevance, and societal engagement necessarily requires strong readjustments of the current funding context away from the support of disciplinary research principally aiming at academic merits or technology-oriented programs driven by job and growth needs of high-income countries, towards a funding that valorises long-term economic perspectives, environmental wisdom, and the needs and interests of local resource users.

3 CONCLUSIONS

For decades, myriads of scientists, consultants, policy makers, and citizens have been pointing to the global functions and importance of forests, and the adverse effects of deforestation and forest degradation in the tropics and elsewhere. Experts, policy makers, lobbyists, and environmental advocates have come together in larger or smaller rounds, and make intelligent and meaningful suggestions of what to do. This has resulted in the establishment of forest-relevant institutions at the international and national level that, by themselves, are contributing with reports, guidelines and agreements on the forest issues. However, in a context that favours, for good reasons, economic over environmental goals, these recommendations have largely been ignored and continue being ignored by decision makers and land users, by the rich and the poor, by the Global North and the Global South. It is little probable that another list of actions to make forests more seriously considered in political and land use decision will be more successful than all the attempts before.

Against this backdrop, we, at the end of this report, want to take a pragmatic view and highlight four possibilities with a realistic potential to at least push global forest governance a bit into the transformative change direction: (1) alignment of the International Forest Regime Complex, (2) promotion of the private sector within a strong regulatory framework; (3) intensification of bilateral action on the ground, and (4) honesty.

1. Obviously, there is little point in pursuing a single global forests instrument as a means of fostering better management of the ‘forested global commons’. There is too much history and not enough commitment to achieve such an ambition. Rather, it seems better to work on focusing and coordinating those elements of the International Forest Regime Complex that are in place and that, if they worked together as ‘intended’, would address enough of the key issues to make a substantive difference. This means creating enough of a virtuous circle amongst the key elements. At the international intergovernmental level, this means recognising and enabling the key elements of each of the CBD (landscape approach), UNFCCC (REDD+), IAF (SFM) and GTLR (SFM through legality) elements, in terms that delivered synergistic and mutually-reinforcing outcomes for the sustainable management and conservation of forests, embedded in the broader context of sustainable landscapes. This may imply the need to set up some of multi-institutional task force to construct and establish coalitions to deliver a common agenda. For example, the Bonn Challenge is a logical vehicle for those parts of this approach focused on restoration; expanding REDD+ ‘beyond pilots’ is a second focus; and public-private partnerships such as those fostered under the New York Declaration a third.
2. The forestry community needs to recognise that legality and sustainability mechanisms are very important to address the extra-sectoral pressures on forests. To do so the State is an important actor but effective public-private sector partnerships and private sector governance is needed. The New York Declaration provides a platform for supporting national and subnational governance that, in the context of a landscape approach, empowers and supports local communities to sustain rather than convert forests.
3. Multilateral action is important as it provides the framework for joint action. However, to push forward action, it is useful to particularly intensify bilateral forest cooperation. The weaker the national economies and governance structures are, the better is the possibility for positive influence, although the implementation might be challenging. But, such efforts have to leave the office and guarantee presence in the forest areas and real partnership with the local forest users. This requires an operational shift in the work of the agencies, and a long-term political and financial commitment with selected partner countries.

4. Finally, we think that honesty is important. An honest reflection on the own ambivalent role, on assumptions and expectations is the basis to more realistically assess what is needed and what is possible. This will help to make better use of existing opportunities.

4 REFERENCES

- Adams, J.M. 1997. Global land environments since the last interglacial. Oak Ridge National Laboratory, Oak Ridge.
- Adams, J.M. and Faure H. (eds.) 1997. QEN members. Review and atlas of Palaeovegetation: Preliminary land ecosystem maps of the world since the last glacial maximum. Oak Ridge National Laboratory, Oak Ridge.
- Ahrends, A., Burgess, N.D., Milledge, A.H.S., Bulling, T.M., Fisher, B., Smart, C.R.J., Clarke, P.G., Mhoro, E.B. and Lewis, L.S. 2010. Predictable waves of sequential forest degradation and biodiversity loss spreading from an African city. *Proceedings of the National Academy of Sciences of the United States of America* 107(33), 14556–14561.
- Alarcon-Diaz, S. 2012. The forest code in Brazil: Compromise or gridlock for REDD projects? *CINCS in Focus* 16.
- Angelsen, A. 2008. Moving ahead with REDD: Issues, options, and implications. CIFOR, Bogor.
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. and Wunder, S. 2014. Environmental income and rural livelihoods: A global-comparative analysis. *World Development* 64, 12–28.
- Ardiansyah, F., Marthen, A.A. and Amalia, N. 2015. Forest and land-use governance in a decentralized Indonesia: A legal and policy review. Occasional Paper 132. Bogor: CIFOR
- Asner, G., Broadbent, E.N., Oliveira, J.C.P., Keller, M., Knapp, E.D. and Silva, J.N.M. 2006. Condition and fate of logged forests in the Brazilian Amazon. *Proceedings of the National Academy of Science* 103(34): 12947–12950.
- Auld, G. 2009. Reversal of fortune: How early choices can alter the logic of market-based authority. Dissertation. Yale University, New Haven.
- Barber, P.C., Cochrane, A.M., Souza Jr., M.C. and Laurance, W.F. 2014. Roads, deforestation, and the mitigating effect of protected areas in the Amazon Biological Conservation 177, 203–209. <http://dx.doi.org/10.1016/j.biocon.2014.07.004>
- Barbier, E. 2012. Natural capital, ecological scarcity and rural poverty. Policy Research Working Paper 6232. World Bank, Washington DC.
- Barbier, E. and Hochard, P.J. 2018. Land degradation and poverty. *Nature Sustainability* 1, 623-631. <https://doi.org/10.1038/s41893-018-0155-4>
- Bartley, T. 2014. Transnational governance and the re-centered state: Sustainability or legality? *Regulation and Governance* 8(1), 93-109.
- Beder, S. 2011. Environmental economics and ecological economics: the contribution of interdisciplinarity to understanding, influence and effectiveness. *Environmental Conservation* 38(2), 140–150.
- Beniers, K.J. and Dur, R. 2007. Politicians' motivation, political culture, and electoral competition. *International Tax and Public Finance* 14: 29.
- Berg, N. 2003. Normative behavioral economics. *Journal of Socio-Economics* 32, 411–427.
- Bhaskar, V., Wildburger, C. and Mansourian, S. 2015. Forests, trees and landscapes for food security and nutrition: A Global Assessment Report. IUFRO World Series 33. IUFRO, Vienna.
- Börner, J., Wunder, S., Wertz-Kanounnikoff, S., Tito, M.R., Pereira, L. and Nascimento, N. 2010. Direct conservation payments in the Brazilian Amazon: Scope and equity implications. *Ecological Economics* 69, 1272-1282.
- Blaikie, P. 1999. A review of political ecology: Issues, epistemology and analytical narratives. *Zeitschrift für Wirtschaftsgeographie* 43(3-4), 131-147.
- Bryant, L.R. 1998. Power, knowledge and political ecology in the third world: A review. *Progress in Physical Geography* 22(1), 79-94.
- Bryant, R. and Bailey, S. 1997. Third world political ecology. London: Routledge.

- Burrows, K. and Kinney, L.P. 2016. Exploring the climate change, migration and conflict nexus. *International Journal of Environmental Research and Public Health* 13: 443.
- Bush, A. 2014. Der deutsche Beitrag zur globalen Waldpolitik. Analyse und Bewertung des Engagements zum Erhalt der Biodiversität und zur Eindämmung des Klimawandels. Promotionschrift. University Göttingen, Göttingen.
- Cashore, B. 2002. Legitimacy and the privatization of environmental governance: How non-state market-driven (NSMD) governance systems gain rule-making authority. *Governance* 15(4), 503–529.
- Cashore B., Auld, G. and Newsom, D. 2004. *Governing through markets: Forest certification and the emergence of non-state authority*. Yale University Press, New Haven.
- Cashore, B., Galloway, G., Cubbage, F., Humphreys, D., Katila, P., Levin, K., Maryudi, A., McDermott, C. and McGinley, K. 2010. Ability of institutions to address new challenges. In: Mery G., Katila, P., Galloway, G., Alfaro, R.I., Kanninen, M., Lobovikov, M. and Varjo, J. (eds.). *Forests and society - responding to global drivers of change*. Chapter 23. IUFRO-WFSE, Vienna.
- Cashore, B., Leipold, S., Cerutti, P. O., Bueno, G., Carodenuto, S., Chen, X., de Jong, W., Denvir, A., Hansen, C., Humphreys, D., McGinley, K., Nathan, I., Overdeest, C., Rodrigues, R.J., Sotirov, M., Stone, M. W., Tegegne, Y.T., Visseren-Hamakers, I., Winkel, G., Yemelin, V. and Zeitlin, J. 2016. Global governance approaches to addressing illegal Logging: Uptake and lessons learnt. In: Kleinschmit, D., Mansourian, S., Wildburger, C. and Purret, A. (eds.). *Illegal logging and related timber trade - dimensions, drivers, impacts and responses. A Global Scientific Rapid Response Assessment Report*. IUFRO World Series Volume 35. IUFRO, Vienna, Chapter 7, 119-132.
- CBD (Convention on Biological Diversity) 1992. *United Nations Convention on Biological Diversity*. United Nations Environment Programme, Montreal: Canada.
- CDM (Clean Development Mechanism) 2010. *Clean Development Mechanism (CDM)*. Available at: <http://cdm.unfccc.int/index.html>.
- Cerutti, P.O., Nasi, R. and Tacconi, L. 2008. Sustainable forest management in Cameroon needs more than approved forest management plan. *Ecology and Society* 13(2): 36.
- Chao, S. 2012. *Forest peoples: Numbers across the World*; FAO, Rome.
- Chen, S. and Ravallion, M. 2011. The developing world is poorer than we thought, but no less successful in the fight against poverty. *Quarterly Journal of Economics* 125(4), 1577–1625.
- Clarka, C.W., van Kerkhoff, L., Lebelc, L. and Gallopin, C.G. 2016. Crafting usable knowledge for sustainable development. *PNAS* 113(17), 4570-4578.
<https://doi.org/10.1073/pnas.1601266113>
- ClientEarth, 2015. *The legal framework for forest conversion in the Republic of Congo*. ClientEarth, London.
- Cochrane, M., 2009. *Tropical fire ecology. Climate change, land use and ecosystem dynamics*. Springer, Dordrecht.
- Chokkalingam, U. and De Jong, W. 2001. Secondary forest: A working definition and typology. *International Forestry Review* 3(1), 19-26.
- DeFries, R.S., Rudel, T., Uriarte, M. and Hansen, M., 2010. Deforestation driven by urban population growth and agricultural trade in the twenty-first century. *Nature Geoscience* 3, 178–181.
- De Jong, W., Pokorny, B., Katila, P., Galloway, G. and Pacheco, P. 2018. Community forestry and the Sustainable Development Goals: A two-way street. *Forests* 9:331.
<https://doi.org/10.3390/f9060331>
- De Schutter, O. 2011. How not to think of land-grabbing. Three critiques of large-scale investments in farmland. *Peasant Studies Journal* 38(2), 249-279.
<http://dx.doi.org/10.1080/03066150.2011.559008>

- Dimitrov, R.S. 2005. Hostage to norms: States, institutions and global forest politics. *Global Environmental Politics* 5(4), 1–24.
- Dimitrov, R.S., Sprinz D.F., Digiusto, G.M. and Kelle, A. 2007. International nonregimes: A research agenda. *International Studies Review* 9, 230–258.
- Donofrio, B., Rothrock, P. and Leonard, J. 2017. Supply-change: Tracking corporate commitments to deforestation-free supply chains. *Forest Trends*, Washington D.C.
- Dudley, N. (ed.) 2008. Guidelines for applying protected area management categories. IUCN, Gland.
- EC (European Commission) 2013. The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation. Report. EC DG ENV, Brussels. DOI: 10.2779/822269
- Edwards, D.P., Sloan, S., Weng, L., Sayer, J., Dirks, P. and Laurance, W.F. 2014. Mining and the African environment. *Conservation Letters* 7, 302-311.
- Elliott, C. 2000. Forest certification: A policy network perspective. CIFOR, Bogor; Indonesia.
- Ellison, D., Morris, E.C., Locatelli, B., Sheil, D., Cohen, J., Murdiyarso, D., Gutierrez, V., van Noordwijk, M., Creed, F.I., Pokorny, J., Gaveau, D., Spracklen, V.D., Bargaues Tobella A., Ilstedt, U., Teuling, J.A., Gebreyohannis Gebrehiwot, S., Sands, C.D., Muys, B., Verbist, B., Springgay, E., Sugandi, Y. and Sullivan, A.C. 2017. Trees, forests and water: Cool insights for a hot world. *Global Environmental Change* 43, 51–61. <http://dx.doi.org/10.1016/j.gloenvcha.2017.01.002>
- FAO (Food and Agriculture Organization of the United Nations) 1966. Wood: World trends and prospects. *Unasylva* 80-81.
- FAO (Food and Agriculture Organization of the United Nations) 2009. How to feed the world in 2050? Discussion paper prepared for Expert Forum: 12–13 October 2009.
- FAO (Food and Agriculture Organization of the United Nations) 2014. State of the World's Forests. Enhancing the socioeconomic benefits from forests. FAO, Rome.
- FAO (Food and Agriculture Organization of the United Nations) 2016. State of the world's forest. FAO, Rome.
- FAO (Food and Agriculture Organization of the United Nations) 2018. The State of the World's Forests 2018 – Forest Pathways to Sustainable Development. FAO, Rome.
- Federici, S., Tubiello, N.F., Salvatore, M., Jacobs, H. and Schmidhuber, J. 2015. New estimates of CO2 forest emissions and removals: 1990–2015. *Forest Ecology and Management* 352(7), 89-98. <https://doi.org/10.1016/j.foreco.2015.04.022>
- Fields S. 2004. Global nitrogen: Cycling out of control. *Environmental Health Perspectives* 112(10), A556-63. DOI: 10.1289/ehp.112-a556
- Fisher, B. 2010. African exception to drivers of deforestation. *Nature Geoscience* 3, 375–376.
- Fisher, B., Edwards, D.P., Xingli, G. and Wilcove, D.S. 2011. The high costs of conserving Southeast Asia's lowland rainforests. *Frontiers in Ecology and the Environment* 9, 329–334.
- FRA (Forest Resource Assessment) 2015. How are the world's forests changing? 2nd edition. FAO, Rome.
- Geist, H. and Lambin E., 2001. What drives tropical deforestation? A meta-analysis of proximate and underlying causes of deforestation based on subnational case study evidence. Land-Use and Land-Cover Change (LUCC) Project, International Geosphere-Biosphere Programme (IGBP). LUCC Report Series 4.
- Ghazoul, J., Burivalova, Z., Garcia-Ulloa, J. and King, L.A. 2015. Conceptualizing forest degradation. *Trends in Ecology & Evolution* 30(10), 622-632. <https://doi.org/10.1016/j.tree.2015.08.001>.
- Gibbs, H.K., Ruesch, A.S., Achard, F., Clayton, M.K., Holmgren, P., Ramankutty, N. and Foley, J.A. 2010. Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *PNAS* 107(38), 16732-7.

- Gilmour, D. 2016. Forty years of community-based forestry: A review of its extent and effectiveness. FAO Forestry Paper 176. FAO, Rome.
- GFN (Global Footprint Network) 2013. National footprint accounts. Available online: <http://www.footprintnetwork.org>.
- Glück, P., Mendes, A. and Neven, I. 2003. Making NFPs work - Supporting factors and procedural aspects. Vienna: Publication Series of the Institute of Forest Sector Policy and Economics, BOKU University, Vienna.
- Glück, P., Rayner, J. and Cashore, B. 2005. Changes in the governance of forest resources. In: Mery, G., Alfaro, R., Kanninen, M. and Lobovikov, M. (eds.). Forest in the global balance – Changing paradigms. IUFRO World Series Volume 17, 51-74.
- Green, M. and Hulme, D. 2005. From correlates and characteristics to causes: Thinking about poverty from a chronic poverty perspective. *World Development* 33(6), 867–879.
- Hagemann, N., Gawel, E., Purkus A., Pannicke, N. and Hauck, J. 2016. Possible futures towards a wood-based bioeconomy: A scenario analysis for Germany. *Sustainability* 8: 98. DOI:10.3390/su8010098.
- Harriss, J., 2007. Bringing politics back into poverty analysis: Why understanding social relations matters more for policy on chronic poverty than measurement. CPRC Working Paper 77. Chronic Poverty Research Centre, Manchester.
- HLPE (High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security) 2012. Climate change and food security. FAO, Rome.
- Howlett, M. and Rayner, J. 2006. Globalization and governance capacity: Explaining divergence in National Forest Programmes as instances of ‘Next-Generation’ regulation in Canada and Europe. *Governance* 19(2), 251-275.
- Howlett, M. and Rayner, J. 2007. Design principles for policy mixes: Cohesion and coherence in ‘New Governance Arrangements’. *Policy and Society* 26(4), 1-18. DOI: 10.1016/S1449-4035(07)70118-2
- HuMa 2010. Preliminary study on the safeguards policies of bilateral donors to REDD Programs in Indonesia: A study for the Indonesian Civil Society Foundation for Climate Justice. HuMa, Jakarta. 114p.
- Humphreys, D. 2004. National Forest Programmes as policy vehicles for sustainable forest management: Findings from a major European research project. In: Buttoud, G., Solberg, B., Tikkanen, I. and Pajari, B. (eds.). The evaluation of forest policies and programmes. *EFI Proceedings* 52, 207-216.
- Humphreys, D. 2004. Redefining the issues: NGO influence on international forest negotiations. *Global Environmental Politics* 4(92), 51-4.
- Humphreys, D. 2006. Logjam: Deforestation and the crisis of global governance. Earthscan, London.
- Humphreys, D. 2008. The politics of ‘Avoided Deforestation’: Historical context and contemporary issues. *International Forestry Review* 10, 433-442.
- IEO (International Energy Outlook), 2016. International Energy Outlook 2016. Washington DC: IEO.
- IIED (International Institute for Environment and Development) 2014. Sustainable Development Goals: A forest module for a transformative agenda. IIED, London.
- IPCC (Intergovernmental Panel on Climate Change) 2007. Climate change 2007: Synthesis report. In: Pachauri, R.K. and Reisinger, A. (eds.). World Meteorological Organization. Geneva.
- IPCC (Intergovernmental Panel on Climate Change) 2018. Global warming of 1.5°C. Special Report. IPCC, Switzerland. Available online: https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_High_Res.pdf
- IFAD (International Fund for Agricultural Development) 2010. Rural poverty report 2011. New realities, new challenges: new opportunities for tomorrow’s generation. IFAD, Rome.

- ITTO (International Tropical Timber Organization) 2006: Status of tropical forest management 2005. International Tropical Timber Organization, Kyoto.
- James, P. 2015. Urban sustainability in theory and practice: Circles of sustainability. Routledge, Abingdon.
- Jonsson R. 2012. Econometric modelling and projections of wood products demand, supply and trade in Europe. Geneva Timber and Forest. Discussion Paper 59. FAO Forestry and Timber Section, Geneva.
- Kahneman, D. and Tversky, A. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47(2), 263-291.
- Kahneman, D., Knetsch, J. and Thaler, R. 1991. Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives* 5(1), 193-206.
- Kaimowitz, D. and Angelsen, A. 1998. Economic models of tropical deforestation: A review. CIFOR, Bogor.
- Katila, P., de Jong, W., Galloway, G., Pokorny, B. and Pacheco, P. 2017. Harnessing community and smallholder forestry for Sustainable Development Goals. IUFRO-WFSE, Helsinki.
- Keenan, R. J., Reams, A. G., Achard, F., de Freitas, V. J., Grainger, A. and Lindquist, E. 2015. Dynamics of global forest area: Results from the FAO Global Forest Resources Assessment 2015. *Forest Ecology and Management* 352, 9–20. <http://dx.doi.org/10.1016/j.foreco.2015.06.014>
- Keohane, R.O. and Victor, D.G. 2010. The regime complex for climate change. Harvard Project on International Climate Agreements. Discussion Paper 10-33.
- Kelly, D.J. 2010. The case for social safeguards in a post-2012 agreement on REDD. *LEAD* 6, 63–81.
- Kilian, L. and Zhou, X. 2018. Modelling fluctuations in the global demand for commodities. *Journal of International Money and Finance* 88, 54-78. <https://doi.org/10.1016/j.jimonfin.2018.07.001>
- Kissinger, G., Herold, M. and Sy, V. 2012. Drivers of deforestation: A synthesis report for REDD+ policymakers. Lexeme Consulting, Vancouver.
- Kleinschmit, D., Mansourian, S., Wildburger, C. and Purret, A. (eds.) 2016. Illegal logging and related timber trade – Dimensions, drivers, impacts and responses. A Global Scientific Rapid Response Assessment Report. IUFRO World Series Volume 35. Vienna.
- Klenk, L.N., Mabee, W., Gong, Y. and Bull, G. 2012. Deforestation, forest management and governance. eLS (Encyclopedia of Life Sciences). John Wiley & Sons, Ltd, Hoboken.
- Krasner, S.D. 1982. Structural causes and regime consequences: Regimes as intervening variables. *International Organization* 36(2), 185-205.
- Lambin, E.F., Gibbs, H.G., Heilmayr, R., Carlson, K.M., Fleck, L.C., Garrett, R.D., de Waroux, Y. le P., McDermott, C.L., McLaughlin, D., Newton, P., Nolte, C., Pacheco, P., Rausch, L.L., Streck C., Thorlakson, T. and Walker, N.F. 2018. The role of supply-chain initiatives in reducing deforestation. *Nature Climate Change* 8, 109-116.
- Lang, F., Bauhus, J., Frossard, E., George, E., Kaiser, K., Kaupenjohann, M., Krüger, J., Matzner, E., Polle, A., Prietzel, J., Rennenberg, H. and Wellbrock N. 2016. Phosphorus in forest ecosystems: New insights from an ecosystem nutrition perspective. *Journal of Plant Nutrition and Soil Science* 179, 129–135. DOI: 10.1002/jpln.201500541
- Lapola, D.M., Schaldach, R., Alcamo, J., Bondeau, A., Koch, J., Koelking, C. and Priess, J.A. 2010. Indirect land-use changes can overcome carbon savings from biofuels in Brazil. *Proceedings of the National Academy of Sciences* 107, 3388–3393.
- Laporte, N.T., Stabach, J.A., Grosch, R., Lin, T.S. and Goetz, S.J. 2007. Expansion of industrial logging in Central Africa. *Science* 316: 1451.
- Larson, A.M., Cronkleton, P., Barry, D. and Pacheco, P., 2008. Tenure rights and beyond: Community access to forest resources in Latin America. Occasional Paper 50. CIFOR, Bogor.

- Laurance, F.W., Reuben Clements, G, Sloan, S. O’Connell, C., Mueller, N., Goosem, M., Venter, O., Edwards, D., Phalan, B., Balmford, A., an Der Ree, R. and Burgues Arrea, I. 2014. A global strategy for road building. *Nature* 513, 229–232.
- Ledec, G. and Quintero, D.J. 2003. Good dams and bad dams: Environmental criteria for site selection of hydroelectric projects. Sustainable Development Working Paper 16. World Bank, Washington DC.
- Leipold, S., Sotirov, M., Frei, T. and Winkel, G. 2016. Protecting “First world” markets and “Third world” nature: The politics of illegal logging in Australia, the European Union and the United States. *Global Environment Change* 39, 294-304.
- León Moreta, M. 2015. The human rights fundamentals of conservation in the context of the extraction of energy resources. V&R Unipress, Bonn.
- Macqueen, D. 2008. Supporting small forest enterprises. A cross-sectoral review of best practice. IIED Small and Medium Forestry Enterprise Series 23. IIED, London.
- Mantau, U. 2012. Holzrohstoffbilanz Deutschland. Entwicklungen und Szenarien des Holzaufkommens und der Holzverwendung von 1987 bis 2015. Hamburg.
- Matthews, E. 1983. Global vegetation and land use: New high-resolution data bases for climate studies. *Journal of Applied Meteorology and Climatology* 22, 474-487. DOI:10.1175/1520-0450(1983)022<0474:GVALUN>2.0.CO;2.
- McDermott, C.L., Noah, E. and Cashore, B. 2008. Differences that “matter”? A framework for comparing environmental certification standards and government policies. *Journal of Environmental Policy and Planning* 10(1), 47-70.
- McDermott, C.L., Cashore, B. and Kanowski, P. 2009. Setting the bar: An international comparison of public and private forest policy specifications and implications for explaining policy trends. *Journal of Integrative Environmental Sciences* 6(3), 217–237.
- McDermott, C.L. 2014. REDDuced: From sustainability to legality to units of carbon - the search for common interests in international forest governance. *Environmental Science and Policy* 35, 12-19.
- McDermott, C.L. and Sotirov, M. 2018. A political economy of the European Union’s timber regulation: Which member states would, should or could support and implement EU rules on the import of illegal wood? *Forest Policy and Economics* 90, 180-190.
- McDermott, C.L., Levin, K. and Cashore, B. 2011. Building the forest-climate bandwagon: REDD+ and the logic of problem amelioration. *Global Environmental Politics* 11(3), 85-103.
- MEA (Millennium Ecosystem Assessment), 2005. Millennium Ecosystem Assessment. Synthesis report. Washington DC: Island Press.
- Morales-Hidalgoa, D., Oswalt, N.S. and Somanathanc, E. 2015. Status and trends in global primary forest, protected areas, and areas designated for conservation of biodiversity from the Global Forest Resources Assessment 2015. *Forest Ecology and Management* 352, 68-77. <https://doi.org/10.1016/j.foreco.2015.06.011>
- Muller, A. and Bautze, L. 2017. Agriculture and deforestation. The EU Common Agricultural Policy, soy, and forest destruction. Report. FERN, Moreton in Marsh.
- Nambiar, E.K.S. 2015. Forestry for rural development, poverty reduction and climate change mitigation: We can help more with wood. *Australian Forestry* 78, 55–64.
- Neeff, T. and Linhares-Juvenal, T. 2016. Zero deforestation initiatives and their impacts on commodity supply chains. Discussion paper prepared for the 57th Session of the FAO Advisory Committee on Sustainable Forest-based Industries, 22. June 2016.
- Neumann, P.R. 2008. Probing the (in)compatibilities of social theory and policy relevance in Piers Blaikie’s political ecology. *Geoforum* 39, 728–735.

- Nesmeabc, T., Metsone, S. G. and Bennett, M.E. 2018. Global phosphorus flows through agricultural trade. *Global Environmental Change* 50, 133-141.
<https://doi.org/10.1016/j.gloenvcha.2018.04.004>
- Nilssona, M. and Perssona, Å. 2017. Policy note: Lessons from environmental policy integration for the implementation of the 2030 Agenda. *Environmental Science & Policy* 78, 36-39.
<https://doi.org/10.1016/j.envsci.2017.09.003>
- Nygren, A. and Rikoon, S. 2008. Political ecology revisited: Integration of politics and ecology does matter. *Society and Natural Resources* 21, 767–782.
- Obersteiner, M., Huettner, M.M., Kraxner, F., McCallum, I., Aoki, K., Bottcher, H., Fritz, S., Gusti, M., Havlik, P., Kindermann, G., Rametsteiner, E. and Reyers, B. 2009. On fair, effective and efficient REDD mechanism design. *Carbon Balance and Management* 4: 11.
- Ostrom, E. 1998. A behavioral approach to the rational choice theory of collective action. *American Political Science Review* 92(1), 1–22.
- Overdeest, C. and Zeitlin, J. 2014. Assembling an experimentalist regime: transnational governance interactions in the forest sector: assembling an experimentalist regime. *Regulation and Governance* 8(1), 22-48.
- OECD (Organisation for Economic Co-operation and Development) 2018. Policy coherence for sustainable development 2018: Towards sustainable and resilient societies. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264301061-en>
- OECD/FAO (Organisation for Economic Co-operation and Development/Food and Agriculture Organization of the United Nations) 2015. OECD-FAO Agricultural Outlook 2015. OECD Publishing, Paris. http://dx.doi.org/10.1787/agr_outlook-2015-e
- Pacheco, P., Putzel, L., Obidzinski, K. and Schoneveld, G., 2012. REDD+ and the global economy: Competing forces and policy options. In: Angelsen A., Brockhaus M., Sunderlin W.D. and Verchot L.V. (eds.). *Analysing REDD+: Challenges and choices*. CIFOR, Bogor.
- Padoch, C., Brondizio, E., Costa, S., Pinedo Vasquez, M., Sears, R.R. and Siqueira, A. 2008. Urban forest and rural cities: Multi-sited households, consumption patterns, and forest resources in Amazonia. *Ecology and Society* 13(2): 2.
- Palangka Raya Declaration 2014. The Palangka Raya declaration on deforestation and the rights of forest peoples. Palangka Raya, Kalimantan. Available online:
<http://www.forestpeoples.org/topics/climate-forests/news/2014/03/palangka-raya-declaration-deforestation-and-rights-forest-people>
- Pannicke, N., Gawel, E., Hagemann, N., Purkus, A. and Strunz, S. 2015. The political economy of fostering a wood-based bioeconomy in Germany. *German Journal of Agricultural Economics* 64(4), 224-243.
- Payn, T., Carnus, J.M., Freer-Smith, P., Kimberley, M., Kollert, W., Liu, S., Orazio, C., Rodriguez, L, Silva, N.L. and Wingfield, J.M. 2015. Changes in planted forests and future global implications. *Forest Ecology and Management* 352, 57-67.
- Perz, S. 2002. The changing social contexts of deforestation in the Brazilian Amazon. *Social Science Quarterly* 83(1), 35-52.
- Pokorny, B. 2015. German bilateral development cooperation in the forest sector: A critical reflection based on the analysis of forest-related development initiatives from Indonesia, Cameroon, and the Democratic Republic of the Congo. Report. University of Freiburg. 148p. DOI: 10.6094/UNIFR/10320. ISBN 978-3-00-051277-3
- Pokorny, B. and Pacheco, P. 2014. Money from and for forests: A critical reflection on the feasibility of market approaches for the conservation of Amazonian forests, *Journal of Rural Studies* 36, 441-452. DOI: 10.1016/j.jrurstud.2014.09.004
- Pokorny, B., Pacheco, P., Cerutti, O.P., Boekhout van Solinge, T. Kissinger, G. and Tacconi, L. 2016. Drivers of illegal and destructive forest use. In: Kleinschmit, D., Mansourian, S., Wildburger,

- C. and Purret, A. (eds.): Illegal logging and related timber trade – Dimensions, drivers, impacts and responses. A Global Scientific Rapid Response Assessment Report. IUFRO World Series Volume 35. Vienna. Chapter 4, 61-78.
- Rademaekers, K., Eichler, L., Berg, J., Obersteiner, M. and Havlik, P. 2010. Study on the evolution of some deforestation drivers and their potential impacts on the costs of an avoiding deforestation scheme. Prepared for the European Commission by ECORYS and IIASA.
- Rayner, J., Buck, A. and Katila, P. (eds.) 2010. Embracing complexity: Meeting the challenges of international forest governance. A Global Assessment Report Prepared by the Global Forest Expert Panel on the International Forest Regime. IUFRO World Series Volume 28. Vienna. 172p.
- Rittenberg L. and Tregarthen T. 2009. Principles of microeconomics. Flat World Knowledge, New York.
- Roberts, P., Hunt, C., Arroyo-Kalin, M., Evans, D. and Boivin, N. 2017. The deep human prehistory of global tropical forests and its relevance for modern conservation. *Nature Plants* 3: 17093. DOI: 10.1038/nplants.2017.93
- Rockström, J., Steffen, W., Noone, K., Persson, A., Chapin 3rd, F.S., Lambin, E.F., Lenton, T.M., Scheffer, M., Folke, C., Schellnhuber, H.J., Nykvist, B., de Wit, C.A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P.K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V.J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. and Foley, J.A. 2009. A safe operating space for humanity. *Nature* 461, 472–475. DOI:10.1038/461472a
- RRI (Rights and Resources Initiative), 2015. Who owns the world’s land? A global baseline of formally recognized indigenous and community land rights. RRI, Washington DC.
- RRI (Rights and Resources Initiative) 2018. At a Crossroads: Consequential trends in recognition of community-based forest tenure from 2002-2017. RRI, Washington DC. 59p.
- Rosendal, K.G. 2001. Impacts of overlapping international regimes: The case of biodiversity. *Global Governance* 7, 95-117.
- Rudel, T.K., Schneider, L., Uriarte, M., Turner, B.L., DeFries, R., Lawrence, D., Geoghegan, et al. 2009. Agricultural intensification and changes in cultivated areas, 1970–2005. *PNAS* 106: 20675–20680.
- Sabogal C., Snook, L., Boscolo, M., Pokorny, B., Quevedo, L., Lentini, M. and Colán, V. 2007. Adopción de prácticas de manejo forestal sostenible por empresas madereras. *Recursos Naturales y Ambientales* 49, 100-111.
- Saito, O., Managi, S., Kanie, N., Kauffman, J. and Takeuchi, K. 2017. Sustainability science and implementing the sustainable development goals. *Sustainability Science* 12, 907–910.
- Schüler, D., Degreif, S., Dolega, P., Hay, D., Manhart, A. and Buchert, M. 2017. EU raw material import flows – Acknowledging non-EU environmental and social footprints. European Policy Brief. Strategic Dialogue on Sustainable Raw Materials for Europe (STRADE) 2, Oeko-Institut e.V., Freiburg.
- Seymour, F. and Busch, J. 2016. Why forests, why now? The Science, Economics and Politics of Tropical Forests and Climate Change Center for Global Development, Washington DC.
- Schwer, S. and Sotirov, M. 2014. Handel sieht Vor- und Nachteile in EUTR. Europäische Holzhandelsverordnung: Segen oder Fluch für die deutsche und europäische Forst- und Holzwirtschaft? *Holz-Zentralblatt* 11, 247.
- Shanley, P., Pierce, A.R., Laird, S.A. and Guillen, A. (eds.) 2002. Tapping the green market: certification and management of non-timber forest products. Earthscan Publications, London.

- Silva, J., Carreiras, J., Rosa, I. and Pereira, J. 2011. Greenhouse gas emissions from shifting cultivation in the tropics, including uncertainty and sensitivity analysis. *Journal of Geophysical Research Atmospheres* 116(D20), 2156-2202.
- Siry, J, Cubbage, F., Newman, D. and Izlar, R. 2010. Forest ownership and management outcomes in the U.S., in global context. *International Forestry Review* 12(1), 38-48.
- Song, X.-P., Hansen, C.M., Stehman, V.S., Potapov, V.P., Tyukavina, A., Vermote, F.E. and Townshend, R.J. 2018. Global land change from 1982 to 2016. *Nature* 560, 639–643. DOI: 10.1038/s41586-018-0411-9
- Sotirov, M. 2014. Changes in environmental governance and illegal logging policies: the case of the European Union’s timber regulation. *International Forestry Review* 16(5): A-33.
- Sotirov, M. and Arts, B. 2018. Integrated forest governance in Europe: An introduction to the special issue on forest policy integration and integrated forest management. *Land Use Policy* 79, 960-967.
- Sotirov, M. and Storch, S. 2018. Resilience through policy integration in Europe? Domestic forest policy changes as response to absorb pressure to integrate biodiversity conservation, bioenergy use and climate protection in France, Germany, the Netherlands and Sweden. *Land Use Policy* 79, 977-989.
- Sotirov, M., Sallnäs, O. and Eriksson, L.O. (in press). Forest owner behavioral models, policy changes, and forest management. An agent-based framework for studying the provision of forest ecosystem goods and services at the landscape level. *Forest Policy and Economics*. Available online: <http://dx.doi.org/10.1016/j.forpol.2017.10.015>
- Sotirov, M., Cappelmann, L., Riemer, A. and Eriksson, O. 2013. Implementing the vision of sustainable forestry through integrated forest management? INTEGRAL First Policy Brief. Available online: www.integral-project.eu.
- Sotirov, M., McDermott, C., Dieguez, L., Selter, A. and Storch, S. 2015. Integrating footprint thinking into EU forest-related policy - Highlights from research on the Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan as a strategy to address the external impacts of EU consumption. INTEGRAL Policy Brief 4. Available online: <http://www.integral-project.eu/images/Documents/Publications/PolicyBriefs/D4.15%20Policy%20briefs%204.pdf>
- Sotirov, M., Dieguez, L. and Wippel, B. 2016. Final report for the SCI-SFM project evaluation mission by order of BMEL. UNIQUE forestry and land use GmbH, Freiburg.
- Steffen, W., Richardson, K., Rockström, J., Cornell, S., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W., de Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B. and Sörlin, S. 2015. Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223): 1259855. DOI:10.1126/science.1259855.
- Szulecka, J., Pretzsch, J. and Seccor, L. 2014. Paradigms in tropical forest plantations: A critical reflection on historical shifts in plantation approaches. *International Forestry Review* 16(2), 128-143.
- Thaler, R.H. 1980. Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization* 1(1), 39-60.
- UN (United Nations) 2006. International Tropical Timber Agreement, 2006. United Nations Conference on Trade and Development. Geneva, Switzerland.
- UN (United Nations) 2015a. Paris Agreement. UN, Paris.
- UN (United Nations) 2015b. New York Declaration on Forests. UN, New York.
- UN (United Nations) 2015c. Transforming our world: The 2030 Agenda for Sustainable Development. 70th Session of the General Assembly (A/Res/70/1). UN, New York. Available online: http://www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

- UN (United Nations) 2017a. Progress towards the Sustainable Development Goals. Report of the Secretary-General, E/2017/66. UN, New York.
- UN (United Nations) 2017b. Global indicator framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development. Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development (A/RES/71/313), Annex. UN, New York.
- UNDP (United Nations Development Programme) 2015. Human development report 2015: Work for human development. UNDP, New York. Available online: http://hdr.undp.org/sites/default/files/2015_human_development_report.pdf
- UNEP (United Nations Environmental Programme) 2016. Fiscal incentives for Indonesian palm oil production: Pathways for alignment with green growth. UNEP, Nairobi.
- UNEP/CBD (United Nations Environment Programme/Convention on Biological Diversity) 2002. Decisions adopted by the Conference of the Parties to the Convention on Biological Diversity at its sixth meeting, Annex I: (UNEP/CBD/COP/6/20), 7–19 April 2002, The Hague.
- UNEP/CBD (United Nations Environment Programme/Convention on Biological Diversity) 2007. Synthesis and analysis of the obstacles to implementation of National Biodiversity Strategies and Action Plans: lessons learned from the review, effectiveness of policy instruments and strategic priorities for action (UNEP/CBD/WG-RI/2/2/Add.1), Ad hoc open-ended working group on the review of the implementation of the Convention, second meeting, UNESCO, 9–13 July 2007, Paris.
- UNFCCC (United Nations Framework Convention on Climate Change) 2011. The Cancun Agreements December 1/CP.16. UNFCCC. 1–31.
- UN-REDD (United Nations Program on Reducing Emissions from Deforestation and Forest Degradation) 2010. 2009 Year in Review. UN-REDD Programme Secretariat, Geneva.
- Valin, H., Peters, D., van den Berg, M., Frank, S., Havlik, P., Forsell, N. and Hamelinck C. 2015. The land use change impact of biofuels consumed in the EU. Quantification of area and greenhouse gas impacts. Project Report (BIENL13120). ECOFYS, Utrecht.
- Visseren-Hamakers, J.I. 2015 Integrative environmental governance: enhancing governance in the era of synergies. *Current Opinion in Environmental Sustainability* 14, 136–143. <http://dx.doi.org/10.1016/j.cosust.2015.05.008>
- Walker, R.T. 2004. Theorizing land cover and land use change: The case of tropical deforestation. *International Regional Science Review* 27(3), 247-270.
- Walker, R., Arima, E., Messina, J., Soares-Filho, B., Perz, S., Sales, M. Vergara, D., Pereira, R. and Castro, W. 2013. Modelling spatial decisions with graph theory: Logging roads and forest fragmentation in the Brazilian Amazon. *Ecological Applications* 23(1), 239-254.
- Warren-Thomas, E., Dolman, P.M. and Edwards, D.P. 2015. Increasing demand for natural rubber necessitates a robust sustainability initiative to mitigate impacts on tropical biodiversity. *Conservation Letters* 8, 230-241.
- WCED (World Commission on Environment and Development) 1987: Report of the World Commission on Environment and Development: Our Common Future. Annex to document A/42/427 – Development and International Co-operation: Environment. Available online: <http://www.un-documents.net/wced-ocf.htm>.
- Wildburger, C. 2009. Forests and Biodiversity Conservation, including Protected Areas and unique types of forest ecosystems. Background document to UNFF8. Available online: http://www.un.org/esa/forests/pdf/session_documents/unff8/UNFF8_Wildburger.pdf.
- Winkel, G. and Sotirov, M. 2011. An obituary for National Forest Programmes? Analysing and learning from the strategic use of “new modes of governance” in Bulgaria and Germany. *Forest Policy and Economics* 13(2), 143-154.

- Winkel, G. and Sotirov, M. 2016. Whose integration is this? European forest policy between the gospel of coordination, institutional competition, and a new spirit of integration. *Environment and Planning C: Government and Policy* 34(3), 496-514.
- Winkel, G., Kaphengst, T., Herbert, S., Robaey, Z.; Rosenkranz, L. and Sotirov, M. 2009. EU policy options for the protection of European forests against harmful impacts. Final report to the EU tender: ENV.B.1/ETU/2008/0049: OJ 2008/S 112 - 149606.
- World Bank 2015. *World Development Report 2015: Mind, society, and behavior*. Washington DC: World Bank.
- Wunder, S., Kaphengst, T. Timeus, K. and Berzins, K. 2012. Impact of EU bioenergy policy on developing countries. Briefing Paper. EP/EXPO/B/DEVE/2011/FWC/2009-01/LOT 5/21. Directorate-General for External Policies of the Union, Policy Department, Brussels.
- WWF (World Wide Fund for Nature) 2014. *Living Planet Report 2012. Biodiversity, biocapacity and better choices*. WWF, Gland.
- Yang, X. Thornton, P.E., Ricciuto, D.M. and Post W.M. 2014. The role of phosphorus dynamics in tropical forests – A modelling study using CLM-CNP. *Biogeosciences* 11, 1667–1681. DOI:10.5194/bg-11-1667-2014

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Dr. Falk Schmidt | Leiter der Geschäftsstelle
Institute for Advanced Sustainability Studies e.V. (IASS)

Berliner Straße 130
14467 Potsdam

Tel: +49 (0) 331-28822-456

Fax: +49 (0) 331-28822-310

Email: falk.schmidt@iass-potsdam.de

visdP

Prof. Dr. Dirk Messner, Co-Vorsitzender

Prof. Dr. Patrizia Nanz, Co-Vorsitzende

Prof. Dr. Martin Visbeck, Co-Vorsitzender

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Über die wpn2030

Die Plattform

Die Wissenschaftsplattform Nachhaltigkeit 2030 ist ein zentraler Ort der Wissenschaft, an dem sie drängende Fragen der Nachhaltigkeitspolitik reflektiert und diskutiert – im Austausch mit Politik, Wirtschaft und Gesellschaft. Wissen für Nachhaltigkeit wird dort zusammengetragen und weitergetragen, insbesondere im Hinblick auf die Umsetzung der Deutschen Nachhaltigkeitsstrategie. Die Plattform arbeitet unabhängig und ist systematisch eingebunden in den offiziellen politischen Steuerungs-, Dialog- und Umsetzungsprozess der Agenda 2030. Träger der Plattform sind SDSN Germany, DKN Future Earth und das IASS Potsdam

Mitglieder des Lenkungskreises

Günther Bachmann, Marianne Beisheim, Jetta Frost, Jörg Hacker, Reiner Hengstmann, Thomas Holtmann, Adolf Kloke-Lesch (ex officio), Stephan Lessenich, Kai Lindemann, Karsten Löffler, Ursula Mathar, Dirk Messner (Co-Vorsitzender), Klaus Milke, Alexander Müller, Patrizia Nanz (Co-Vorsitzende), Jürgen Renn, Ulrike Schell, Ina Schieferdecker, Falk Schmidt (ex officio), Dennis Snower, Olaf Tschimpke, Martin Visbeck (Co-Vorsitzender), Markus Vogt, Joachim von Braun, Hilmar von Lojewski, Marion Weissenberger-Eibl

Vorsitzende des Lenkungskreises

Prof. Dr. Dirk Messner
Prof. Dr. Patrizia Nanz
Prof. Dr. Martin Visbeck

Kontakt

Geschäftsstelle Wissenschaftsplattform Nachhaltigkeit 2030

c/o Institute for Advanced Sustainability Studies e. V. (IASS)
Berliner Str. 130, 14467 Potsdam
Tel.: +49-331-28822-456
www.wpn2030.de, info.wpn2030@iass-potsdam.de

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