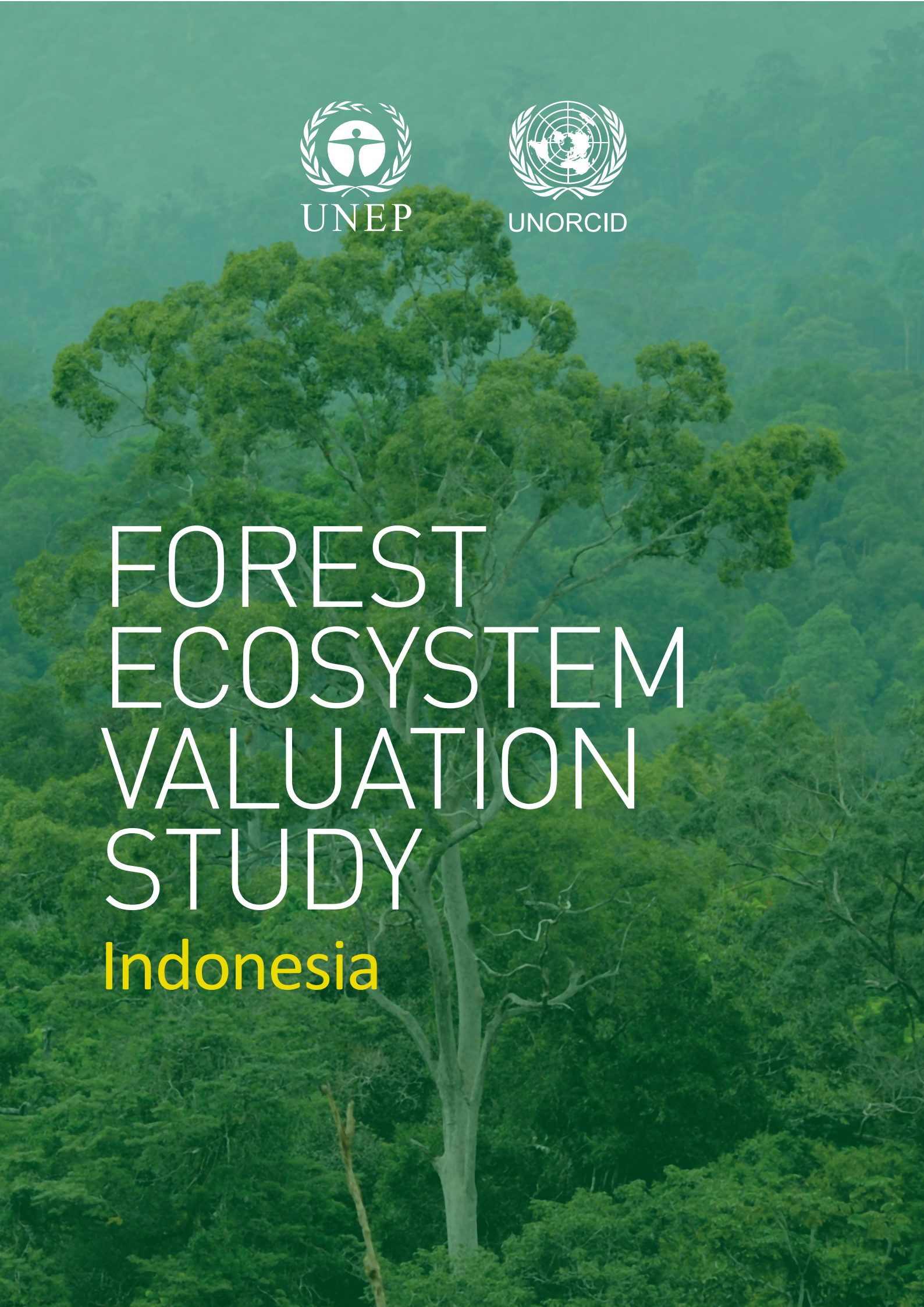

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FOREST ECOSYSTEM VALUATION STUDY

Indonesia

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Study Leader: Pavan Sukhdev

Report Authors: Andrea Bassi, Kaavya Varma and Winnie Toppo

Contributions from: Pierre Dupuis, Karishma Bhuyan and Swapan Mehra

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List of Abbreviations

BAPPENAS	Ministry of National Development Planning
BAU	Business as Usual
BPS	Badan Pusat Statistik (Central Statistics Agency)
CIFOR	Centre for International Forestry Research
DICE	Dynamic Integrated Climate and Economy (Model)
DNPI	Dewan Nasional Perubahan Iklim (National Council on Climate Change)
FAO	Food and Agriculture Organization of the United Nations
FEV	Forest Ecosystem Valuation
FEVS	Forest Ecosystem Valuation Study
GAISP	Green Accounting for Indian States Project
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GE	Green Economy
I-GEM	Indonesia Green Economy Model
ITTO	International Tropical Timber Organization
LECB	Low Emissions Capacity Building
MoEF	Ministry of Environment and Forestry (Indonesia)
MRV	Monitoring, Reporting and Verification
NTFPs	Non-Timber Forest Products
PES	Payments for Environmental Services
REDD	Reducing Emissions from Deforestation and Forest Degradation
RICE	Regional Extension of DICE (Model)
SCC	Social Cost of Carbon
SDM	System Dynamics Modelling
SEEA	System of Environmental and Economic Accounting
TEEB	The Economics of Ecosystems and Biodiversity
UNEP	United Nations Environment Programme
UNORCID	United Nations Office for REDD+ Coordination in Indonesia

Foreword

Indonesia has emerged as a global pioneer- in terms of national commitments, groundbreaking ideas and practical achievements- in pursuing green growth and a green economy transition. Within the past decade or so, the country has made significant progress in defining for itself a development trajectory that succeeds in producing sustainable outcomes for economy, people and nature.

In recent years, Indonesia has witnessed more severe flooding, landslides and prolonged droughts, as well as shifting weather patterns, phenomena which take their greatest toll upon society's most vulnerable: the rural poor. In parallel to this vulnerability to climate change, Indonesia is also one of the world's largest emitters of greenhouse gases (GHG). The overwhelming majority of Indonesia's GHG emissions – 85 percent – come from land use related activities, which include deforestation and forest degradation as well as peatland decomposition and peat fires. Land use, land use change and forestry in Indonesia have traditionally been considered drivers of national economic growth; even though there is compelling evidence now that this development trajectory jeopardizes the socio-economic wellbeing of Indonesia's current and future generations.

One of the most basic but fundamental difficulties is making the case for a green economy transition in terms that are familiar to those responsible for making development decisions. A key approach to such decision-making remains cost-benefit analysis, and the anticipation of outcomes in different scenarios. If green economy is to win over business-as-usual, it must be demonstrated that this approach is genuinely more profitable for people- as well as planet- in the long run. It is common knowledge that rural communities across Indonesia (over 50 million people) depend upon access to 'free' ecosystem services for food, shelter, building materials, livelihoods and other basic needs. Their situation truly exemplifies the meaning of the term 'natural capital'.

By shedding light upon the true economic value of Indonesia's forests, this *Forest Ecosystem Valuation Study (FEVS)* hopes to better inform policy-makers of the consequences of their decisions relating to tropical landscape management, and motivate them to pursue sustainability in this regard. The study also hopes to help attract investment in sustainable forest management by raising awareness of the real value of such efforts- and, conversely, the scope of the negative impacts of 'business as usual'. Specific reference is made to REDD+, given Indonesia's professed commitment to this mechanism as a means to facilitating a transition to sustainable tropical landscapes.

This FEVS complements studies funded by the UN-REDD Programme in other REDD+-implementing countries (Kenya, Tanzania, Panama, and Zambia), which share the objective of providing quantitative evidence on the values of forest ecosystem services with a view to increasing investments to support sustainable natural resource management.

I would like to place on record our gratitude to the United Nations Environment Programme (UNEP) for funding the FEVS for Indonesia, and also to Pavan Sukhdev, UNEP Goodwill Ambassador, for his leadership of the study. I hope that this study will serve to illuminate not only policy makers, but also Indonesians and people across the world, the significance of the true value of nature.

Satya S. Tripathi
Editor in Chief

Executive Summary

Over the last few years, Indonesia has demonstrated considerable leadership in recognising the value of its natural capital. With the third largest area of tropical forest in the world, Indonesia's forests play a significant role in climate change mitigation at the national and global level. They are also critical for economic growth and the welfare of people. Therefore, recognising, capturing and demonstrating the benefits provided by forest ecosystems in Indonesia can significantly assist the country in transitioning towards a green economy. This can result in equitable growth, stable economic development and the preservation of Indonesia's natural assets for its future generations.

The Forest Ecosystem Valuation Study (FEVS), undertaken by the United Nations Office for REDD+ Coordination in Indonesia (UNORCID) with funding support from the United Nations Environment Programme (UNEP) aims to highlight the significance of the contributions provided by Indonesia's forests and their ecosystem services, which are often not accounted for in mainstream decision-making, but nonetheless critical in their immense socio-economic value. By providing quantitative evidence on the values provided by nature, the FEVS seeks to significantly increase investments in forest ecosystems and promote the sustainable management of these natural resources, leading to higher social equity and sustained long-term economic growth.

The FEVS draws its conceptual and methodological framework from internationally recognised assessments such as The Economics of Ecosystems and Biodiversity (TEEB) study, which go beyond traditional measures of growth and support policy reforms that effectively follow the principles of a green economy. The economic valuations provided throughout the FEVS seek to provide a "snapshot" of the substantial contributions from forests to Indonesia's national and sub-national economies. The study lays the groundwork for more comprehensive and deeper assessments of Indonesia's forests to enable a more widespread recognition of the role that natural resources can play in enhancing the livelihoods of the rural poor in Indonesia and in assisting an overall green economy transition.

Importance of forests and forest services for a green economy transition

By valuing the benefits of forests and their services, the Government of Indonesia can promote a shift towards the recognition of the critical interdependencies between socio-economic development and forest conservation. There is already evidence of this green growth oriented thinking in Indonesia reflected through Indonesia's deep engagement with the REDD+ mechanism and through the involvement of communities in forest management, which is demonstrated by the Community Plantation Forest (CPF) programme. A valuation of natural capital can enhance the knowledge and ability to set priorities for programmes, policies, and actions so that new jobs in sustainable sectors are created, green industrial activities are identified and new and innovative economic expansion opportunities based in the natural capacities of a region are designed.

REDD+ technical support and financial investments further have a role to play in the pursuit of a green economy transition for Indonesia. Increasing local participation in forest management and promoting strategies for widespread private and public participation in conservation could lead to more effective protection of forest cover and Indonesia's biodiversity. Such approaches based in better management of natural resources then have the capacity to generate diverse opportunities for additional economic revenues, which could have beneficial impacts for economic growth and for poverty alleviation. They could also support Indonesia in achieving the proposed Sustainable Development Goals (SDGs), as 13 out of 17 of the proposed SDG targets are directly or indirectly reliant on the condition of natural resources.

Significance for poverty alleviation and social equity

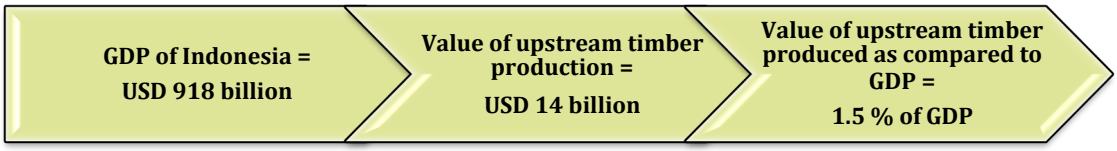
Indonesia's forests, through Non Timber Forest Products (NTFPs) play an important role in the livelihoods of poor rural communities. For example, on average across Central Kalimantan, 76 percent of the incomes of rural households are derived from forests and ecosystem services (Sukhdev *et al.,* 2014). A development strategy seeking to alleviate poverty would be more effective if it recognises exactly which natural resources support the well-being of the poor on an everyday basis.

Across Indonesia, more than 74 percent of the poor depend on ecosystem services for their basic livelihoods. Depletion of these services would thus, have dramatic effects on the livelihoods of the poor, whilst widening the national inequality gap. For instance, in East Nusa Tenggara, bearing in mind that 80 percent of the population is involved in the agricultural sector, a continued degradation of forests will deplete key regulating services for agriculture, which could particularly affect the rural poor within this province and reduce their resilience to any unexpected climate change impacts.

The FEVS underlines how these environmental, social and economic issues are deeply interlinked. While valuation of forest ecosystem services demonstrates the role of forests in promoting multiple branches of the economy, it also emphasizes the strong social implications of forest degradation and deforestation. As one domain affects the other, the FEVS seeks to highlight the intertwined dimensions to enable policy-makers to make more informed decisions.

Key findings

- The upstream timber industry added more than USD 14 billion to the Indonesian economy in 2012 (see Figure 1, below). This estimation excludes timber from illegal sources and could thus be seen as an underestimation of the true value of timber production. Not only would a further degradation of forest areas contribute to a decrease in this crucial source of income - without even mentioning the equally important employment dimension - but this would also engender a significant loss in tax revenue for the Indonesian economy. For example, in 2010, total forestry taxes amounted to IDR 2.7 trillion. In order to ensure an increase, or simply maintain these important economic contributions, sustainable management of forests is necessary.



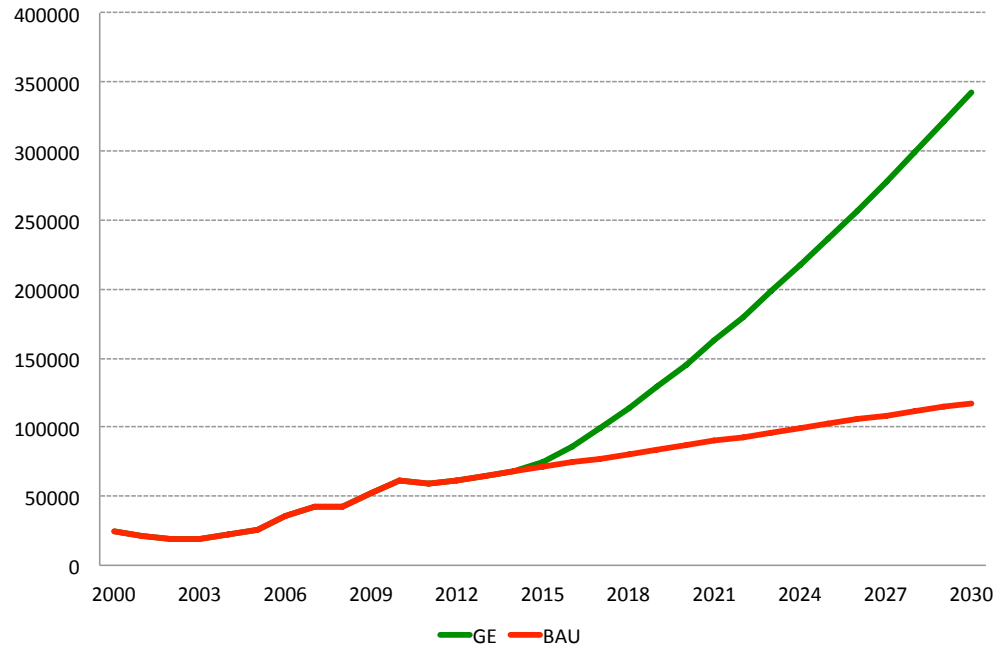
Contribution of upstream timber production to national GDP

- NTFPs have significant economic potential for Indonesia as their production has considerably increased over the past decade. Overall, the medicinal plants industry and the essential oil industry are strongly anchored throughout the country. Indeed, whilst in 2011, the medicinal plants industry produced more than USD 1 billion worth of products, Indonesia is now the world's biggest producer of 8 types of essential oils. These economic contributions have the promising capability of developing in the near future, but this is subject to the state of Indonesian forests, and how well they will be protected.

- Forestry regulating services are vital for the socio-economic well-being of many of Indonesia's provinces. For example, in Central Sulawesi, the FEVS shows that one hectare of forest prevents soil erosion equivalent to 6,538 kg/ha/year, which, also considering soil nutrient loss due to surface run-off, translates to an avoided cost of approximately USD 30 per hectare of forest in a year. This 'avoided cost' provides a significant argument in favour of increasing investments in forest protection, as failing

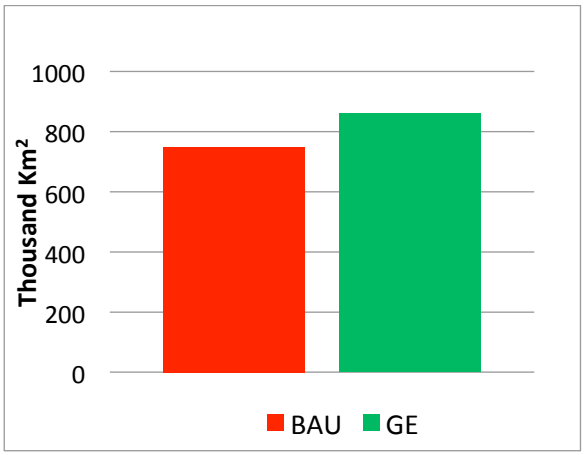
to do so will diminish soil quality and considerably reduce agricultural yields. Specifically, this would not be coherent with the Regional Medium-Term Development Plan (RPJMD) which has the main objective of increasing economic growth through pro-poor economy schemes, based on the extensive utilisation of natural resources and agriculture. Overall, these valuations of regulating services applied to five key provinces, reveal that the economic value of soil erosion prevention in the provinces ranged from USD 2 million to 81 million per year; the economic value of carbon sequestration and storage ranged from USD 17 million to 97 million and USD 1.2 to 19 billion per year, respectively; and the economic value of water augmentation ranged from USD 435 million to 2.4 billion per year. Generally speaking, sustainable management of forests would conserve the value of these assets, reducing administrative and fiscal costs at provincial levels, which could be required if these natural services are degraded and substitutes need to be instituted.

- A Green Economy (GE) route, rather than 'Business as Usual' (BAU), would lead to a better management of forests that would ultimately translates into an increase in production and revenues from the forestry sector, as shown in the example represented below.

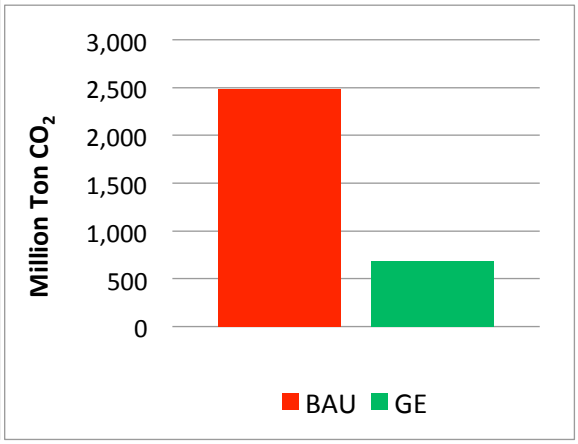


Annual timber value added in IDR billion under BAU and GE scenarios

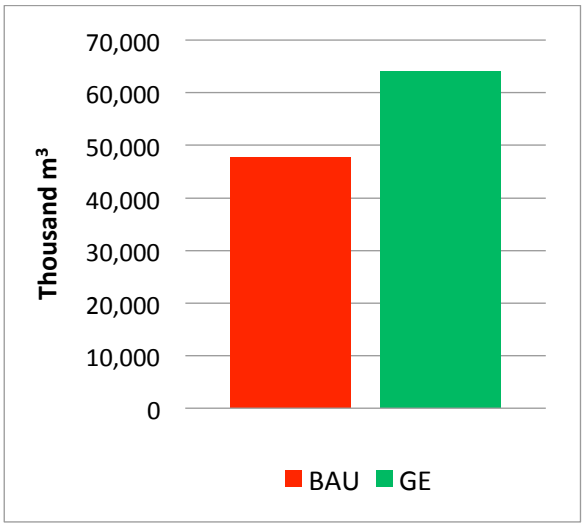
Impacts under GE versus BAU Approaches



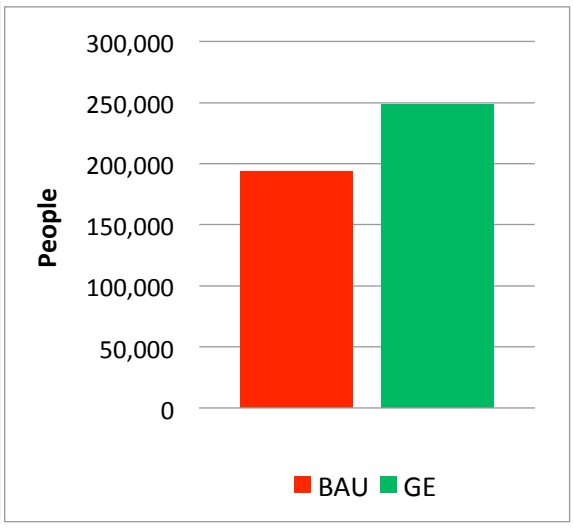
Total forest cover in 2030



Cumulative annual CO_2 emissions 2015-2030



Total timber production in 2030



Total employment in the forestry sector 2030

The graphs above summarise the main outcomes of green economy modelling accounting for forest cover, timber production of forest, employment in the forestry sector, and CO_2 emissions. The BAU simulation assumes a continuation of historical trends while the GE scenario simulates offsetting deforestation through afforestation and reforestation of secondary forest.

Chapter 1. Forest Ecosystem Valuation: An Overview

1.1 Why value ecosystem services?

Natural capital and ecosystem services form the very basis of an economy, however, they are "economically invisible" (TEEB, 2010a). Ecosystem services are public goods, which means they are freely available to all and are subject to exploitation and over-use (Montero and Perrings, 2011). Most of nature's vital goods and services such as provision of clean air and water, provision of fertile soil, service of floods and drought control, and regulation for climate stability are not recognised in conventional economic valuation mechanisms (Sukhdev, 2012). Therefore, these indispensable goods and services and the benefits that are derived from them are "neglected or undervalued" in decision-making, leading to poor management of ecosystems (TEEB, 2009).

Overall, valuation is a multidimensional and complex undertaking. Ecosystem service valuation studies can be realised at different geo-political scales, within a context of contradistinctive layers of the biosphere, whilst also being subject to the intricate institutional dimensions (TEEB, 2010a). In those regards, valuation should not be interpreted as a simple economic pricing, but more as an important human institution, whether it be formal (laws, regulations), or informal (norms, ideologies) (Sukhdev *et al.*, 2014). Valuation can thus be considered as a 'constructed set of rules or typifications' (Vatn, 2000), illustrating how the latter can be visualised differently depending on the socio-cultural context. For example, Judaeo-Christian culture values the superiority of mankind as the 'inheritor of Earth' whilst many naturist tribes support the idea of deep ecology and that all species have an inherent value in themselves (Sukhdev et al, 2014). Throughout the understanding of these fundamentally contrasting contexts whilst also drawing back on the multidimensionality of valuation explained above, one can comprehend how a one-size-fits-all valuation model is senseless, and should ideally take place within a contextual ground-based analysis.

Measuring in economic terms enables for a simpler understanding of the value that ecosystems provide to human welfare and well-being. Boyd (2012) iterates this concisely, saying that economic valuation is a necessary step in order to conserve ecosystems, as "financial languages and arguments permeate our social and household discourse". However, it must be noted that valuing nature does not mean putting a price tag on nature, commodifying or privatizing the global commons (TEEB , 2009). Rather, economic valuation is a means to communicate the value of ecosystem services to the economy in understandable terms to policy makers, to ensure that more informed policy decisions are made (TEEB, 2010a).

In general terms, valuation should be applied and interpreted through a political-ecology lens. Only then does the resulting valuation allow a deeper understanding of the interlinkages between environmental, social and economic well-being. In the context of forestry, Adams (2008) states that 'it is necessary to understand the specific political, economic, social and environmental processes at work' as broad generalizations about causes of forestry depletion are compelling but highly misleading. However, It is crucial for policy makers to adopt and incorporate such valuations in their decision-making, because they enable the mainstreaming of ecosystem services into policies and allow for a recognition of what would be genuinely lost socially, environmentally and in terms of stable long-term growth (TEEB, 2010).

1.1.1 Significance of ecosystem services

Ecological systems are critical to the functioning of Earth's life support systems (Daily, 1997). Capturing the value of the benefits of ecosystem services only representatively captures the range of benefits ecosystems provide for society, which in effect are actually 'infinite' (Costanza *et al.,* 1997).

As for forests, the support they provide to human life worldwide is huge, with billions of people depending on them for food, energy, livelihoods and shelter, mostly in developing countries (FAO, 2014). Forests help rural households meet dietary needs during seasons of scarcity and add variety to diets, providing essential vitamins, minerals, proteins, and calories (Byron and Arnold, 1997). Moreover, they provide the fuel wood for an estimated 2.4 billion people use for cooking (FAO, 2014). Services provided by forest ecosystems help support smallholder farming, which provides approximately 80 percent of the food consumed in most developing countries, therefore, contributing significantly to poverty reduction and food security (IFAD, UNEP, 2013). For instance, coffee farmers in Indonesia depend on natural pollinators who inhabit nearby forests; as forest quality deteriorates pollinator visitation rates decline, resulting in the decline of yields, production and incomes (IFAD, UNEP, 2013). Forests also provide the wood that is used as the main energy source in large rural areas of less developed countries and the main material for the houses of at least 1.3 billion people worldwide (FAO, 2014).

In addition, forests deliver a number of services such as floods and drought control, protection from natural calamities, cleaner air, better soil and water quality, aesthetic and recreational values. For instance, during the 2004 tsunami, along the stretch of the eastern coast of India, in the Cuddalore District in Tamil Nadu, three villages that were unprotected by mangroves were completely destroyed, while three villages protected by mangroves were unscathed, and five within coastal tree plantations were only partially damaged (Mullan, 2014). The role of mangroves as a vital buffer against storms is increasingly recognised and is also a more cost-effective strategy to reduce impacts of floods or climate change compared to man-made substitutes (TEEB, 2010b). For instance, in Vietnam an investment of USD 1.1 million in mangrove restoration saved an estimated USD 7.3 million a year in sea dyke maintenance (UNEP, n.d.).

In addition to forests, the marine ecosystem helps provide food security to over 1 billion people living in coastal regions, by providing essential animal protein and nutrients. The world's fisheries support 170 million jobs, directly and indirectly, providing USD 35 billion in household incomes per year (UNEP, 2011).

Regional and global studies have estimated that when ecosystem services are valued in economic terms, they provide trillions of USD worth of goods and services every year. The social and environmental benefits of forestry in Britain, for example, equalled EURO 1 billion in 2003 (Defra, 2007). The world's coral reefs provide several ecosystem services such as natural hazard management (up to USD 189,000/hectare/year), tourism (up to USD 1 million/hectare/year), genetic materials and bio-prospecting (up to USD 57,000 /hectare/year), and fisheries (up to USD 3,818/hectare/year) (TEEB, 2009). Table 1 provides a few examples of studies that estimate the economic value ecosystem services - mostly from tropical forests provided to different regions at different scales.

Table 1: Estimated values of ecosystem services

Ecosystem Service	Value
Food, fibre and fuel	• The total value of fish supplied by fisheries and aquaculture in 2010 was estimated to amount to USD 217.5 billion (FAO, 2012) • Lescuyer (2007) valued the provisioning services of Cameroon's forests at USD 560 for timber, USD 61 for fuel wood, and USD 41-70 for non-timber forest products (all values per hectare per year).
Climate regulation	• Eliasch (2008) estimated that halving deforestation rates by 2030 would reduce global greenhouse gas emissions by 1.5 to 2.7 Gt CO_2 annually. The global damage cost of the climate change impacts of forest emissions could reach $1 trillion a year by 2100 under a Business As Usual scenario. • Lescuyer (2007) valued climate regulation by tropical forests in Cameroon at USD 842-2265 per hectare per year.
Water regulation, groundwater recharge and flood prevention	• Yaron (2001) valued flood protection by tropical forests in Cameroon at USD 24 per hectare per year. • Van Beukering *et al.* (2003) estimated the Net Present Value of water supply from the Leuser Ecosystem, Indonesia (comprising approximately 25,000 km^2 of tropical forest) at USD 2.42 billion. • Kaiser and Roumasset (2002) valued the indirect watershed benefits of the 40,000 hectare Ko'olau watershed, in Hawaii, at USD 1.42-2.63 billion over 25 years. • In a study commissioned by the New Zealand Department of Conservation, the value of water provision from the 22,000 hectare Te Papanui Conservation was estimated by calculating the cost that would be incurred if water was to be obtained from elsewhere. The study found out that the value of water supply was NZD 11 million in 2005, equalling a Net Present Value of NZD 136 million (New Zealand Department of Conservation, 2006).
Pollination and pest control	• Losey and Vaughan (2006) estimated that the value of ecological services provided by wild insects in the United States amounted to USD 57 billion annually. They consider only four services - dung burial, pest control, pollination, and wildlife nutrition – and base their estimation on the projected losses that would accrue if insects were not operating at current levels.

Source: TEEB, 2010a; FAO, 2012; Losey & Vaughan, 2006; New Zealand Department of Conservation, 2006.

1.2 Ecosystem services valuation approaches

Environmental goods and services are the main inputs and foundations for the growth of a majority of economic sectors, especially of a developing country (DIFID, 2004). However, conventional economic indicators such as the GDP fail to measure the extent of change in the stocks and flows of natural capital caused by production and consumption activities undertaken in the economy (UNEP, 2011). As a result of not determining and accounting for this change, natural resources are depleted at an unsustainable pace, thereby, significantly reducing the ability of ecosystems to deliver economic benefits, in terms of provisioning, regulating, cultural or supporting services (UNEP, 2011).

In order to overcome this limitation in the system of national accounting, the U.N. Statistical Division, together with the European Union (EU), Food and Agriculture Organization of the United Nations (FAO), International Monetary Fund (IMF), Organization for Economic Co-operation and Development (OECD) and

the World Bank have developed the System of Environmental and Economic Accounting (SEEA). The SEEA helps place statistical value of the environment and its relationship to the economy at the core of official statistics (United Nations, 2014). It helps capture environmental stocks and flows and provides environmentally-adjusted indicators for depleting environmental assets.

To work towards the ultimate goal of enabling a system of national accounting that takes into account natural capital stocks and flows, there is a need to firstly quantify the environmental goods and services employed in the economy. A variety of valuation approaches and classifications exists in order to help estimate the value of the various services and benefits that ecosystems and biodiversity generate (De Groot *et al.,* 2002; Fisher *et al.*, 2007; Boyd & Banzhaf, 2007), each with specific advantages and disadvantages (TEEB, 2010c).

Despite the challenges and difficulties, the main purpose of valuation is to remove the invisibility of nature's contributions to the economy in current measurement metrics in order to reorient our understanding of what underpins long-term growth and development. The intention is to give policy-makers and other stakeholders a set of options, methodologies and guidance tools that can assist them to identify the linkages between human well-being, revenue generation and preservation of natural resources. To this end, it is important to look at the local and regional value of nature, administrative capacities on the ground, data availability, monitoring mechanisms in place, and knowledge gaps, to help governments, NGOs, scientists and communities understand the costs and benefits of planned interventions.

The Millennium Ecosystem Assessment (MEA) is a widely accepted framework for ecosystem valuation. Initiated in 2001, the objective of MEA is to provide a scientific basis for actions needed to augment the conservation and sustainable use of ecosystems to enhance their contribution to human well-being without undermining their long-term health and productivity. It divides ecosystem services into four categories: provisioning services, regulating services, cultural services and supporting services.

The Economics of Ecosystems and Biodiversity (TEEB) approach follows similar categorisation for ecosystem services as the MEA. It divides ecosystem services into four categories, which are defined as follows:

- Provisioning Services: Ecosystem services that describe the material or energy outputs from ecosystems. They include food, water and other resources.
- Regulating Services: The services that ecosystems provide by acting as regulators. For instance, regulating the quality of air and soil or providing flood and disease control.
- Habitat or Supporting Services: Habitat or supporting Services underpin almost all other services. Supporting ecosystems provide living spaces for plants or animals; they also maintain a diversity of different breeds of plants and animals.
- Cultural Services: They include the non-material benefits people obtain from contact with ecosystems. They include aesthetic, spiritual and psychological benefits (TEEB, 2010b).

TEEB has published four study reports for different stakeholders (*Ecological and Economic Foundation*, *National and International Policy-Making, Local and Regional Policy Makers*, and *Business and Enterprise*) outlining the tools and methodologies available to demonstrate, capture and recognise the value of benefits provided by nature to societies. Table 2 provides a summary of the various techniques that can be used during valuation.

Table 2: Ecosystem valuation techniques

Group	Methods	Summary	Statistical analysis	Examples of service valued
1. Direct market prices	Market prices	Observe market prices	Simple	Provisioning services
2. Market alternative	i. Replacement costs	Finding a man-made solution as an alternative to the ecosystem service	Simple	Pollination, water purification
	ii. Damage cost avoided	How much spending was avoided because of the ecosystem service provided?	Simple	Damage mitigation, carbon sequestration
	iii. Production function	How much is the value-added by the ecosystem service based on its input to production processes?	Complex	Water purification, freshwater availability, provisioning services
3. Surrogate markets	i. Hedonic Price Method	Consider housing market and the extra amount paid for higher environmental quality	Very complex	Use values only, recreation and leisure, air quality
	ii. Travel Cost Method	Cost of visiting a site: travel costs (fares, car use etc.) and also value of leisure time expended	Complex	Use values only, recreation and leisure
4. Stated preference	i. Contingent valuation method	How much is the survey respondent willing-to-pay to have more of a particular ecosystem service?	Complex	All services
	ii. Choice experiments	Given a 'menu' of options with differing levels of ecosystem services and differing costs, which is preferred?	Very complex	All services
5. Participatory	Participatory environmental valuation	Asking members of a community to determine the importance of a non-marketed ecosystem service relative to goods or services that are marketed	Simple	All services
6. Benefits transfer	Benefits transfer (mean value, adjusted mean value, benefit function)	'Borrowing' or transferring a value from an existing study to provide a ballpark estimate for current decision	Can be simple, can be complex	Whatever services were valued in the original study

Source: Hussai & Gundimeda, 2010.

1.3 Review of ecosystem assessments in Indonesia

Several studies have been conducted on the significant role played by forests in the economy and society. Van Beukering *et al.* (2003) performed a valuation study to determine the total economic value (TEV) of the Leuser National Park in Sumatra, Indonesia, using a systems dynamic model[1] to comparatively evaluate the economic consequences of deforestation versus conservation over a 30-year period (2000-2030). Three scenarios were considered: conservation, deforestation, and selective use. The economic benefits considered included: water supply, fisheries, flood and drought prevention, agriculture and plantations, hydro-electricity, tourism, biodiversity, carbon sequestration, fire prevention, non-timber forest products, and timber. An impact pathway approach was utilised, which consisted of (1) defining impacts on ecological services; (2) identifying the physical impacts that are economically significant; (3) quantifying the effects; and (4) calculating monetary values. For the economic valuation, a mix of techniques was used. For easily quantifiable ecosystem service disruptions, such as decrease in groundwater and fishery supply, the production function and market price were used for valuation purposes. For others, such as loss of recreational activities, willingness to pay (WTP) and contingent valuation were utilised.

The stakeholders included local community members, the local and national governments, logging and plantation companies, and the international community. With a 4 percent discount rate, the accumulated TEV for the ecosystem over the 30-year period was found to be: USD 7 billion under the deforestation scenario, USD 9.5 billion under the conservation scenario, and USD 9.1 billion under the selective utilization scenario. The main components in the conservation and selective use scenarios were water supply, flood prevention, tourism, and agriculture. Timber revenues were the main contributor in the deforestation scenario. Compared to deforestation, conservation proved to benefit all categories of stakeholders, except for the elite logging and plantation stakeholders. The results support the notion that conservation promotes social and economic equity, while deforestation widens the gap between rich and poor (Van Beukering *et al.,* 2003).

In addition, a study assessing the value of environmental services of peatlands in Central Kalimantan highlighted that ecosystem services play a salient role in sustaining local livelihoods (Van Beukering *et al.*, 2008). The study found that due to the difficulty of making a living from infertile peatlands, local farmers are willing to switch to more sustainable practices such as reforesting part of their land to maintain and increase their income. From its findings, the study made a number of recommendations for effective peatland conservation measures, such as the need to create awareness among local communities about the benefits of conservation, secure tenure rights, reduce the risk of food and income shortages, as well as the opportunities for setting up compensation schemes for the collaboration of local farmers (Van Beukering *et al.,* 2008).

Similarly, a study highlighting the social and economic importance of forests succeeded in engaging stakeholders in sustainable forest management programmes (Van Paddenburg *et al.* 2012). The study estimated the contribution of forests to socio-economic development in the Heart of Borneo (HoB), assessed ways to optimize economic growth whilst maintaining HoB's natural capital, and estimated the costs and benefits associated with sustainable landscape management. The authors combined different methodologies and tools, such as ecosystem valuation and mapping tools, and system dynamics model, for valuing ecosystem services and projecting the impacts of different policy interventions on the economy,

[1] System dynamics modelling (SDM) is a form of computer simulation modelling designed to facilitate a comprehensive approach to development planning in the medium to long term. SDM operates by simulating historical data for a period of at least one decade, and comparing simulation results with the available data (Meadows, 1980) (Richardson & Pugh, 1981).

society, and environment. The study provided a number of key recommendations for the integration of green economy policies in the Heart of Borneo (Van Paddenburg *et al.,* 2012).

Another example of ecosystem services provided by forests can be found in a study undertaken by Priess *et al.* (2007), who estimated the value of pollination services on coffee yields in coffee agroforestry systems in Central Sulawesi. The authors demonstrated that forests in the study area annually provide pollination services worth EURO 46 per hectare. However, the scale of these services could increasingly reduce due to forest conversion, which could lead to a decrease in coffee yield by up to 18 percent and a drop in net revenues per hectare up to 14 percent within two decades as compared to average yields and revenues of the year 2001.

1.4 Outline of the Forest Ecosystem Valuation Study in Indonesia

The Forest Ecosystem Valuation Study (FEVS) seeks to value the ecosystem services provided by forests in Indonesia with a view to enhancing understanding of the role of forests in the Indonesian economy and society. It aims to support the integration of green economy principles into forest and land use planning and socio-economic development by providing Indonesian policy-makers with the necessary information to trigger a transition to a green economy; it is not intended as a document for the scientific community addressing the precise role of ecosystem services within the Indonesian biosphere. The FEVS contains inevitable generalisations in terms of biological analysis -bearing in mind the crucial time and data constraints- but the resulting study remains a solid background for policy implications which are required for a transition towards a more sustainable management of ecosystem services. Additional reports will possibly follow this ambitious valuation task within a more precise and local context, but this will require much more in-depth research including considerable primary data collection, thus, involving a much longer time scale. Nevertheless, with the on-going rate of deforestation and its significant socio-economic effects, it is necessary to address the urgency of the situation and provide Indonesia's policy-makers with this snapshot to make it clear that the current system is destroying assets on which future prospects are based.

Indonesia's forests indeed provide considerable economic, social, and environmental benefits for the people of Indonesia (Ministry of Forestry, 2009). Biodiversity plays a huge role in food security, human health and livelihoods, providing clean water, timber, medicinal plants and other important services. Biodiversity also enhances community resilience to climate change impacts and contributes to carbon sequestration and climate change mitigation.

The FEVS in Indonesia uses representative data collected for a sample selection of services to determine the contribution of these services to the national economy, thereby, providing a straightforward approximate economic estimate of the importance of selected ecosystem services of Indonesian forests. Data was collected both at the national level and from six provinces to determine the contributions of forest ecosystem services in different geo-physical contexts. While more comprehensive assessments are required that collect primary data, develop landscape specific methodologies, capture the difference between ecosystem functioning and services, determine beneficiaries of the service (who can provide a more locally specific understanding), and reflect the reality on the ground, the purpose of the FEVS is to provide a general overview of the value existing in nature's services in Indonesia. The study can, therefore, serve as a basis for further, more in-depth and micro-economic analysis in each province and ecosystem.

Due to data and time constraints, the FEVS only considers provisioning and regulating services, with a focus on timber, non-timber forest products (NTFPs), soil preservation, water regulation, and carbon sequestration. A section on the significance of peatlands is included since Indonesia contains 60 percent of all tropical peatland forests (Moore, 2009). However, this analysis is only meant to serve as a "snapshot" of the significance of peatlands for Indonesia's economy, leaving scope for a more focused study that addresses the needs of those working at sub-national levels.

The FEVS contains an assessment of the significance of timber and NTFPs for Indonesia's economy as well as a broader discussion on the importance of natural capital in supporting Indonesia's green economy transition. Data from the sample provinces of Central Sulawesi, Nusa Tenggara Timur, Jambi, East Java and Central Kalimantan examines the economic value of regulating services such as soil conservation, carbon storage and ground water regulation. This analysis employs secondary data due to constraints in terms of the information available and the scoping nature of the study.

At a larger level, the FEVS seeks to inform and support more effective allocation of resources that can contribute to green economy transitions facilitated by UNEP, especially in regards to REDD+.

Table 3: Provisioning and regulating services valued

Valuation of Forest Services		
Report	**Classification**	**Ecosystem service**
National	Provisioning	Timber
		NTFPs
Provincial	Regulating	Soil conservation
		Carbon storage
		Ground water augmentation

1.4.1 Methodology

As aforementioned, the FEVS in Indonesia provides an estimate of the value of the benefits provided by forest ecosystem services in Indonesia through a representative analysis of selected provisioning and regulating services. The FEVS is not a comprehensive assessment and is limited in its analysis due to data availability, data quality resulting in data inconsistencies, short timeframes and limited resources. The report findings underline that there is a need for a more robust data collection[2]. In instances where data is unavailable, certain substitutions have been made based on similar landscapes and other geo-physical characteristics. The provisioning services of timber and NTFP as well as the revenue of forestry taxes to the Indonesian economy are considered in the analysis, and the regulating services of soil conservation, carbon sequestration and storage and water augmentation have been estimated with data from five sample provinces. The following sections summarise the methodology and the key challenges and constraints of the valuation study.

Provisioning services: Timber and NTFPs

To calculate the economic significance of the value of timber in Indonesia, direct market prices are utilised. It is recognised that market prices do not always reflect the real value of a product and can overvalue or

[2] In particular, while the initial study framework anticipated the inclusion of Papua within the analysis, this could not be achieved due to data constraints. The inclusion of data from Papua would be essential to complete the picture provided by this scoping analysis.

undervalue it. Furthermore, market prices are also affected by distortions such as taxes, subsidies, and price regulations (TEEB, 2010b). In addition, externalities are often not captured by conventional market prices (Hawkins, 2003). Whilst acknowledging these limitations, direct market prices are utilised to estimate the value of timber and NTFPs in Indonesia's economy, as they are considered a reasonably good approximation of this value.

The average annual domestic market prices for timber products are taken from the Tropical Timber Market (TTM) report, which is published periodically by the International Tropical Timber Organization.[3]

In terms of NTFPs, a greater number of challenges exist that affect the ability to estimate their contribution to the economy. Some of these challenges include:

- The inventory of products to be valued tends to be enormous, as forests contain a large number of different plants and animals (Wong *et al.*, 2001).
- NTFPs are usually traded in informal markets, with different prices depending on distances to markets.
- Secondary NTFP data is difficult to find, especially if they are not exchanged for cash and are not recognised by markets or authorities (Agrawal *et al.,* 2013).

Given these constraints, the FEVS considered a country-wide production value (quantitative value) of a few major NTFPs and medicinal plants based on secondary data sources. Performing economic valuation was not possible due to secondary data inconsistencies and a lack of records of the exact range of NTFPs in Indonesia. However, an indication of the role of NTFPs in the Indonesian economy is given by providing data related to the exports of a number of these products.

Regulating services: soil conservation, carbon storage, ground water augmentation

Two regulating services, soil conservation and ground water augmentation, are valued based on the approach utilised by the 'Green Accounting for Indian States Project' (GAISP) in the monograph 'Accounting for the Ecological Services of India's Forest: Soil Conservation, Water Augmentation and Flood Prevention'.[4]

To estimate the services provided by forests in soil conservation, the 'resource value of soil loss' approach is used. This can be categorised under the technique of 'replacement cost', as soil supplies vital nutrients and when it is eroded and degraded due to deforestation artificial fertilizers must be used to restore its fertility. A drawback of the 'replacement cost' method is the use of market prices of the fertilizers used to replace the nutrients loss when measuring the economic value of soil conservation as an ecosystem service. Market prices, as mentioned earlier, suffer from their own set of limitations. In this specific case, it has to be taken into account that the fertilizer sector of Indonesia is subsidized (Yasmin, 2014), and hence distortions arise in the final estimation. In addition to this, another challenge is that the study relies heavily on existing research papers to gauge the value of soil erosion and nutrient concentrations of study sites within each province. These values are extrapolated to the whole provinces after careful consideration of similarity of the study site and the province. Consequently, the final results can only provide rough estimations, and it is therefore, recommended that context-specific assessments be undertaken to better evaluate the role of forests in preventing soil erosion as a follow up to this study.

[3] ITTO is an intergovernmental organization established under the International Tropical Timber Agreement (ITTA) of the United Nations Conference on Trade and Development. It promotes the conservation and sustainable management, use and trade of tropical forest resources.

[4] See http://www.gistindia.org/monograph.html for the approach employed by GAISP for India and the full set of 6 monographs.

For valuation of ground water augmentation, the additional recharge facilitated by forests is computed using the 'water balance equation'[5]. It is assumed that the precipitation quantum left over after evapotranspiration, surface run-off and saturation of soil is available for groundwater recharge (Kumar *et al.,* 2006). However, ground water is not confined or static to the area of recharge, on a regional scale. The configuration of the water table commonly is a subdued replica of the land-surface topography (U.S. Geological Survey, n.d.). Therefore, the methodology used to compute ground water recharge simplifies this process by making a number of assumptions and takes into account a hypothetical, static situation. For instance, the study takes into account the price of water at a particular time in order to economically evaluate the benefit of water augmentation by forests. This is not the case in reality, where price is a function of the demand and supply of a commodity or service and can fluctuate with the changes of demand and supply.

To calculate the economic value of carbon in the forests of the six provinces, the quantity of carbon stored and sequestered in both primary and secondary forests is multiplied with an approximate economic value of carbon known as the social cost of carbon (SCC), expressed in USD per ton of carbon. The SCC value used in the FEV report is taken from the RICE model (regional extension of DICE model) given in the report "Measuring Green Prosperity in Indonesia. Technical and Policy Considerations for Including Avoided Climate Impacts in the Millennium Challenge Corporation's Cost-Benefit Analyses" (Wolosin, 2014). Wolosin estimated the Indonesia-specific SCC values for 5 percent, 3 percent and 2.5 percent discount rate. The reason 3 percent discount rate has been used is because it is a "central case", or the mean value to calculate SCC (Ackerman & Stanton, 2012).

1.5 Indonesia Green Economy Model (I-GEM): An Overview

The Indonesia Green Economy Model is utilised to compare investments in forest preservation and sustainable forest management options, with the added benefits and avoided costs that would be derived from the successful implementation of such options. More precisely, the three main components of the analysis are described as follows:

a) *Added benefits:* the monetary valuation of economic, social and environmental benefits deriving from sustainable forest management, focusing on short-, medium- and long-term impacts across sectors and actors. These may include, for example, enhanced production of non-timber forest products and higher agricultural productivity due to soil quality preservation.
b) *Avoided costs:* the estimation of potential costs that could be avoided as a result of the successful implementation of sustainable forest management policies and processes. These refer to the avoided payments for the replacement of key ecosystem services provided by forests. For example, the avoided costs of flood damage are estimated and accounted within this category, as well as expenditure for water purification (related to water quality).
c) *Investments:* they refer to the allocation and/or reallocation of financial resources (e.g. under REDD+) to create enabling conditions for sustainable forest management in Indonesia.

[5] "In hydrology, a water balance equation can be used to describe the flow of water in and out of a system. A system can be one of several hydrological domains, such as a column of soil or a drainage basin" (Dutta *et al.,* 2013).

1.5.1 Projecting socio-economic trends to reveal added benefits and avoided costs

To determine the kinds of investments needed for conserving forests and greening relevant sectors to support the transition towards a green economy in Indonesia, it is important that the added benefits and avoided costs of sustainably managing forests are assessed. The economic value of forest services is calculated based on existing and historical data on forest ecosystem services. Trends and projections are also shown for the Business as Usual scenario. Modelling under I-GEM is used to show the added benefits of sustainable forest management under Green Economy scenarios to evaluate the added social, economic, and environmental benefits, including but not limited to improved agricultural productivity, green jobs creation, improved health conditions, and carbon sequestration.

Avoided costs directly related to the environment can be measured, including costs for the replacement of affected ecosystem services. For instance, these include the costs of human-engineered solutions to address water quality and quantity, artificial flood control and flood protection systems such as dams and other types of barriers. Secondly, unsustainable use of natural resources may cause additional social costs, especially in communities that largely depend on forests goods and services for livelihoods and safety net against flood, erosion and shortfalls in food supply. This study, through GE scenarios, demonstrates the saved and avoided costs in relation to the economic performance of key sectors affected by forest degradation, such as eco-tourism, agroforestry, and timber production.

1.5.2 Scenarios for cost benefit analysis

An extended cost-benefit analysis is performed focusing on two alternative future scenarios of forest management in Indonesia. These include:

- A **Business as Usual (BAU)** scenario that assumes the continuation of historical and present trends of forest management. This includes all policies and interventions currently active and enforced, but excludes policies planned but not yet implemented.
- A **Green Economy (GE)** scenario that simulates, among others, additional interventions that promote sustainable forest management. Under this scenario, net deforestation would be stopped by 2015, and all peatland would be managed under sustainable practices by 2030.

The scenarios simulated also take into account REDD+ strategies and projects. In fact, both BAU and GE scenarios are consistent with the baseline and alternative scenarios defined in REDD+ analysis (e.g. concerning land cover and emissions). As a result, the I-GEM model can be used to inform policy formulation and assessment, specifically on how REDD+ and other cross-sectoral investments can be directed to help Indonesia's transition towards a green economy.

Investments are intended here as the financial resources utilised by public and/or private actors for the implementation of policies/projects that would contribute to the preservation of forest cover and forest ecosystems in Indonesia. The analysis of possible alternative investment options is a key starting point for selecting the most cost-effective policy interventions. For example, different possible investment options can be considered (and measured) to address the problem of unsustainable deforestation (Van Paddenburg *et al.,* 2012). Reforestation and afforestation policies could be implemented to avoid the loss of natural capital, at the same time ensuring the continuation of forestry production. In addition, protected areas could be established or expanded in order to preserve primary forests from aggressive exploitation. Furthermore, incentives and subsidies could be adopted to support the development of sustainable

economic activities, such as eco-tourism. Indicators can be used to quantify each of these investments, thereby providing a coherent framework for informed, evidence-based decisions.

Table 4 provides a general overview of key indicators to quantify different kinds of investments, broadly divided into capital and operation and management costs, training costs, and government costs. The set of indicators is not exhaustive, but rather reflects a generic portfolio of indicators that can be flexibly customised (i.e. expanded or narrowed down) to the requirements and objectives of specific policy assessments.

Table 4: Indicators of investment in the preservation of forests and their ecosystems

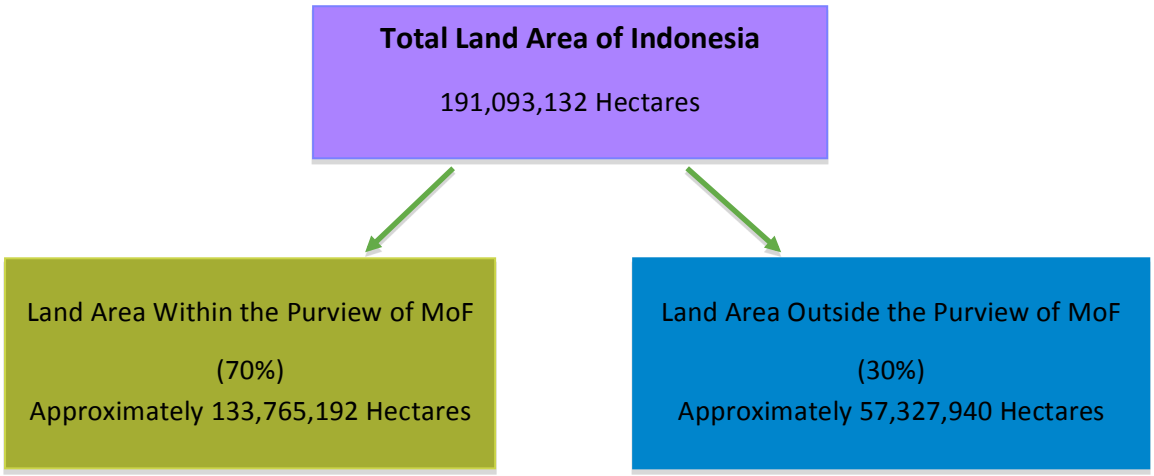
Capital and O&M Costs	Training Costs	Government Costs
• Reforestation costs (IDR/ha) • Establishment/Expansion of Forest Protected Areas, including enforcement costs (IDR/year) • Costs associated with the respect of legal and customary rights of indigenous people (IDR/ha). (eg: Community facilitation, participatory mapping, drafting acknowledgement of customary rights proposals)_ • Sustainable plantations for timber production purposes (IDR/ha). • Labor cost (IDR/person; IDR/year; IDR/ton).	• Training and supervision of forest workers (IDR/person). • Training of law enforcement officials (IDR/person)	• Compensation costs for the expansion of forest protected areas (IDR/household) • Subsidies to local forest communities (IDR/year) • Development and implementation of policies for Environmental, Social, & Economic Performance Criteria (IDR/year).

Chapter 2. State of Forest Cover, Deforestation and Snapshot of Ecosystem Services Provided by Forests in Indonesia

2.1 Forest cover of Indonesia

Approximately 70 percent of Indonesia's landmass (or 133 million hectares) is designated as state forests, placed under the jurisdiction of the Ministry of Forestry.[6] The discrepancy that exists between actual and designated forest status is due to the history of forest management in Indonesia, which placed all natural forest under control of state over the course of the period starting during the colonial periods (1863 Forestry law) to 1967 (Forestry Law (5/1967), which in principle has been confirmed in the 1999 forestry law (Fay et al., 2000). However, due to deforestation, swidden agriculture and land-use changes associated with the development of forest industries (both legal and illegal) and the commodity sector, not all of this land is actually forested. In 2013, the total forest cover in Indonesia was estimated to be 98 million hectares, equalling 52.2 percent of the total land cover of the country. The following figure gives an approximation of the area of land in Indonesia that falls within and outside the purview of the MoF of Indonesia.

Figure 1: Division of land area of Indonesia



Source: Compiled by authors based on land area data from BPS (2013a) and percentage division of land from Indrarto *et al.* (2012)

[6] In October 2014 the Ministry of Forestry (MoF), and the Ministry of Environment (MoE) were merged into the new Ministry of Environment and Forestry (MoEF). However, since the data we use is taken from sources of the old Ministry of Forestry, we still refer to it throughout this report. Reference to the Ministry of Environment and Forestry is made only when considering facts that happened from October 2014 onwards. It is worth mentioning that in January 2015, through Presidential Regulation No. 16/2015, the cabinet-level agency BP REDD+ and the National Council on Climate Change (DNPI) also ceased to exist, being integrated as well into the newly formed Ministry (MoEF).

The Ministry of Forestry divides the forest estate into four different categories, based on functions:
1) Conservation Forests: designated for conservation of plant and animal species.
2) Protection Forests: to serve life support systems and maintain regulating services provided by forests.
3) Production Forests: designated for producing forest products, including timber. Production Forest is subdivided into Permanent Production Forest and Limited Production Forest.
4) Conversion Forest, which is to be converted for other land uses (Ministry of Forestry, 2014).

The following table gives the extent of actual forest cover within the area designated as forest by the MoF.

Table 5: Primary, secondary and plantation forest cover in Indonesia under MoF purview, 2013 (*1000 hectares)

	Conservation forest	Protection forest	Limited production forest	Permanent production forest	Conversion forest	Total
Primary Forest cover	12,795.1	14,683.7	9,757.8	4,760.5	3,188.7	45,185.8
Secondary Forest cover	42,94.4	82,35.8	12,155.9	11,077.1	5,059.6	40,822.8
Plantation forest	135.9	304.5	551.5	1,933.2	119.1	3,044.2
Total forest cover	17,225.5	23,224.0	22,465.2	17,770.8	8,367.4	89,052.9

Source: Based on Landsat Satellite data from Ministry of Forestry (2014).

According to Table 5, the total forest area including primary, secondary and plantation forest under the purview of MoF in 2013 was estimated at 89,052,900 hectares. This accounts for about 47.4 percent of total land area of Indonesia.

The table below provides data on the amount of forest cover that falls outside the purview of MoF.

Table 6: Primary, secondary and plantation forest cover in Indonesia outside MoF purview, 2013 (*1000 Hectares)

	Primary Forest cover	Secondary Forest cover	Plantation forest	Total forest cover
Other land use	1524	5606.4	1889.3	9019.8

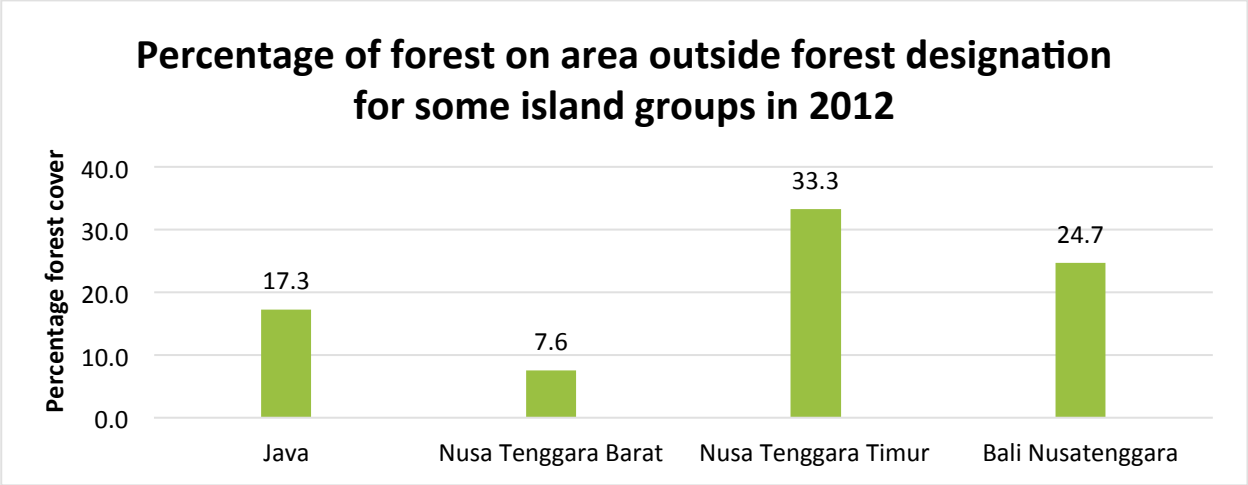
Source: Based on LandSat Satellite data from Ministry of Forestry (2014).

Considerable forest areas are present outside the forest zone designated by the Ministry of Forestry, as illustrated by Figure 2. Although currently the forests outside the purview of MoF account for only about 4.8 percent of Indonesia's landmass, these areas, consisting of mostly secondary forests, are increasing in size. In 2013, the total forest cover in land designated for other land uses (*Area Penggunaan Lain – APL*) increased from 8.63 million hectares in 2011 to more than 9 million hectares (MoF, 2012 & 2014). A prominent trend underlying this steadily increasing forest area is the conversion of agricultural farmland to farm forestry on Java and the Eastern Islands. Since the cultivation of agricultural products like cassava and rice is labour-intensive and younger generations are increasingly moving to the large metropolises of Java, more households are planting fast growing trees on their lands, mainly for timber and pulp production. The

area of these farm forests, mainly consisting of Teak (*Tectona grandis*), Mahogany (*Swietenia macrophylla*) and Sengon (*Albizia chinensis*), is rapidly increasing. Even though the MoF indicates that forested areas outside of forest zone boundaries only cover approximately 1.8 million hectares, this is an underestimation due to the fact that small, scattered forests with low tree density can be overlooked by satellite land cover analysis. Indeed, a different study concluded that the area in use of these community forests increased from 1,900,000 ha in 1993 to 2,799,181 ha in 2009, representing 20 percent of the total area of Java (Suprapto, 2010). A comparable trend, in which agricultural crop lands are converted to farm forests, is observed in Nusa Tenggara Timur, with forests outside of the designated forest estate mounting up to 987,900 hectares, or 55 percent of the total forest cover of the province (Ministry of Forestry, 2014).

Community managed forests located outside of the forest estate cover a substantial amount of land. In the group of provinces Bali Nusatenggara (comprising the provinces of Nusa Tenggara Timur, Nusa Tenggara Barat, and Bali), for example, 24.7 percent of the land outside the forest estate is actually forested (Ministry of Forestry, 2013). These agroforests include mainly a combination of "*adat*" (custom) based forest management systems, timber production and fallow tree crops. Besides farm forestry and community forests, other forested areas within APL (Other Land Uses) are private forest plantations and forests areas that are allocated for planned conversion to alternative land uses but have not been converted yet.

Figure 2: Percentage of forest on total area outside forest designation by MoF for some island groups, 2012.



Source: Compiled by authors based on data from Ministry of Forestry (2013)

Given that forest areas outside the MoF forest estate are growing in size, they are of increasing importance to the provision of key ecosystem services. However, at the present moment there are no regulatory frameworks that can encourage the sustainable management of these areas. Given the different nature of these forests, legal frameworks should be put in place taking into account specific local contexts and features. Nevertheless, some shared principles can be identified, for which the key features are as follows:

- To ensure that critical areas in terms of delivering environmental services are protected, one of the key challenges is to protect forested lands with High Conservation Value (HCV) from conversion to other land uses. Ideally, Law 37/2014 on Plantation Crop production should be revised to allow for the establishment of HCVF within existing concessions.
- Assess the possibility of using fiscal mechanisms to stimulate carbon sequestration as well as the provision of other environmental services on private lands. A lower tariff of the Land Value tax

might be a possibility to stimulate tree planting on degraded private lands by farmers. To this end, REDD+ can potentially play a role in incentivising more sustainable land uses.

- Acknowledge and stimulate production forest management by smallholders both through community-based mechanisms and private/farm-based production, ideally through anticipated land reform and acknowledgement of *Adat* rights.
- Improve market access for timber through stimulating the inclusion of smallholder timber producers in certified timber value chains. However, applying the same standard to small and medium enterprises is a fundamental challenge because of the sheer size of the sector. For instance, in the furniture sector in Java 20 to 30 percent small-scale shops deliver products to large-scale furniture companies. These small-scale producers often lack basic legality requirements for certification, and certification costs are high given the small volumes and scattered productions. Group certifications are a way to overcome these high costs, and REDD+ investment could serve as a mechanism to subsidise certification (Obidzinski *et al.,* 2014).
- Include agroforestry system/farm-based timber production as a separate land classification unit in spatial planning to better understand the impact of proposed land use change options for local development.

Such interventions could inform the on-going policy debate on improving forest management in Indonesia. In particular, the government seeks to accelerate the development of Forest Management Units (FMU) as the basic management unit for all forest areas. A FMU is "a well-defined and demarcated land area, predominantly covered by forests, managed on a long-term basis with a set of clear objectives specified in a forest management plan" (FAO, 2000). A dominant forest function, namely conservation forest, protection forest, and production forest is assigned to each FMU to define the management plan of the areas and ensure the achievement of stated goals. The FMU scheme has been tested in some Indonesian forests, such as Forest Estates (Perhutani) in Java (except the province of Yogyakarta).

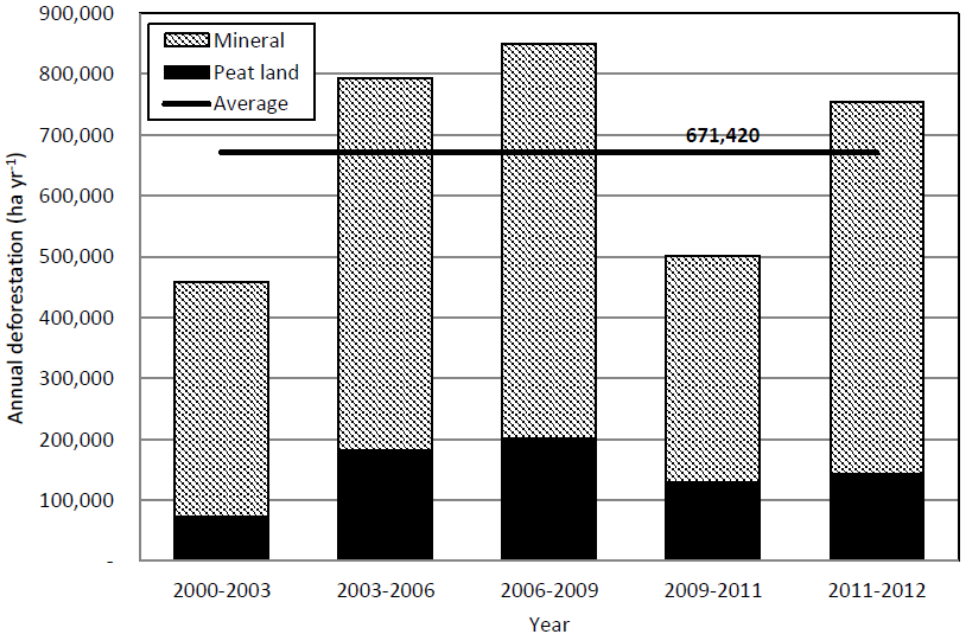
Another forest management practice that is supported by the Indonesian government is the formalisation of customary forest ownership by indigenous communities. Under this practice, the government recognises the rights of indigenous communities to own and manage their forests in accordance with their customary law. Such an approach is based on the acknowledgement of customary rights and the directive role that local/customary communities should play in sustainable forest management.

2.1.1 Deforestation in Indonesia

Indonesia has the highest deforestation rates in the world, exceeding even Brazil while having only a quarter of Brazil's forest area (Margono *et al.,* 2014). The major drivers of deforestation are in the following order of magnitude: fibre plantations, logging concessions, oil palm, mixed concessions and mining concessions (Abood *et al.,* 2015). However, protected forest areas have also been targeted for deforestation to meet demands in international markets.

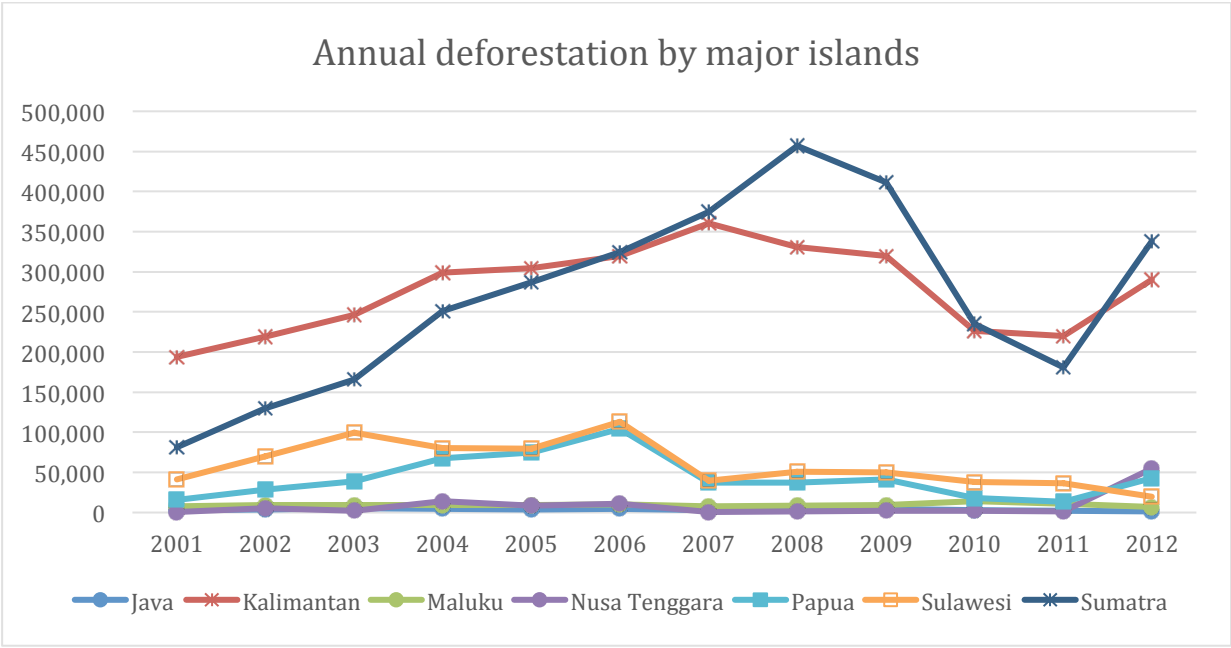
According to *Indonesia's National Forest Reference Emission Level*, the average annual deforestation for the period 2000-2012 was 671,420 hectares. During this period, more than 80 percent of deforestation occurred in Kalimantan and Sumatra, while Sulawesi and Papua follow with 9 percent and 6 percent, respectively (Government of Indonesia, 2014).

Figure 3: Annual deforestation in hectares



Source: Indonesia's National Forest Reference Emission Level (Government of Indonesia, 2014)

Figure 4: Annual deforestation (in ha) in Indonesia by 7 major islands or island groups



Source: Reference Emission Level (REL) for REDD+ in Indonesia (2014), draft paper distributed at a stakeholder meeting of the 5th of November 2014.

Sumatra witnessed a dramatic decrease in forest cover in recent decades. Primary forest cover was drastically reduced from 21 million hectares in 1990 to 7.54 million hectares in 2010, with another 2.31 million hectares of primary forest being degraded (Margono *et al.*, 2012). Similarly, Kalimantan suffered from extensive forest loss in the period 2000-2010, with 4.9 million hectare of forest lost (Abood *et al.*, 2015).

In Java, the deforestation rate of natural forests as opposed to secondary forests reached 2,500 hectares per year over the 2003-2006 period, or 0.2 percent of the total deforestation in Indonesia, and rose to 10,000 hectares per year in the 2007-2010 period, therefore, showing a fourfold increase. The biggest deforestation happens in East Java, amounting to 438.1 hectares per year comprising 25.1 hectares per year of primary forests, 43.6 hectares per year of secondary forests, and 369.5 hectares per year of other types of forests (Profauna, 2015).

Another significant issue in Indonesia is the deforestation of peat forests and the resulting peat fires. Peatlands are a huge storehouse of carbon and help sequester large amounts of CO_2 from the atmosphere (Agus *et al.,* 2011). Indonesia contains most of the world's peatlands (Agus *et al.,* 2011), but these areas are being rapidly cleared for the cultivation of agricultural commodities and oil palm plantations, particularly in Kalimantan and Sumatra. Peat swamp forest loss between 2000 and 2010 in Sumatra, Kalimantan, Sulawesi, Moluccas and Papua totalled 2.9 million hectares (Abood *et al.,* 2015). When peat forests are cleared, the peat is exposed to the air and sun as well as a sinking water table, subsequently drying out, breaking down and/or catching fire, particularly in prolonged periods of draughts. Once ignited, they tend to burn deep below the ground across large areas making them very difficult to extinguish. 57,800 fire hotspots were noted over the last ten years, out of which 41 percent occurred in Kalimantan and 37 percent in Sumatra (Yulianti *et al.,* 2012). However, only 7 percent of these hotspots occurred within forest areas, while 58 percent of the burned areas were forested in the five years previous to the fires (Gaveau *et al.,* 2014), showing that forests are potent fire preventive ecosystems. Peat decomposition and fires constitute 40 percent of the total emissions of Indonesia (2,000 Mt CO_2e/year) (Uryu, 2008). Since peat is the most effective terrestrial carbon storage system, these fires emit enormous amounts of carbon. This leads to the alarming figure of Indonesia emitting 6.5 times as much carbon dioxide from degraded peatlands than it does from fossil fuels each year (Silvius et al., 2006).

Furthermore, the social and economic consequences of peatland deforestation are tremendous. From a human health perspective, exposure to the thick haze generated by slow-burning peat has a positive correlation with an increase in respiratory diseases, with adverse impacts on economic productivity. For example, forest and land fires in February and March 2014 in the province of Riau, Sumatra, resulted in losses amounting to IDR 20 trillion, and 51,000 people suffering from respiratory diseases (World Resources Institute, 2014). Similar economic valuations have estimated that peat land fires have resulted in losses of more than USD 3 billion and haze impacts caused damages of more than USD 1 billion, adding up to a total damage of more than USD 4 billion to the economy of Indonesia during the year 1997 (Glover & Jessup, 2006). Another estimate by BAPPENAS-ADB (1999) gives an even higher estimate of damages suffered by Indonesia at about USD 9.2 billion.

Interestingly, when analysing the economic contribution of peat lands used for palm oil plantations or forestry production, one can recognise how they only contribute to a fraction of the GDP of Indonesia. Indeed, this economic revenue accounts for USD 1.06 billion, which is 0.26 percent, of the national economy (GDP) (BAPPENAS, 2009).

Overall, economic valuation sets a clear message: whilst the economic benefits received from peatlands exploitation are fairly poor, the underlying social, economic and environmental consequences are exceptionally important.

2.2 Snapshot of forest ecosystem services in Indonesia

Forests provide various valuable products and services to the people of Indonesia, many of whom depend on them for their survival. For example, Sumbawa is the top honey-producing island in Indonesia, reaching 125 tons per year. Most of this honey is extracted from forests by local communities that reside in 115 villages surrounding forest areas. As bees thrive in diverse ecosystems, the value added of honey in Sumbawa is directly dependent on the state of forest ecosystems.

In West Timor, a number of forest areas (i.e. the Recreation Park of Bipolo, the Nature Recreation Park of Camplong, the Nature Reserve of Mount Mutis, the Protection Forest of Mount Timau, the Hunting Park of Dataran Bena, the Nature Reserve of Kateri, and the Wildlife Reserve of Maubesiare) are essential in providing key services such as clean water, firewood, and medicinal plants and maintaining the hydrological cycle in the island. The water flows through three watersheds and thirteen watercourses that cleave the districts and Kupang city, supplying freshwater to 1.2 million inhabitants of West Timor. Of particular importance is the Mount Mutis Nature Reserve, which provides a source of water, construction materials and woodfuel for the local communities. The forest also supports local livelihoods through the production of both non-timber and timber forest products, such as honey and sandalwood. Moreover, the Reserve is composed of nearly homogenous strands of *ampupu* (*Eucalyptusurophylla*), which constitute a unique ecosystem.

Within the context of the Eastern Islands, water provisioning services play an important role. An example is the province of West Nusa Tenggara (Nusa Tenggara Barat or NTB) and especially the island of Lombok. Mount Rinjani supports a wet tropical forest environment and functions as the main water catchment area for the whole island. In particular, the Rinjani catchment areas play a central role in supplying water to the capital city of Mataram downhill, where a population of 600,000 depends on these water supplies. However, degradation of water supplies and forest condition have been observed for more than a decade (1992-2002), during which 43 percent of the large springs surrounding Rinjani have dried up, and approximately 30 percent of the Rinjani area was deforested. A number of policy interventions have been designed to stop deforestation and forest degradation on Lombok Island. A payment for ecosystem services scheme was decided in 2003 to maintain environmental services with financial support from beneficiaries (legalizing the “beneficiary pays principle”). The PES scheme, which was finally initiated in 2009, allowed stakeholders to reach a comprehensive agreement that has the potential to generate financial resources and produce long-lasting environmental management (Pirard, 2012), and is an example of how possible forest-based payment schemes can work.

Chapter 3. Outcomes of Forest Ecosystem Valuation

3.1 Valuing the contribution of the 'provisioning services'

Section 3.1 describes the analysis of the economic value of provisioning services delivered by Indonesian forests, namely timber and NTFPs. The production, export and import of forest products have been considered, as well as the revenues the central and local governments earn from the forestry sector through taxation.

3.1.1 The significance of timber for Indonesia's economy

GDP from the forestry covers commodities like logs (at harvest stage), firewood, rattan, bamboo, and other forest products. According to a Indonesian National Statistics Agency (Badan Pusat Statistik – BPS) source on Supply and Use Tables (SUT), timber logs production constituted 79 percent of total supply of goods and services from the forestry industry, while non-timber forest products (NTFPs) and forestry services amounted to 19 percent and 2 percent, respectively.

The contribution of the forestry sector to Indonesia's GDP according to BPS is presented in the table below. As can be observed, although the GDP of the forestry sector has increased every year in absolute terms, the percentage contribution of the forestry sector to Indonesia's GDP is seen to be dwindling over the last 15 years.

Table 7: Contribution of forestry sector to Indonesia's GDP (Billion IDR) at current market prices, 2000-2014

Year	GDP from Forestry (Billion IDR)	Total GDP (Billion IDR)	Forestry GDP to Total GDP (%)
2000	16,343	1,389,770	1.18
2001	16,962	1,646,322	1.03
2002	17,602	1,821,833	0.97
2003	18,415	2,013,675	0.91
2004	20,290	2,295,826	0.88
2005	22,562	2,774,281	0.81
2006	30,066	3,339,217	0.90
2007	36,154	3,950,893	0.92
2008	40,375	4,948,688	0.82
2009	45,120	5,606,203	0.80
2010^{r}	58,126	6,864,133	0.85
2011	62,248	7,831,726	0.79
2012	65,882	8,615,705	0.76
2013*	69,599	9,524,737	0.73
2014**	74,618	10,542,694	0.71

Source: Data for 2000-2009 period taken from BPS (2014a), data for 2010-2014 period based on BPS unpublished data

*Note: r = GDP changed its based year (rebased) into 2010=100; * = preliminary figures; ** = very preliminary figures*

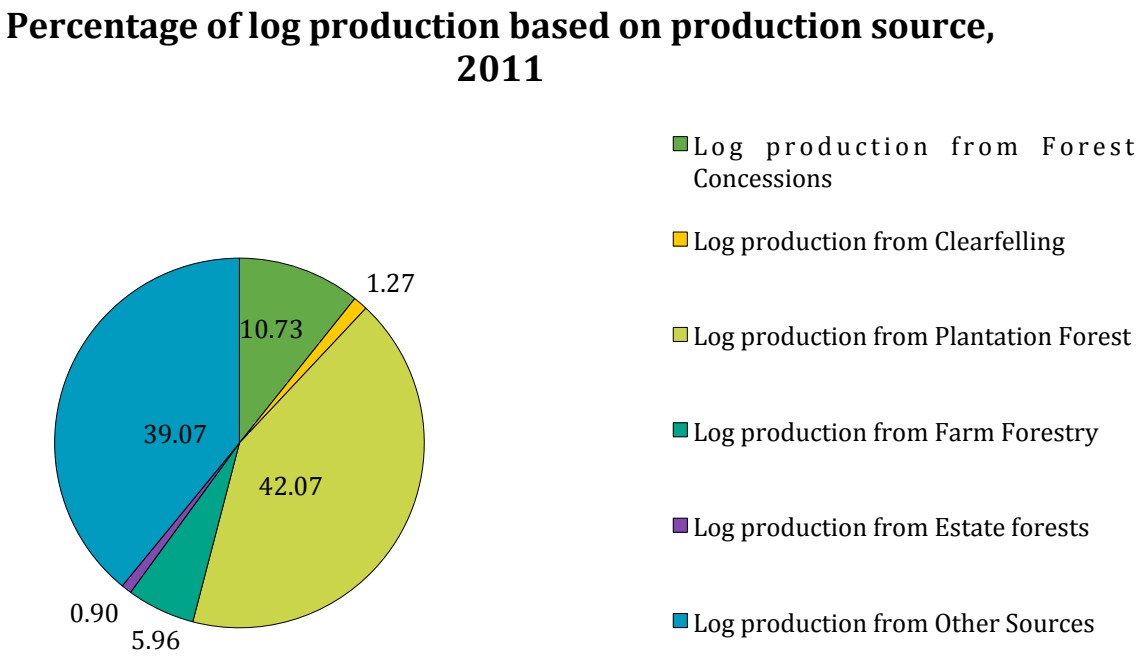
The wood processing industry

The wood processing industry, particularly timber production, has played a significant role in Indonesia's economic development. In the early 1970s, Indonesia emerged as the world's largest exporter of tropical logs, and the forestry sector became the country's second-largest source of GDP. The New Order regime issued concession rights on approximately 60 million hectares of forests to private and state-owned timber companies, in recognition of the potential of the wood processing industry for Indonesia's economic growth (Barr *et al.,* 2006). The subsequent massive production of logs fuelled the growth of wood processing and paper and pulp industries. By the late 1980s, production capacity of paper and pulp industries increased by 700 percent, making Indonesia the world's ninth largest pulp producer and eleventh largest paper producer (The Timber Mafia, 2002). However, this growth rate led to unsustainable production, since the wood supply needed to feed wood processing industries such as sawmills, plywood manufacturing plants, and pulp mills, is now substantially more than what can be produced from the country's legal forest and timber plantations. According to estimates, as a direct impact of the growth of wood processing industries annual deforestation increased from 300,000 ha/year in 1970 to 1,000,000 ha in 1990 (Sunderlin & Resosudamo, 1996).

The report "Wild Money: The Human Rights Consequences of Illegal Logging and Corruption in Indonesia's Forestry Sector" (Human Rights Watch, 2009) reported that Indonesia's timber processing industries, including pulp and paper, plywood and veneer consumed more than 50 million cubic meters of wood between 2003 and 2006, exceeding the legal wood supply by more than 30 million cubic meters.

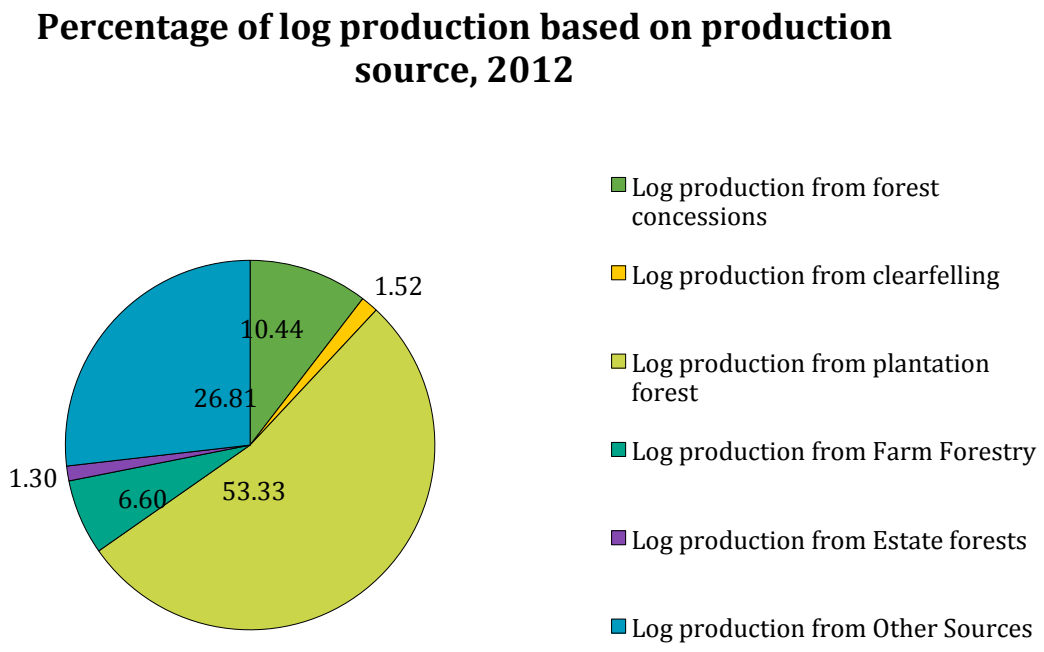
Data from the MoF provides a more recent estimate of the illegal supply of wood. The MoF records the total logs produced in Indonesia each year, derived from forest classifications categorising log production from forest concessions, clearfelling, plantation forests, farm forestry and estate forests. While examining the total log production of Indonesia in 2011 and 2012, another category listed as 'other sources' is not described in further detail. It appears that these 'other sources' refer to the gap between what has been produced according to the other five categories and what has been delivered to the processing industries, which includes logs from illegal sources that is not captured by the other five categories. As presented in figure 5 and figure 6, these 'other sources' have enormously contributed to the total log production in 2011 and 2012, adding up to 18,530,228 cubic meters and 13,208,597 cubic meters respectively. This MoF data points to the assumption that in 2011 and 2012 as much as 39.07 percent and 26.81 percent of Indonesia's total log production was derived from illegal sources. This would, however, be an underestimate, as it does not contain the estimate of logs that have been directly exported or used for local consumption. More accurately, it does not contain estimates of the portion of logs that have not been consumed by Indonesia's wood processing industries.

Figure 5: Percentage of logs produced based on production source, 2011



Source: Ministry of Forestry (2012).

Figure 6: Percentage of log produced based on production source, 2012



Source: Ministry of Forestry (2013).

Volume of timber production

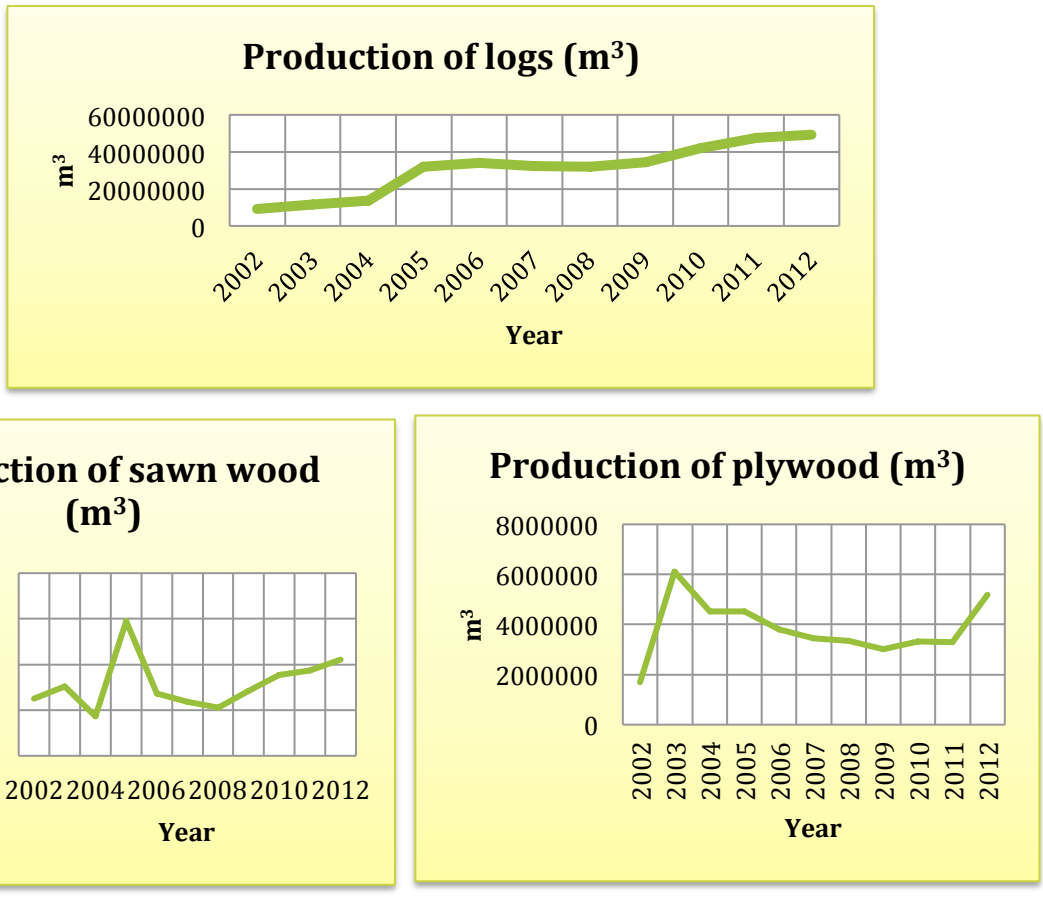
The BPS maintains a record of timber production in Indonesia in three categories: logs, sawn wood and plywood. The following table and figure show the production data together with the production trends of these timber categories between 2002 and 2012.

Table 8: Production of logs, sawn wood and plywood in Indonesia, 2002-2012

Year	Production of logs (m^3)	Production of sawn wood (m^3)	Production of plywood (m^3)	Total Production ($m^{3)}$
2002	9,004,105	623,495	1,694,405	11,322,005
2003	11,423,501	762,604	6,110,556	18,296,661
2004	13,548,938	432,967	4,514,392	18,496,297
2005	31,965,725	1,471,614	4,533,749	37,971,088
2006	34,092,484	679,247	3,811,794	38,583,525
2007	32,197,046	587,402	3,454,350	36,238,798
2008	32,000,786	530,688	3,353,479	35,884,953
2009	34,320,536	710,208	3,004,950	38,035,694
2010	42,114,770	885,425	3,324,889	46,325,084
2011	47,429,335	934,757	3,302,843	51,666,935
2012	49,258,255	1,053,408	5,178,252	55,489,915

Source: BPS (2013b)

Figure 7: Production trends of logs, sawn wood and plywood, 2002-2012



Source: Compiled by authors based on BPS data in Table 8

Figure 7 represents data points for production of logs, sawn wood and plywood for 11 years. These graphs show a sharp increase in production of logs and sawn wood in 2005, while the production of plywood peaked in 2003. The reasons for these spikes in production are not clear. In terms of plywood, a possible explanation is the log export ban enacted by the Ministry of Forestry in October 2001. Besides reducing illegal logging, one of the main reasons underlying the ban was to support the domestic wood processing industries, particularly plywood, which had to cope with rapidly increasing competition from China (Resosudarmo & Yusuf, 2006). A series of limitations on log exports applied in the 1980s, including an outright ban in 1985, led to a significant increase in domestic plywood production and exports (Brann, 2002). It seems, therefore, reasonable to assume that the same dynamics could have happened in the wake of the log export ban of 2001.

Methodology for valuing timber production

Timber is categorised as a provisioning service, thus, direct market prices are used to estimate its economic value (TEEB, 2010b).

Prices of logs, plywood and sawn wood are taken from the Tropical Timber Market (TTM) report published periodically by the International Tropical Timber Organization, which regularly collects, analyses and disseminates data on the production and trade of tropical timber. The following sections elaborate on the method used for estimating average domestic prices of the three categories of timber.

It is assumed that the domestic prices in the TTM report from various years are representative of the domestic prices existing in Indonesia in those years (Annex 1 contains prices for 2014). Furthermore, since the volume of different types of logs, sawn wood and plywood produced is not known, the average price of the different types of logs, sawn wood and plywood mentioned in the TTM report is calculated, as briefly explained below:

- *Logs*: Since the different categories of logs produced are not mentioned in the BPS statistics, the mean of the price range of different types of logs mentioned in the TTM report is taken, and then average of the mean is calculated. Types of logs considered are Face Logs, Core logs, Sawlogs (Meranti), Falcata logs, Rubberwood, Pine, and Mahoni (plantation mahogany).
- *Sawn wood*: The mean of the range of prices of different types of sawn wood with different dimensions is taken from the TTM report (Kampar and Keruing with different dimensions considered). The average of the mean is then calculated to determine the price.
- *Plywood*: A proportion of different dimensions of the plywood produced is not known. Hence, mean of the range of prices for different thicknesses of 9mm, 12mm, and 15mm is taken and the average price calculated.

Table 9: Example of calculation of price of logs, sawn wood and plywood, for the year 2014

Type of wood product	Price (USD) per m^3
Logs	[(220+220+170+107.5+130+140)/6]=164.6
Sawn wood	[(565+610+635+505+428)/5]= 548.6
Plywood	[(395+375+335)/3]= 368.3

Source: ITTO, TTM Report (June 2014)

Economic value of timber

The average prices for different years are multiplied with the respective volume of logs, sawn wood and plywood to obtain the yearly economic value of timber produced in Indonesia (in Indonesian Rupiah - IDR).

Table 10: Economic value of logs, sawn wood and plywood from year 2002 to 2012

Year	Particulars	Logs	Sawn wood	Plywood
2002	Volume produced (m^3)	9,004,105	623,495	1,694,405
	Price per unit (USD per m^3)	131	264	196
	Total Value for the year (USD)	**1,178,251,454**	**164,335,468**	**331,820,979**
2003	Volume produced (m^3)	11,423,501	762,604	6,110,556
	Price per unit (USD per m^3)	131	258	183
	Total Value for the year (USD)	**1,495,662,667**	**196,915,247**	**1,115,176,470**
2004	Volume produced (m^3)	13,548,938	432,967	4,514,392
	Price per unit (USD per m^3)	147	258	266
	Total Value for the year (USD)	**1,988,790,542**	**111,798,265**	**1,200,075,873**
2005	Volume produced (m^3)	31,965,725	1,471,614	4,533,749
	Price per unit (USD per m^3)	166	258	272
	Total Value for the year (USD)	**5,320,009,946**	**379,991,758**	**1,231,668,478**
2006	Volume produced (m^3)	34,092,484	679,247	3,811,794
	Price per unit (USD per m^3)	238	295	301
	Total Value for the year (USD)	**8,101,835,305**	**200,086,759**	**1,146,714,695**
2007	Volume produced (m^3)	32,197,046	587,402	3,454,350
	Price per unit (USD per m^3)	277	308	318
	Total Value for the year (USD)	**8,920,881,531**	**180,668,072**	**1,099,634,750**
2008	Volume produced (m^3)	32,000,786	530,688	3,353,479
	Price per unit (USD per m^3)	283	312	326
	Total Value for the year (USD)	**9,042,507,815**	**165,460,937**	**1,092,675,241**
2009	Volume produced (m^3)	34,320,536	710,208	3,004,950
	Price per unit (USD per m^3)	209	218	249
	Total Value for the year (USD)	**7,163,186,157**	**155,129,719**	**747,731,725**
2010	Volume produced (m^3)	42,114,770	885,425	3,324,889
	Price per unit (USD per m^3)	219	227	252
	Total Value for the year (USD)	**9,205,085,443**	**201,370,943**	**837,317,880**
2011	Volume produced (m^3)	47,429,335	934,757	3,302,843
	Price per unit (USD per m^3)	243	242	272
	Total Value for the year (USD)	**11,545,655,263**	**226,144,426**	**899,474,244**
2012	Volume produced (m^3)	49,258,255	1,053,408	5,178,252
	Price per unit (USD per m^3)	250	247	289
	Total Value for the year (USD)	**12,296,971,516**	**259,966,046**	**1,495,651,786**

Source: Calculated by authors based on data from BPS as provided in table 8 and ITTO-TTM reports (various years)

The total value of timber produced annually in Indonesia is obtained through adding the monetary values of logs, sawn wood and plywood. As shown in the figures presented in Table 10, the production of timber in Indonesia grew dramatically in the period of 2002-2012, with an increase of 390 percent in the volume of wood produced within that period. As the price of timber rose during the same period, the total yearly value of logs, sawn wood and plywood produced increased by 739 percent.

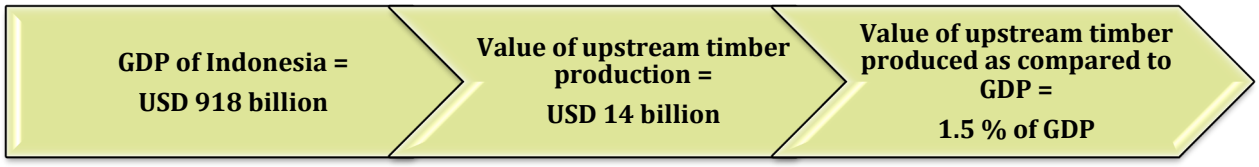
Table 11: Total value of timber produced from year 2002 to 2012

Total value of timber produced	
Year	Value in USD
2002	1,674,407,901
2003	2,807,754,384
2004	3,300,664,680
2005	6,931,670,183
2006	9,448,636,759
2007	10,201,184,353
2008	10,300,643,993
2009	8,066,047,600
2010	10,243,774,266
2011	12,671,273,932
2012	14,052,589,348

Source: Compiled by authors based on data displayed in Table 10

The values in Table 11 show that timber production in Indonesia plays an important part in the economy. Figure 8 helps to understand the significance of the timber industry to the economy of Indonesia and gives a sense of the scale by comparing the values of the three timber products to the GDP of Indonesia in 2012.

Figure 8: Importance of timber products to the economy of Indonesia, 2012



Source: Compiled by authors based on Table 7 and Table 11. The World Bank exchange rate for 2012 has been used to convert the value of GDP from IDR to USD.

In 2012, Indonesia's GDP was approximately USD 918 billion and the value of timber produced was USD 14 billion, which compares to about 1.5 percent of the GDP. This figure is twofold larger than the percentage contribution of the forestry sector to Indonesia's GDP provided in Table 7. The reason for this difference is due to the fact that different types of products have been considered at different stages of production and the methodologies used for calculating the prices of these products are different. However, even the larger estimate is likely to be a substantial understatement, mainly due to two reasons. Firstly, the value of timber has only been calculated for the upstream harvesting industry, and the multiplier effect that the timber industry has on the downstream manufacturing industries – such as paper and pulp and furniture - has not been accounted for. These industries create a significant additional value and provide employment to a large number of people in addition to the workers employed in the harvesting sector, for which the

economic value is already captured. Secondly, the value of timber produced is calculated only for the wood produced as recorded by BPS. The value would be much higher if all timber production was calculated, as illegal timber can account for about 40 percent to 80 percent of all log production, as mentioned earlier. Therefore, it is assumed that the contribution of the timber industry to Indonesia's economy is significantly higher than what is recorded.

Export and import of timber

Towards the end of the 1960s and early 1970s Indonesia became a major exporter of raw materials, including timber logs. Forests were seen as valuable assets to fuel economic growth because wood was abundantly available and required minimum infrastructure for production. In the period between 1978 and 1980 Indonesia was the world's largest exporter of tropical hardwood logs, reaching an export volume of 20 million cubic meters in 1980 (Hasan, 2015). However, in the following decades Indonesia transitioned from exporting timber logs and sawn wood to more value-added wood-based products, such as plywood, pulp and paper, and furniture. China, Japan, the E.U. and the U.S. are the main destinations for timber-sector exports, and China, Japan and South Korea for the paper sector (Hoare & Wellesley, 2014).

This shift can be mainly attributed to measures taken by the Government of Indonesia, including the 2001 ban on the export of logs and the 2003 ban on the export of sawn timber (barring certain types of sawn timber) (Lawson, 2014). However, government restrictions and bans have not stopped illegal trade of wood products across national borders. On the contrary, such measures could encourage illegal trade, as the price increase from reduced supply from legal sources makes illegal trading more lucrative (Telapak & Environmental Investigation Agency, 2005).

Various countries such as China, Malaysia, Singapore, and India still claim to import logs that originate from Indonesia. In 2013, the total reported import value of Indonesian logs was USD 8 million (Hoare & Wellesley, 2014). According to Lawson (2014), due to the export ban and the major discrepancies between recorded imports of sawn timber in destination countries and exports from Indonesia, 90 percent of all sawn timber imports from Indonesia since 2003 were illegal.

Table 12 details the volume and values of exports and imports of wood products between 2003 and 2013 in Indonesia. Exports and imports of wood products listed below contain broad categories of products, including plywood, pulp, paper, books and many others, with a small fraction of rattan and bamboo products also included. An exhaustive list of the products considered in the valuation of wood product exports is mentioned in Annex 2.

Table 12: Export and import data of all wood products, 2003-2013

Year	Export wood products (Quantity - kg)	Export wood products (Value - USD)	Import wood products (Quantity - kg)	Import wood products (Value - USD)
2003	11,448,481,591	6,050,342,109	3,259,611,269	1,113,774,365
2004	10,171,336,875	6,160,599,809	3,808,158,958	1,451,408,867
2005	10,670,225,971	6,433,133,321	3,637,403,864	1,489,343,221
2006	12,194,861,735	8,078,838,133	3,906,452,687	1,615,357,545
2007	10,480,090,764	7,634,590,186	4,134,344,909	1,950,248,210
2008	9,749,160,945	8,156,188,987	4,540,833,870	2,866,849,287
2009	9,415,189,641	6,654,894,680	4,481,395,785	2,124,507,479
2010	11,049,206,550	8,688,021,188	4,935,248,260	3,063,677,974
2011	11,580,268,226	9,202,177,019	5,160,802,648	3,676,349,327
2012	11,916,374,193	9,050,160,115	5,274,615,376	3,422,226,181
2013	13,150,982,775	9,358,960,869	5,681,690,443	3,597,104,977

Source: Compiled by authors based on BPS (2015)

Note: The amount of wood products imported and exported is reported in kilograms in both the official sources of the government of Indonesia - BPS and the Ministry of Forestry – that were used throughout the report, and we were not able to find data expressed in other units. As a consequence, it is difficult to compare this data with production data of timber products, which are expressed in cubic meters.

Although the economic values can be compared, it is difficult to explain the relation between timber production and wood product export using this data alone. For instance, from 2005 onwards the value of wood products exported is on average about 80 percent the value of logs, plywood and sawn wood produced, whereas for the years 2003 and 2004 the ratio is 200 percent. The value addition made to timber products along the wood processing chain before export could be considered as a possible explanation of higher value of exports against the value of production, but it was not possible to validate this hypothesis with the available data. Likewise, due to lack of suitable data, it was not possible to find a reasonable explanation for the trend indicated in the ratio between exports and production of wood products over the period considered.

Surprisingly, despite the abundance of timber, the import of wood products in Indonesia has grown gradually. From 2003 to 2013 the import volume increased by 74 percent, and from 2010 onwards the import value of wood products was almost 40 percent of the export value. The reasons underlying the steady increase in wood products import are at least twofold.

Firstly, the items representing a major proportion of the import value are pulp and paper. For instance, in 2013 paper and pulp made up 87 percent of the import value of wood products. As highlighted in this report, the paper and pulp industry was given a huge push under the New Order regime, and the amount of wood needed to fulfil the current production capacity cannot be supplied by national production alone.

Secondly, 11 percent of total wood imports are made up of timber products, primarily sawn wood and particle board, which are commonly used in the manufacturing of various furniture items. Growing consumerism and improved standards of living in Indonesia can be attributed to the rise in demand for furniture products. This growth of demand, particularly in exotic wood and wood products can also be seen in the affluent society of Indonesia. According to The American Hardwood Export Council (AHEC), between 2008 and 2010 Indonesia purchased as much as USD 18 million worth of American hardwood sawn lumber

and USD 8 million of American hardwood logs. The American hardwood sawn lumber and logs are used for flooring and other uses such as doors and picture frames, and quite a large quantity is re-exported as finished products (Buckley, 2011).

As for the export of wood products, in 1990 forest commodities were ranked second after oil and gas with respect to foreign exchange earnings, while in 1997 wood products accounted to almost 18 percent of the total export revenue in Indonesia (EC- FAO, 2002). While the value of wood product exports has continued to rise during the period of 2003-2013, its value in relation to other non–oil and gas exports has decreased substantially. As shown in table 13, the export share of wood products has halved since 2003. However, as stated earlier, these numbers only represent the legal recorded exports and it must be noted that a large percentage of total wood exports are derived from illegal sources.

Rather than banning the exports of logs and sawn timber, a more effective way to stop illegal logging would be to strengthen control over the sources of wood products in the markets where they are exported, such as banning unverified products. For example, on the 30th of September 2013, Indonesia and the European Union signed a landmark Voluntary Partnership Agreement stipulating that only verified legal timber and timber-derived products could be exported to the EU (Global Business Guide Indonesia, 2013). This is expected to boost the sustainable timber industry and discourage illegal trade to a certain extent.

Table 13: Share of wood products in total exports of Indonesia, 2003-2012

Year	Export data (USD)		
	Total non-oil and gas exports	**Wood products exports**	**Percentage Share**
2003	47,406,800,000	6,033,695,110	**12.7**
2004	55,939,300,000	6,160,599,809	**11.0**
2005	66,428,400,000	6,433,133,321	**9.7**
2006	79,589,100,000	8,078,838,133	**10.2**
2007	92,012,300,000	7,634,590,186	**8.3**
2008	107,894,200,000	8,156,188,987	**7.6**
2009	97,491,700,000	6,654,894,680	**6.8**
2010	129,739,500,000	8,688,021,188	**6.7**
2011	162,019,600,000	9,202,177,019	**5.7**
2012	153,043,000,000	9,050,160,115	**5.9**

Source: Compiled by authors based on BPS (2015)

3.1.2 Value of Non-Timber Forest Products

Apart from timber, forests provide a diverse variety of non-timber forest products. The Centre for International Forestry Research (CIFOR) defines non-timber forest products as any product or service other than timber that is produced in forests. They include fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences, and a range of barks and fibres such as bamboo, rattan, and a host of other palms and grasses (CIFOR, 2015). Indonesia's tropical forests, some of the most biologically diverse in the world, produce a large variety of non-timber forest products. Even though NTFPs also include fish and game by definition, they have not been accounted for in this report. Only major plant origin products have been taken into consideration.

The following list presents some of the main groups of NTFPs in Indonesia.

- Resins, Rattan, Essential oils, Honey, Fruits, Medicinal plants (Jamu), Gaharu (Agarwood), Bamboo and Dyes

A large part of the rural population in Indonesia depends on one or more of these NTFPs for sustenance and livelihoods. However, the degree of dependency on NTFPs within Indonesia's rural population differs greatly from region to region. The dependence on NTFPs also varies from village to village, since factors such as the types and availability of NTFPs, local culture, religion, and economic status can vary significantly across different geographical contexts. For example, villages located next to rivers may be more dependent on coconut tree products, whereas villages within forests would be more dependent on products such as rattan and resins. In recent years the importance of NTFPs is increasingly recognized, as a result of the greater awareness of their role in providing a source of sustenance and employment, preserving biodiversity, and fostering the sustainable management of forests.

Various studies demonstrate the importance of forests, forest services, and NTFPs for the livelihoods of poor rural communities. The paper "Environmental Income and Rural Livelihoods: A Global-Comparative Analysis" (Angelsen *et al.,* 2014) presents the results from a comparative analysis of environmental incomes from approximately 8,000 households located in 333 villages in 24 developing countries. The analysis was carried out through primary surveys by research partners in CIFOR's Poverty Environment Network (PEN). The findings of the study show that the average share of income derived from natural forests services and NTFPs is as high as 21.1 percent globally, and 18.4 percent in Asia. Although this can already be considered as a significant contribution, other studies report higher percentage share. The Economics of Ecosystems and Biodiversity's report *National and International Policy Making* (2011), for instance, highlights that the share of ecosystem services and non-market goods of the total income of the poor in Brazil, Indonesia and India, is approximately 89.9 percent, 74.6 percent, and 46.6 percent, respectively.

In terms of Indonesia, further data can be found in the report 'Indonesian Green Economy Model (I-GEM)' (Sukhdev *et al.,* 2014). This report is part of the United Nations Development Programme's 'Low Emissions Capacity Building' (LECB) project, which provides Indonesia with the Indonesian Green Economy Model, a system dynamic simulation model to support the country's reduction targets on greenhouse gas emissions. I-GEM employs three outcome indicators, namely Green GDP, Decent Green Jobs and GDP of the Poor. The GDP of the Poor indicator measures ecosystem-based cash and non-cash incomes of forest-dependent households with the purpose to better understand the value of ecosystem services to rural livelihoods. An initial assessment was undertaken in Central Kalimantan province to determine the extent of rural dependency on natural resources through a survey involving 119 forest-dependent poor households across six districts. The results of the initial assessment show that the share of income based on forest ecosystem services and NTFPs ranges from 34 percent to 86 percent of total household income, depending on the type of village. On average, the percentage of income derived from ecosystem services across all households is 76 percent.

The figures cited above show a significant variation on the dependency of the rural poor on forest ecosystem services. This difference can be attributed to a number of reasons, such as the methodology employed and what sources of income have or have not been included in the studies. In addition, the dependency of rural households on forest ecosystem services strongly correlates with local geographical, environmental and socio-economic features. Notwithstanding the variation in findings, all of the studies mentioned above highlight the significant role of NTFPs and other forest ecosystem services to the livelihoods and sustenance of the rural poor. However, this economic contribution is often overlooked by traditional economic indicators, such as the standard GDP.

Volume of NTFP production

To a great extent, NTFPs are consumed at the household level and traded in local markets. Consequently, it is difficult to both keep records of NTFPs production and to calculate the economic value of these products, as the NTFPs used for self-consumption are not priced and the price of the ones sold in local markets differ from village to village.

The data provided in Table 14 and Table 15 lists 19 major NTFPs produced in Indonesia from the year 2000 to 2012 according to the Ministry of Forestry. Bamboo and cajuput oil are considered separately, as they are expressed in units other than ton.

Table 14: Production data of major NTFPs of Indonesia, 2000- 2006

Commodity	Unit	2000	2001	2002	2003	2004	2005	2006
Rattan	Ton	94,752	23,836	17,779	127,295	1,880,503	221,381	24,554
Gondorukem (Pine Sap)	Ton	-	580	-	4,592	38,435	27,098	3,210
Resin	Ton	3,342	2,921	1,131	4,401	2,722,866	9,131	11,087
Sago	Ton	114	-	-	-	-	-	-
Turpentin	Ton	-	-	-	544	7,684	36,958	5,152
Copal	Ton	647	428	442	442	318	320	149
Sap	Ton	-	-	-	-	87,170	45,465	556
Charcoal	Ton	-	-	-	-	5,057,390	33,117	-
Gaharu (Agarwood)	Ton		-	-	-	6,175	231	668
Kemedangan	Ton	-	-	-	12	394	4,424	252
Honey	Ton	1,995	2,112	1,932	1,949	3,841	1,568	1,421
Cocoon	Ton	309	455	317	430	319	418	339
Silk Yarn	Ton	71	110	91	89	55	69	14
Cendana	Ton	-	-	-	-	-	-	-
Gum resin	Ton	-	-	-	-	-	-	-
Nibung	Ton	-	-	-	-	-	-	-
Gambir	Ton	-	-	-	-	-	-	-
Total	**Ton**	**101,230**	**30,442**	**21,692**	**139,754**	**9,805,150**	**380,180**	**47,402**

Commodity	Unit	2000	2001	2002	2003	2004	2005	2006
Bamboo	Rod	-	-	-	-	-	-	-
Cajuput Oil	Liter	-	-	27,925	28,138	31,978	275,192	20,010

Source: Ministry of Forestry (multiple years)

Table 15: Production data of major NTFPs of Indonesia, 2006- 2012

Commodity	Unit	2007	2008	2009	2010	2011	2012
Rattan	Ton	3,153	132,579	78,910	-	81,690	6,950
Gondorukem (Pine Sap)	Ton	850	-	56,817	-	118,352	186,117
Resin	Ton	648	24,867	1,612	-	6,539	206,807
Sago	Ton	-	-	-	-	2,600,000	444,994
Turpentin	Ton	-	-	12,147	-	-	-
Copal	Ton	-	-	-	-	-	-
Sap	Ton	-	144	1,545	-	-	-
Charcoal	Ton	-	-	-	-	-	-
Gaharu (Agarwood)	Ton	-	-	714	-	964	358
Kemedangan	Ton	1,350	-	-	-	-	-
Honey	Ton	-	-	1,932	-	43	10,800
Cocoon	Ton	470	273	232	-	-	-
Silk Yarn	Ton	-	-	19	-	-	-
Cendana	Ton	-	-	-	-	-	168,556
Gum resin	Ton	-	-	-	-	7,166	168,556
Nibung	Ton	-	-	-	-	-	1,140
Gambir	Ton	-	-	-	-	-	7,250
Total	**Ton**	**6,471**	**157,863**	**153,928**	**-**	**2,814,754**	**1,201,528**

Commodity	Unit	2007	2008	2009	2010	2011	2012
Bamboo	Rod	-	-	-		982,800	77,310,783
Cajuput Oil	Liter	324,019	-	74,333	-	20,500	253,986

Source: Ministry of Forestry (multiple years)

Note: The MoF keeps record of only a small part of the NTFPs produced by forests, and many data gaps exist for those recorded. However, this list corresponds to the best available data of NTFP production at the national level.

The data provided above has to be considered as a coarse representation of NTFP production in Indonesia because of a lack of information for many products and various years. The huge fluctuation seen in the data seems also to suggest caution about their reliability. On the other hand, a certain degree of variation is expected in the production of NTFPs, as it usually depends on the collectors' time availability, harvest possibilities and market demand.

Production of medicinal plants

Medicinal plants are an important category of NTFPs to the Indonesian economy and society. It is estimated that around 2,000 species of plants in Indonesia are used for medicinal purposes. For instance, the Agricultural University of Bogor (IPB) has documented 2,039 species until 2001, while the Ministry of Health estimates that 1,889 species of medicinal plants existed in Indonesia in 2012, providing the raw materials for 1,183 traditional medicinal products (Aditama, 2015).

In Indonesia, the use of traditional medicinal plants is known as *Jamu*, which directly translates to 'the traditional medicine from plants' (Elfahmi *et al.,* 2006). Traditional medicinal plants are used for preventing or curing a range of diseases, including but not limited to obesity, anemia and iron deficiency, osteoarthritis, and hepatitis. Moreover, they are also extensively used in the cosmetic industry (Aditama, 2015). According to the following table, as of 2011 the *Jamu* industry contributed more than USD 1 billion worth of products.

Table 16: Yearly turnover of Jamu, 2006-2011

Jamu Turnover		
Jamu	Trillion IDR	Million USD
2006	5	559
2007	6	618
2008	7.2	786
2009	8.5	930
2010	10	1,031
2011	11	1,059

Source: Saerang

The BPS keeps the production records of 13 widely used medicinal plants of Indonesia. The short list presented in Table 17 and Table 18 are in no way a depiction of the volume of medicinal plants produced, but it helps paint a picture of the rising demand for these plants.

Table 17: Production of medicinal plants in Indonesia, 2001-2013 (ton)

Year	Ginger	Galanga	East Indian Galangal	Tumeric	Zingiber Aromaticum	Java Tumeric	Black Tumeric
	Ton						
2001	128,437	26,154	11,112	27,195	4,794	6,089	1,663
2002	118,496	27,934	12,848	23,993	4,531	7,174	3,040
2003	125,386	24,588	19,527	30,707	4,684	11,762	4,490
2004	109,296	27,244	25,370	46,207	7,091	17,669	7,067
2005	125,827	36,293	35,478	82,107	8,897	22,582	7,725
2006	177,138	44,370	47,081	112,898	5,773	21,359	5,607
2007	178,503	41,619	48,367	117,464	6,308	40,801	8,186
2008	154,964	50,093	38,531	111,259	7,621	23,740	8,817
2009	122,181	59,332	43,635	124,047	8,804	36,826	7,584
2010	107,735	58,962	29,638	107,375	8,520	26,671	7,141
2011	94,743	57,701	34,017	84,803	8,717	24,106	7,921
2012	114,538	58,186	42,626	96,979	7,236	44,085	6,113
2013	155,286	69,730	41,343	120,726	11,408	35,665	9,584

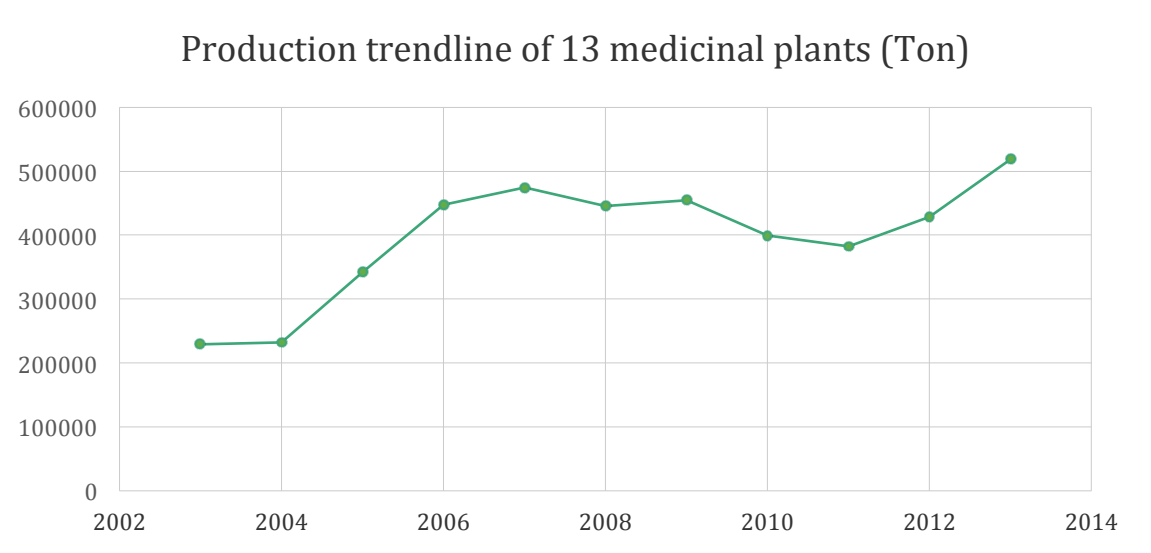
Source: BPS (2011 & 2014b)

Table 18: Production of medicinal plants in Indonesia, 2001-2013 (ton) (continued)

Year	Verbenaceae	Sweet Root (Calamus)	Java Cardamon	Indian Mulberry	King of Bitter	Chinese Keys
	Tonne					
2001	678	114	1,929	-	-	-
2002	611	366	3,539	-	-	-
2003	711	495	3,563	1,910	231	655
2004	660	335	4,833	4,733	670	1,732
2005	1,348	418	7,179	9,821	2,151	2,563
2006	1,903	610	13,144	12,984	2,656	2,035
2007	870	508	14,527	14,016	1,299	2,446
2008	1,202	687	21,231	16,306	7,716	3,097
2009	944	1,075	25,179	16,267	4,335	4,702
2010	1,139	755	28,550	14,613	3,845	4,358
2011	949	612	47,231	14,412	3,286	3,952
2012	834	526	42,973	8,968	965	4,307
2013	964	634	54,171	8,432	2,257	8,829

Source: BPS (2011 & 2014b)

Figure 9: Production trend line of 13 medicinal plants, 2003 to 2013



Source: Calculated by authors based on Table 17 and Table 18

Note: Due to unavailability of data for certain products for the years 2001 and 2002, data from 2003 to 2013 has been considered.

It can be observed that the production volume of medicinal plants increased by 126 percent, albeit inconsistently: the years 2005 and 2006 saw the highest increases of 47 percent and 30 percent from the previous year, respectively, whereas 2010 experienced a decrease of 12 percent in the total production from the previous year.

Export and import of NTFPs

Table 19 and Table 20 present the export value and volume of major NTFPs from 2001 to 2013 in three-year successions.

Table 19: Export volume of major NTFPs in Indonesia, of alternative years starting from 2001 to 2013 (kilograms)

Particulars	2001	2003	2005	2007	2009	2011	2013
Crumb rubber	-	1,584,800	1,674,700	2,097,100	1,872,800	2,435,600	-
Rattan products	43,502,915	55,406,105	29,776,284	40,225,823	32,278,850	54,868,973	-
Bamboo products	2,620,718	4,463,213	8,996,237	32,636,432	7,321,783	11,759,409	-
Essential oils	5,399,465	3,609,611	4,666,999	4,841,988	4,589,198	4,359,431	4,358,017
Plant Gums	11,734	12,761	14,678	15,315	14,069	22,099	
Organic pigments, non-synthetic	690,318	295,693	-	632,285	-	-	-
Cannabis resin	-	-	-	-	1,681	949	346,688
Vegetable tanning materials, non-synthetic	6,715,504	6,661,096	-	16,509,474	-	-	-
Export natural latex	1,469,303	658,020	-	8,546,532	-	-	-
Gambier	10,673,855	3,631,460	7,202,672	13,583,700	18,297,700	13,338,341	15,671,106
Sandalwood	372,561	171,111	175,893	889,246	220,602	65,904	19,713
Insect products	-	-	-	-	-	893	5,913
Total	71,456,373	76,493,870	52,507,463	119,977,895	64,596,683	86,851,599	20,401,437

Source: Compiled by authors based on BPS data (multiple years)

Table 20: Export value of major NTFPs in Indonesia, of alternative years starting from 2001 to 2013 (FOB value, USD)

Particulars	2001	2003	2005	2007	2009	2011	2013
Crumb rubber		1,402,400	2,133,400	4,243,200	3,050,400	11,209,300	-
Rattan products	69,856,969	66,470,140	40,143,144	54,560,898	163,847,991	42,736,816	-
Bamboo products	1,231,506	1,885,934	12,250,712	32,634,854	10,861,352	5,138,960	-
Essential oils	53,984,028	43,190,230	64,122,772	100,923,275	90,648,424	161,025,709	123,047,947
Plant Gums	5,418,669	6,837,615	9,971,057	12,276,271	11,004,358	21,418,192	-
Organic pigments, non-synthetic	1,566,383	691,607	-	3,398,133		-	-
Cannabis resin	-	-	-		8,594	6,748	404,159
Vegetable tanning materials, non-synthetic	7,361,039	10,799,213	-	33,630,444	-	-	-
Export natural latex	1,501,417	1,042,354	-	14,691,418	-	-	-
Gambier	17,235,189	4,159,844	13,478,885	22,871,209	38,038,766	30,020,528	34,847,421
Sandalwood	146,285	60,834	178,339	387,809	110,860	71,231	64,417
Insect products	-	-	-	-	-	19,575	178,997
Total Value	158,301,485	136,540,171	142,278,309	279,617,511	317,570,745	271,647,059	158,542,941

Source: Compiled by authors based on BPS data (multiple years)

Note: The data provided above, despite being the best available, has to be taken with caution since it shows many gaps and very wide unexplained fluctuations over the period considered.

From the export value table of major NTFPs we can see that rattan and essential oils provide the largest values. However, the two products present different trends, with the value derived from rattan export showing an overall decline over the years and the value obtained from export of essential oils being on the rise.

According to the report "*Rattan: The decline of a once-important non-timber forest product in Indonesia"* (Meijaard *et al.,* 2014) there are three main reasons for the decline of the rattan industry in Indonesia. Firstly, farmers prefer to invest their time and energy into more lucrative cash crops such as rubber and oil palm, rather than gathering low-priced rattan. Secondly, Indonesian exports are becoming relatively expensive due to the increasing value of the Rupiah as compared to the more stable Chinese Yuan. Thirdly, overseas demand for rattan has been declining since the 2008 economic crisis, with consumers opting for cheaper alternatives such as synthetics and Lloyd Loom.

As for essential oils, around 40 different kinds are produced in Indonesia, with 12 being commercially produced at an industrial scale (TRECYDA, 2011). Indonesia is the world's biggest producer of patchouli, nutmeg, clove leaf, cajeput, cananga, massoia, keffir lime, and cubeb oils.

One of the reasons for the growth in Indonesia's essential oil industry is the attractiveness of essential oils as traded commodities. They are low volume and high value products, easy to plant, maintain, harvest, process and transport. Another reason underlying the growth of essential oil production is the competitive

labour costs in Indonesia, especially given the labour-intensive process of essential oil production (Tekriwal, 2009). To add to this, essential oils are mainly used in high-growth, fast-moving consumer good sectors like fragrance, medicine and the culinary industries. For instance, the cosmetic industry in Indonesia grew by 12 percent in 2012 (EIBD, 2014). Similarly, the aromatherapy industry has also grown substantially in the last decade, thereby adding to the demand for essential oils.

Table 21 and Table 22 present the import value and volume of major NTFPs from 2001 to 2013. As for the case of export, data has been provided at three year successions.

Table 21: Import volume of major NTFPs in Indonesia, of alternative years starting from 2001 to 2013 (kilograms)

Particulars	2001	2003	2005	2007	2009	2011	2013
Rattan products	29,013	101,118	756,150	926,364	155,113	32,399	17,475
Bamboo products	206,155	274,932	328,988	201,796	1,030,007	1,038,262	1,070,016
Essential oils	1,592,590	1,424,757	2,663,517	3,419,696	4,606,992	6,566,451	7,559,273
Plant Gums	475,204	721,866	1,476,622	338,083	1,351,074	1,670,267	1,795,976
Cannabis resin	-	-	-	-	15,010	27	499
Vegetable tanning materials, non-synthetic	995,643	2,622,434	2,182,254	930,462	1,112,738	71,176	41,911
Natural latex	6,333,620	8,565,162	4,779,014	8,148,055	10,932,972	9,970,694	17,208,149
Gambier	-	362	13,834	328,797	107,388	2,730	1,006
Sandalwood	-	-	-	-	-	-	-
Insect products	-	-	-	-	1,474	11,000	3,653
Total	9,632,225	13,710,631	12,200,379	14,293,253	19,312,768	19,363,006	27,697,958

Source: Compiled by authors based on BPS data (multiple years)

Table 22: Import value of major NTFPs in Indonesia, of alternative years starting from 2001 to 2013 (FOB value, USD)

Particulars	2001	2003	2005	2007	2009	2011	2013
Rattan products	79,140	237,205	865,119	2,275,883	313,755	114,700	148,866
Bamboo products	190,926	259,247	505,430	222,787	1,350,687	1,063,423	1,030,251
Essential oils	7,438,078	8,627,605	13,443,525	18,352,806	30,125,304	57,872,317	137,455,098
Plant Gums	654,200	1,058,048	3,969,453	968,975	2,110,854	4,344,497	5,071,975
Cannabis resin	-	-	-	-	17,170	611	24,972
Vegetable tanning materials, non-synthetic	1,426,996	4,066,769	824,401	562,175	1,813,587	295,262	237,982
Natural latex	4,344,211	6,119,194	4,331,750	11,279,700	14,603,311	32,062,134	32,927,264
Gambier	-	3947	10,707	59,318	143,591	11,583	3,572
Sandalwood	-	-	-	-	-	-	-
Insect products	-	-	-	-	28,967	59,102	33,753
Total	14133551	20,372,015	23,950,385	33,721,644	50,507,226	95,823,629	176,933,733

Source: Compiled by authors based on BPS data (multiple years)

3.1.3 Value of Taxes from the Forestry Sector

As stated throughout this report, forests provide an important source of revenue to Indonesia's GDP. According to 'Domestic timber market dynamics in Indonesia', in 2010, forestry taxes contributed 0.28 percent to total tax revenue in Indonesia (Simangunsong, 2013). This percentage only represents taxes collected from forest concessions given out to lumber companies. If downstream taxes were to be added, including taxes paid by plywood and paper and pulp companies, the percentage would be substantially larger.

The following outlines the three major types of taxes that were collected from forest concessionaires during the New Order period:

- **HPH License Fee** (IHPH - Iuran Hak Pengusahaan Hutan) – This is a fee that has to be paid once, when the timber contract is issued.
- **Forest Resource Rent Provision** (PSDH - Provisi Sumber Daya Hutan) – This is a volume-based fee charged on each cubic meter of timber harvested. The fee is a percentage of the price per cubic meter of timber, set biannually by the Ministry of Industry and Trade.
- **Reforestation Fund** (DR - Dana Reboisasi) – This is also a volume-based fee on each cubic meter of timber harvested and is meant to support rehabilitation and reforestation activities. The fee amount varies according to the type, grade and location of wood harvested. The fees are collected and managed through a separate fund.

A 'Forest village community development fee' was also levied on timber concession-holders after 1995 (Barr *et al*., 2006). Under the New Order government, most of the taxes and royalties produced from timber extraction were withheld by the central government. However, following the fall of the regime, provincial and regional governments asked for a larger share of the taxes and royalties to be redistributed back to the provinces, where most of the timber and timber products are produced, to help fuel regional development. A general framework for the redistribution of revenues between Indonesia's central and regional governments was established following the enactments of Law 25/1999 on Fiscal Balancing and Law 22/1999 on Regional Governance. Law 25/1999 delineated how petroleum, timber, and mining royalties are to be divided and redistributed among Indonesia's national, provincial, and district governments under a more decentralised regime (Barr *et al.,* 2006).

Table 23 and Table 24 break down the redistribution of forestry concession taxes before and after decentralisation. Initially, the central government withheld 30 percent of IHPH (HPH License Fee) and 55 percent of PSDH (Forest Resource Rent Provision), both of which were reduced to 20 percent following the enactment of Law 25/1999.

Table 23: Revenue sharing among central, provincial, and district/municipality governments prior to 1999 decentralisation and fiscal balancing laws (percentage)

Revenue Source	Central Government	Provincial Government	District or Municipality
Forestry: IHPH	30	56	14
Forestry: PSDH	55	30	15

Source: Barr *et al.* (2006)

Table 24: Revenue sharing among central, provincial, and district/municipality governments under Law 25/1999 on fiscal balancing and its implementing regulation (percentage)

Revenue Source	Central Government	Provincial Government	Originating District or Municipality	Other Districts and Municipalities in the Same Province	All Districts and Municipalities in Indonesia
Forestry: IHPH	20	16	64	0	0
Forestry: PSDH	20	16	32	32	0

Source: Resosudarmo & Yusuf (2006)

Table 25: Taxes collected from the forestry concessions of Indonesia (1)

Year	License fees and log royalties (IHPH + PSDH/IHH) IDR (million)	Reforestation fund(DR) IDR (million)	Total IDR (million)	Total USD (million)
1993/94	405,340	996,257	1,401,597	665.55
1994/95	511,660	1,069,703	1,581,363	724.12
1996/97	614,402	1,233,185	1,847,587	810.14
1997/98	642,835	1,253,783	1,896,618	800.88
1998/99	837,114	1,844,077	2,681,191	578.15
2001	1,772,800	3,066,010	4,838,810	471.35
2002	1,593,980	2,741,370	4,335,350	468.12
2003	731,850	1,331,730	2,063,580	240.75
2004	1,301,830	2,829,600	4,131,430	462.12

Source: Barr *et al.* (2006)

Table 26: Taxes collected from the forestry concessions of Indonesia (2)

Year	Government forest revenues (Billion IDR)					Total USD
	Forest concession license fee (IHPH)	Permits forest concessions (IHPHTI)	Forest products royalty (IHH/PSD)	Reforestation fee (DR/DJR)	Total	
2000	47	1	846	1868	2762	327,959,173
2001	47	1	891	2258	3197	311,572,628
2002	4	0	804	1902	2710	291,047,653
2003	1	0	747	1856	2604	303,598,057
2004	82	0	913	2374	3369	376,894,119
2005	42	0	654	2538	3234	333,239,221
2006	111	0	561	1732	2404	262,464,899
2007	68	0	670	1368	2106	230,390,548
2008	68	0	618	1643	2329	240,128,839
2009	74	0	674	1455	2203	212,032,023
2010	272	0	797	1721	2790	306,916,174

Source: Simangunsong (2013). USD equivalent calculated by authors based on exchange rate of respective year provided by World Bank.

Table 25 and Table 26 present the data regarding the amount of forest tax revenue collected by the government from different types of concessions. These tables have slightly different estimates and hence have not been merged into one. According to Simangunsong (2013), total forestry taxes collected in 2010 amounted to IDR 2.7 trillion.

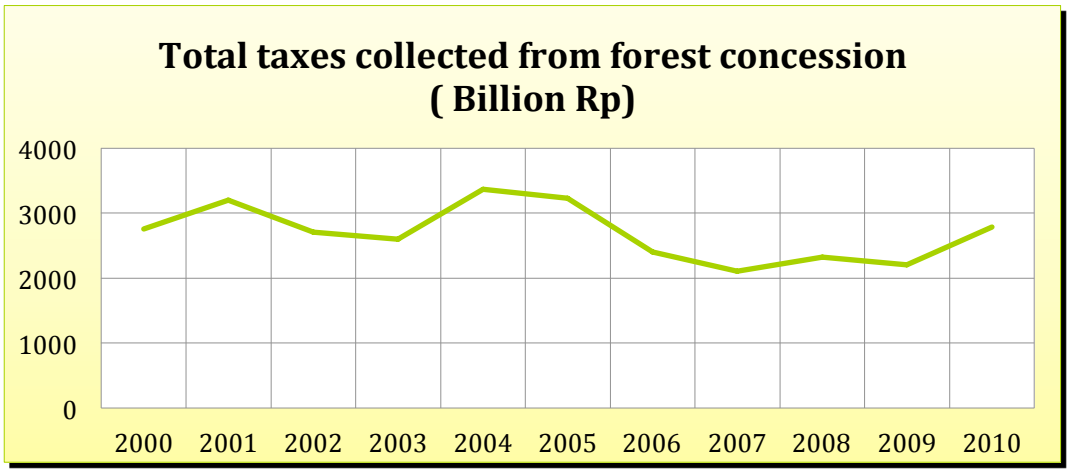
Table 27: Forest revenue share of total government revenue

Forest revenue share of total government revenue										
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1.34	1.06	0.91	0.76	0.84	0.65	0.38	0.30	0.24	0.26	0.28

Source: Simangunsong (2013)

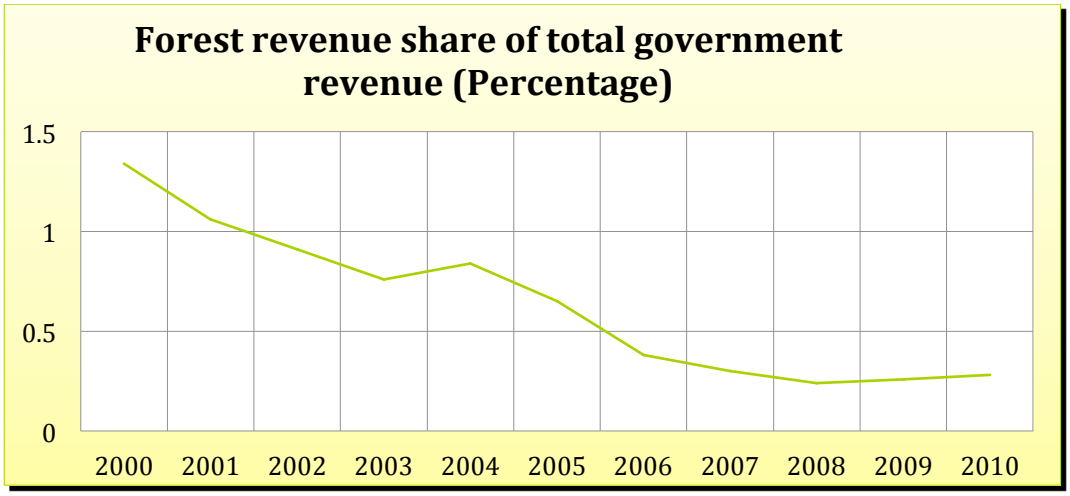
Table 27 presents the percentage of forestry revenue share against the total government revenue, including domestic tax and non-tax revenues and grants. In 2000, this share was 1.34 percent, which dropped to 0.28 percent in 2010.

Figure 10: Trend of taxes collected by government



Source: Compiled by authors from Table 26

Figure 11: Trend of forest revenue share from total revenue

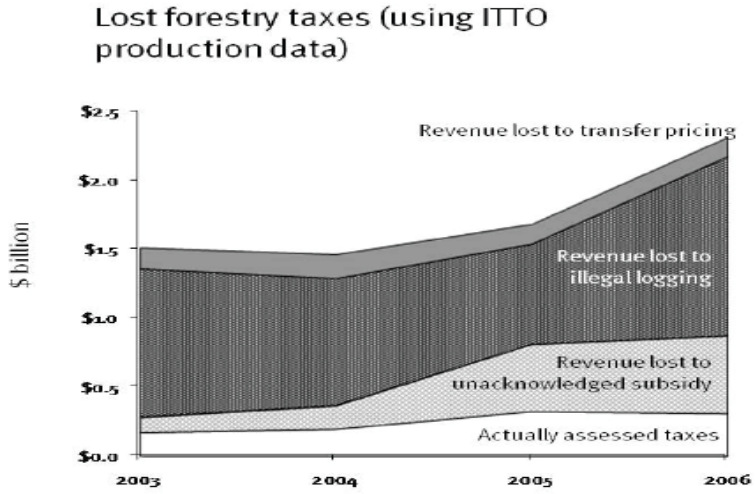


Source: Compiled by authors from Table 27

The trend of total taxes and fees collected from forest concessions is presented in Figure 10. Although fluctuations occurred during the timeframe considered, the amount of taxes collected in 2010 is approximately the same as in 2000. Conversely, there is a clear downward trend in the forest revenue share from total government revenue, as illustrated in Figure 11, indicative of the declining contribution of the timber trade in Indonesia's economy.

However, these numbers only represent the taxes and fees collected for timber logging from legal sources. As aforementioned, Illegal logging can account for between 40 percent and 80 percent of Indonesia's timber trade, costing the Government of Indonesia billions of dollars in revenue loss every year. For instance, a Human Rights Watch report (2009) estimated that the Government of Indonesia lost almost USD 2 billion in taxes annually between 2003 and 2006, largely attributed to illegal logging. Other relevant factors underlying this loss are related to large unacknowledged subsidies and tax evasion in forestry.

Figure 12: Causes of lost forestry taxes 2003-2006



Source: Human Rights Watch, 2009

3.2 Valuing the contribution of 'regulating services'

The nature and value of regulating services provided by forests are dependent on the characteristics of the region with respect to the type of forest, forest area, local geographic, climatic and socioeconomic profile etc., hence the analysis of the value generated by regulating services has been conducted at the provincial level. The sub-national analysis attempts to value three regulating services, that is, soil erosion, carbon sequestration and storage and water augment; provided by the forests of five selected provinces of Central Sulawesi, East Nusa Tenggara, Jambi, East Java and Central Kalimantan. The provinces are representative for the ecoregions they are located in which are Sumatra (Jambi), Kalimantan (Central Kalimantan), Sulawesi (Central Sulawesi) and the Eastern Island. Unfortunately for Papua data availability was too limited to conduct meaningful analysis.

A brief summary of the outcomes of the economic valuations of the regulating services calculated in the provincial report has been mentioned in the sections below.

3.2.1. Economic Value of Soil Erosion Prevention

The economic valuation of the soil loss prevented by forests is calculated based on the methodology followed by the Green Accounting for Indian States Project (GAISP) monograph "Accounting for the ecological services of India's forests[7]."

Key Results[8]:

The final values for the soil loss prevented, and economic value of soil conservation provided by the primary forests of the selected provinces are shown in the table below.

Table 28: Value of the soil loss prevented and economic value of soil conserved

Province	Year considered for the calculations	Soil erosion prevented by primary forests of the province (billion kg)	Nutrients considered for estimation	Total weight of nutrients loss prevented (million kg/year)	Economic Value of soil conservation (million USD)
Central Sulawesi	2012	18	Organic carbon, Nitrogen, Potassium, Calcium, Magnesium, Sodium	1,464	81
Nusa Tenggara Timur	2012	1.15	Organic carbon, Nitrogen, Potassium, Calcium, Magnesium, Sodium	93	5
Jambi	2012	2.3	Organic Carbon, Nitrogen, Phosphorous, Calcium	186	2
East Java	2012	6	Organic carbon, Nitrogen, Phosphorous, Potassium	294	4
Central Kalimantan	2012	38	Organic Matter, Nitrogen, Phosphorous, Potassium, Calcium	844	29

Table 28 provides the economic value of nutrient loss prevented by the forests of the five provinces. Results of various studies conducted on soil erosion have been taken from different research papers to calculate the soil loss for the provinces. The final economic value of Central Sulawesi is much larger than the other provinces because the area under primary forest in Central Sulawesi is much larger than the other provinces. However, Central Kalimantan among the five provinces considered shows the highest per hectare nutrient conservation value (in the presence of forests) and due to the fact that the soil erosion rates in that area are very high in the absence of forests.

[7] Kumar, P., Sanyal, S., Sinha, R., Sukhdev, P., 2015, Accounting for the Ecological Services of India's Forests: Soil Conservation, Water Augmentation, and Flood Prevention, Green Accounting for Indian States and Union Territories Project, Delhi, India. TERI Press.

[8] Detailed calculations can be found in, Sukhdev, P., Varma, K., Toppo, W., Martens, R., (2015) Prepared under the forest ecosystem valuation study - "Indonesia Forest Ecosystem Valuation – Provincial Analysis Report."

3.2.2. Economic Value of Carbon Sequestered and Stored

For calculating the quantity of carbon sequestered by the forests of the selected provinces, direct values for the sequestration of CO_2 by the forest of the different provinces have been taken from the report "Progress of MRV System in Indonesia" by Rahayu (Progress of MRV System in Indonesia, 2012).

The carbon stock of the provinces has been calculated by multiplying the primary forest and secondary forest areas provided by the MoF, in hectares, for each of the provinces, by the average carbon storage capacity (The average carbon storage capacity of primary and secondary forests for each of the provinces has been taken from studies conducted in the respective provinces).

To calculate the economic value of the carbon sequestered and stored in the forest of each of the provinces, the quantity of carbon stored and sequestered has then been multiplied with an approximate economic value of carbon known as the social cost of carbon (SCC), measured in USD per ton of carbon. The SCC value taken into consideration is at a 3 percent discount rate which give a value of USD 3.33 for the year 2010 (Wolosin, 2014).

Key Results[9]:

Table 29: Average carbon stock and average economic value of carbon sequestered

Province	GDP (in million USD (for 2011))	Average annual value of carbon sequestered for the period 2009-2011 (ton CO_2)	Average carbon stock (Primary forest + Secondary forest) (tons/ha)	Total carbon stock as of 2010 (Primary and secondary forest, ton C)	Average annual economic value of carbon sequestered for the period 2009-2011 (million USD)	Economic value of carbon stock as of 2010 (billion USD, and as a percentage of 2011 GDP)
Central Sulawesi	$1,344	5,737,858	168 (187,148)	794,209,589*	19	9.6 (714%)
NTT	$5,115	5,009,871	135 (194, 76)	159,838,000	17	1.9 (34%)
Jambi	$6,594	8,033,076	126 (175, 76)	124,783,600	27	1.5 (22.7%)
East Java	$92,125	16,590,326	126 (176, 76)	95,946,000	55	1.2(1,3%)
Central Kalimantan	$4,069	29,213,820	230 (269,192)	1,597,038,416	97	19.5 (479%)

*Central Sulawesi figure for year 2011, data for 2010 not available.

Again the carbon stock value of Central Sulawesi is large because the area of forest in Central Sulawesi is large. However, Central Kalimantan has the highest value of both carbon sequestration and carbon stock, because the per hectare carbon content in the forests of Central Kalimantan is very high due to the peat forest (3 million ha).

[9] Detailed calculations can be found in, Sukhdev, P., Varma, K., Toppo, W., Martens, R., (2015) Prepared under the forest ecosystem valuation study - "Indonesia Forest Ecosystem Valuation – Provincial Analysis Report."

Comparing the value of carbon against provincial GDP provides interesting conclusions- including, that those provinces which are sparsely populated have the highest share in terms of value of carbon against GDP. East Java with its limited forests has the lowest value of slightly more than 1%.

3.2.3. Economic Value of Differential Water Recharge between Forested and Non-Forested Areas

The methodology followed to compute the economic value of differential water recharge between forest and non-forest areas is similar to the methodology used in the GIST monograph "Accounting for the Ecological Services of India's Forests: Soil Conservation, Water Augmentation, and Flood Prevention "[10].

This method is derived from what is known as the 'water balance equation,' which provides the ground water recharge available after evapotranspiration, run-off, and amount of moisture required to saturate soil to field capacity, is subtracted from precipitation, P=E+R+F+GW

Where, P = Precipitation, E = Evapotranspiration, R = Run-off, F = Moisture required to saturate soil to field capacity, GW = Ground water recharge

Key Results[11]:

Table 30: Differential value of recharge and the total economic value of differential recharge

Province	GDP (in Million USD per year)[12]	Year considered for valuation	Ground water Recharge (mm per year)		Annual differential value of recharge (mm)	Total additional recharge (million m^3 per year)	Economic Value of additional water recharge (billion USD) (% as compared to GDP)
			Forested Area	Non-Forested area			
Central Sulawesi	$1,344	2012	1,002	556	446	12,364	2.4 (178 %)
NTT	$5,115	2012	1,421	328	1,093	1,930	0.435 (8.5%)
Jambi	$6,594	2012	2,070	934	1,136	3028	0.874 (13%)
East Java	$92,125	-	-	-	-	-	-
Central Kalimantan	$4,069	2012	1,151	908	243.18	2349	1.25 (30%)

In the case of Central Sulawesi, economic value of additional water recharge is large because there is a large area of primary forest present in the province, as stated earlier, as compared to the other provinces. The primary forest area of Central Sulawesi is 14 times, 9 times, 7 times and 2 times larger as compared to the forest areas under NTT, Jambi, East Java and Central Kalimantan, respectively.

[10] Kumar, P., Sanyal, S., Sinha, R., Sukhdev, P., 2015, Accounting for the Ecological Services of India's Forests: Soil Conservation, Water Augmentation, and Flood Prevention, Green Accounting for Indian States and Union Territories Project, Delhi, India. TERI Press.

[11] Detailed calculations can be found in, Sukhdev, P., Varma, K., Toppo, W., Martens, R., (2015) Prepared under the forest ecosystem valuation study - "Indonesia Forest Ecosystem Valuation –Provincial Analysis Report."

[12] As per BPS (2012)

3.2.4. Implications of valuing the contribution of regulating services

The overall data collected from these economic valuations encompasses a multitude of implications. The most prominent finding of these studies is the vital significance of forestry towards the socio-economic well-being of the Indonesian people. In Central Sulawesi, the above calculations show that one hectare of forest prevents soil erosion equivalent to 6,538 kg/ha, which, along with nutrient loss from surface run-off, translates to nutrient costs of approximately USD 30 per hectare of forest in a year (see Table 28). This provides a significant argument in favour of increasing investments in forest protection, as failing to do so will diminish soil quality and considerably reduce agricultural yields. Specifically, this is would not be coherent with the local medium-term socioeconomic development plan (RJPMN) which has the main objective of increasing economic growth through pro-poor economy schemes, based on the extensive utilisation of natural resources and agriculture. More importantly, the other main objective being the promotion of forest and natural resource rehabilitation or conservation (Irawan, 2012), deforestation -and the subsequent soil quality loss- would certainly go against the local RJPMN and actually be counterproductive.

The above Table 30 underlines how in a year in East Nusa Tenggara, the forested area helps recharge an additional 1,930 million cubic metres of groundwater, compared to a non-forested area. While this is only an estimate, it highlights the importance of the role that forests play in promoting other primary sectors like agriculture as well as fisheries. In this specific province, the RPJMD gives major importance to the development of the province's agricultural sector because its gradual intention is to increase the agriculture-based economy's capacity. Whilst it is clear agriculture needs to be given special attention in East Nusa Tenggara, especially as approximately 80 percent of the population is engaged in the agricultural sector, this cannot be accomplished at the expense of forest protection. Indeed, forest degradation paralyses the latter's ability of recharging substantial amounts of groundwater (as seen above) which will directly affect the province's agricultural development.

Equivalently, the data on Papua provides clear findings. Putting these tables into context, results can be used to support local officials in Papua to address problems regarding forest and natural resource management, including: to provide information regarding Papua's natural resources values; to raise awareness amongst the Papuan community on the importance of forests and natural resources; and to provide a foundation for developing a compensation scheme for natural resource preservation.

Overall, the local policies and RPJMDs can only be effective in maintaining provinces' natural capital if the relevant stakeholders understand the value of services forests provide. Indeed the valuation exercise described above demonstrates the vital ability of forests to stabilise the soil, prevent erosion, and enhance the land's capacity to store water. Thus, Table 28, Table 29 and Table 30 provide a very important analysis that substantially contributes to achieving the RPJMD goals in each province. And in outlining what kinds of interventions related to nature should be implemented to improve the extent to which better management of forests and their ecosystem services can support provincial economic growth.s

Chapter 4. Scenario Analysis

A modelling exercise was undertaken to better understand the relevance of forests for Indonesia's social development, economic performance, and environmental integrity. This analysis was designed to provide insights in terms of the required investments to maintain forest cover and promote better forest management practices in ensuring sustainable supplies of critical forest ecosystem services. The analysis is based on an enhanced version of the Indonesia Green Economy Model (I-GEM), by including additional details on forests.

I-GEM is a demo national model, which was validated against historical national data, and which allows simulation of the impacts of green economy policies nation-wide across five main sectors, namely agriculture, forestry, fishery, energy and mining.

Using I-GEM, two scenarios were tested, a Business As Usual case and a Green Economy one. While the BAU simulation assumes a continuation of historical trends (accounting for policies that are already approved), the GE scenario simulates additional interventions emphasizing reforestation efforts (in the same amount as deforestation of primary and secondary forest) to curb the reduction of forest cover. The goal under the GE scenario is to halve deforestation and offset remaining deforestation with afforestation and reforestation of secondary forest, while at the same time encouraging sustainable timber production and higher NTFP production.

Table 31 summarises the main assumptions used for the simulation of the BAU and GE scenarios for the forestry sector.

Table 31: Main assumptions used for model development and scenarios simulation

Carbon stored by primary forests	81,300 ton per km^2
Carbon stored by forests under ground	65,100 ton per km^2
Carbon market price	USD 5 per ton
Primary forest average emissions	22,170 TCO_2e per km^2 per year
Secondary forest average emissions	17,700 TCO_2e per km^2 per year
Timber production employment	0.0037 people per cubic meter
Employment in production forests that follow the SFM Law	0.978 people per km^2
Employment in sustainable natural forest concessions	1.866 people per km^2
Employment in rattan production	0.09 people per ton
Green jobs in rattan production	0.039 people per ton
Environmentally friendly jobs – Rattan	0.086 people per ton
Employment in NTFP collection	0.2 people per ton
Green jobs in NTFP collection	0.047 people per ton
Environmentally friendly jobs - NTFPs	0.189 people per ton

4.1 Simulation Results

4.1.1 Investment required

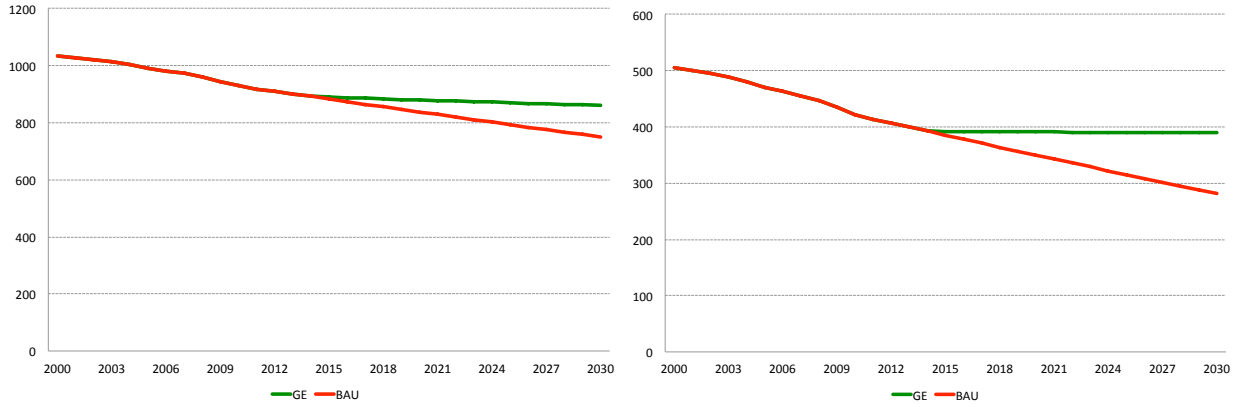
The total investment required to avoid forest cover changes varies depending on the activities implemented to reduce deforestation and increase reforestation. In this study, a cost of USD 100 per hectare per year was estimated by averaging the costs associated with different ecological practices that can increase agricultural output, thereby reducing the pressure on forested lands (Baker *et al.,* 2007; Pretty *et al.,* 2006). Assuming a projected avoided deforestation of over 110,000 km^2 until 2030, it is estimated that the total cumulative investment required to reach this goal is close to USD 10 billion (IDR 121,360 billion) between 2015 and 2030. The annual investment required therefore slightly exceeds USD 600 million (IDR 7,280 billion). When considering also the opportunity cost of, for instance, foregone timber production, the investment required would be higher, due to the potential economic returns to be accrued from deforestation.

While the investment required may seem high, the following sections emphasise the overall benefits of sustainable forest management, which evidently generate positive returns for the public sector, private companies, households (including forest communities), as well as the global community (e.g. through increasing carbon sinks). The stakeholders with the capacity to deliver the necessary investment may largely differ from the ones that would benefit from such investment. Creating a sound framework of incentives and ensuring a fair distribution of benefits is therefore a crucial challenge. In particular, since poorer communities are the most dependent on natural resources and therefore, most affected by their degradation, incentives and the distribution of benefits should be translated down to the rural household level to preserve the natural assets they need.

4.1.2 Forest cover

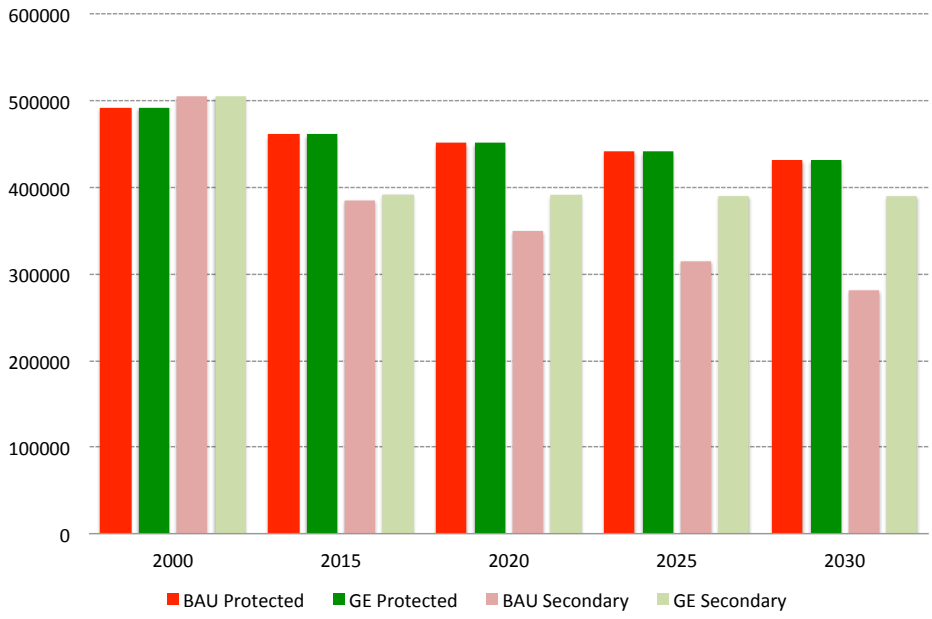
Deforestation in Indonesia is closely related to timber production and the expansion of agricultural and settlement land. A continuation of existing trends, if no corrective measures are implemented, is projected to result in a reduction of forest cover of 15 percent between 2015 and 2030, going from approximately 880,000 km^2 to 749,941 km^2 (Figure 13). On average, 8,300 km^2 of forest would be cleared every year for timber extraction or land conversion between 2015 and 2030. As the total forest cover declines, so does the amount of carbon stored. The cumulative emissions from 2015 to 2030 from forest loss would reach 2.5 billion tCO_2, which, considering an average carbon price of USD 5 to USD 10 per ton (based on international average market prices), would translate in a cumulative loss of about USD 10 billion to USD 25 billion between 2015 and 2030.

Figure 13: Total forest cover (left) and secondary forest area (right) under the BAU and GE scenarios (thousand km²)



Alternatively, under the GE scenario, the results of the simulation show that total forest cover (including primary, secondary and planted forests) would be 15 percent higher than the BAU scenario by 2030. As shown in Figure 14, reforestation activities imply the replanting of deforested primary forests into secondary forests. As a result, while the reduction of primary forest cover would be the same under GE and BAU, secondary forest would not decrease under the GE scenario. Additional interventions could be implemented in order to reduce primary forest depletion, in particular through the strengthening of law enforcement in protected forest areas.

Figure 14: Protected forest and secondary forest land, under BAU and GE scenarios (km²).

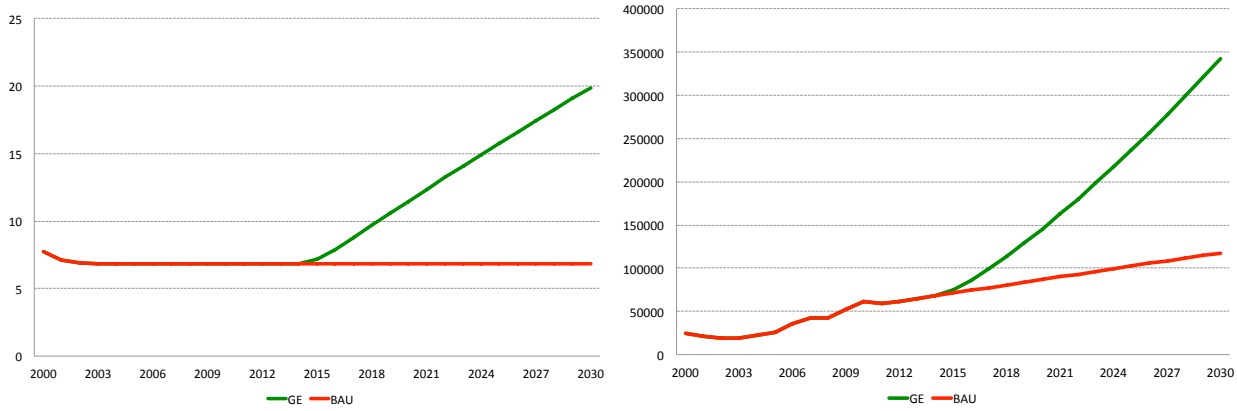


As a result of reforestation policies under the GE scenario, the amount of carbon sequestered by forests is expected to be higher than BAU, thereby partially compensating the annual emissions caused by forest clearing. Also, the new production forests that would be planted under the GE scenario would further contribute to carbon sequestration, and potentially sustainable timber and NTFPs. More specifically, average annual emissions from deforestation would amount to 46 million tCO_2 between 2015 and 2030 under the GE scenario, compared to 165 million tCO_2 under BAU, corresponding to an average annual reduction rate of 72.2 percent. Assuming a carbon market price of USD 5 to USD 10 per ton, the additional economic value of carbon sequestration under GE relative to the BAU case would amount to USD 9 billion to USD 18 billion by 2030.

4.1.3 Forestry production

The production of timber and NTFPs contributes to the GDP and constitutes an important source of livelihood for local forest communities. As shown in Figure 15, annual timber production is projected to remain constant in the BAU case and increase in the GE one, while forestry value added is projected to continue to increase under the GE scenario as result of the reduction of deforestation and the adoption of sustainable forest management practices in the expanded production forest areas. In particular, projections show that the average annual forestry value added between 2015 and 2030 would be 107 percent higher under the GE scenario than BAU, amounting to approximately IDR 196,281 billion and IDR 94,680 billion, respectively (Figure 15).

Figure 15: Annual timber production in million cubic meters (left) and annual timber value added in IDR billion (right) under BAU and GE scenarios



Higher profits from timber production are expected to have a positive impact on government revenues from forestry taxation. The average annual tax revenue from forestry sector between 2015 and 2030 would more than double under GE compared to the BAU scenario, amounting to IDR 11,777 billion and IDR 5,681 billion, respectively.

In addition to increasing value added and taxation, the preservation of forest cover under the GE scenario would maintain key ecosystem goods and services that play a central role in providing livelihoods, ensuring forest hydrological functions, and conserving Indonesia's rich biodiversity, all of which are essential for the sustainable development of the country.

The preservation of forest natural capital and its biodiversity would allow for the sustainable exploitation of non-timber forest products, as well as the extraction and commercialisation of biodiversity products, such as medicinal herbs, fruit species, timber. In addition, ecosystem and biodiversity conservation play a salient role in food security through the provision of services such as the pollination of crops. Projections show that the average annual production of NTFPs and medicinal herbs would be close to 40 percent higher under the GE scenario by 2030, as compared to BAU. In particular, the average annual NFTP production and corresponding value added in 2030 would be 371,840 tons and IDR 34,675 billion under BAU, compared to 514,718 tons and IDR 48,000 billion under GE (Figure 16). Similarly, the average annual medicinal herbs production and value added between 2015 and 2030 would be 252,851 tons and IDR 7,272 billion under BAU, while they would amount to 350,008 tons and IDR 10,067 billion under GE (Figure 17).

Figure 16: Annual NTFP production in thousand tons (left) and annual NTFP value added in IDR billion (right) under BAU and GE scenarios

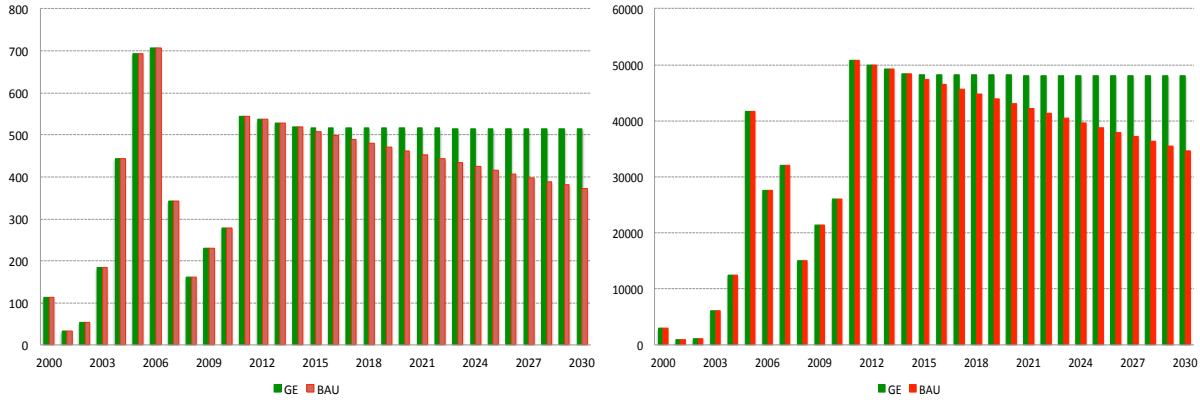


Figure 17: Annual medicinal herbs production in thousand tons (left) and annual medicinal herbs value added in IDR billion (right) under BAU and GE scenarios

4.1.4 Scope for employment

The formal forestry sector employs approximately 0.6 percent of total labour force in Indonesia (ILO, 2010). However, a large part of the population derives its livelihoods from the informal extraction of timber and non-timber forest products. The progressive reduction of forest cover under BAU is expected to negatively impact employment, thereby potentially increasing poverty in forest communities. More precisely, forestry employment is projected to decline until 2030, driven by the intensive exploitation of forest stocks and the lack of interventions to support the emergence of certified production and sustainable practices. It is projected that over 15,000 jobs would be lost every year on average between 2014 and 2030 in the BAU case. On the other hand, the sustainable growth of the forestry sector under the GE scenario would create additional employment opportunities from both timber production and reforestation activities, in addition to jobs created in the NTFP sector. It is estimated that under the GE scenario up to 17,000 jobs could be created on average each year between 2014 and 2030, amounting to a total of 275,000 new jobs in formal forestry sector (65,000 from sustainable timber production and 210,000 from rubber and NTFPs). Consequently, the creation of jobs under the GE model would lead to an increase in the total forestry revenue, both directly and indirectly, through salaried work and higher revenues from, for example, NTFPs.

Text Box 1: Potential for Green Jobs in Central Kalimantan

Potential for Green Jobs in Central Kalimantan

An International Labour Organisation (ILO) study on the overall labour market and green jobs sector for Central Kalimantan showed that the province has a greater proportion of jobs that could be considered to be both "green" and "decent" than the national level, with green jobs estimated to be linked to 9 percent of jobs in the province in 2010. The majority of green jobs within the province are found in the agriculture, forestry, hunting and fishery sectors. Employment is growing in both palm oil and in rubber, and it is important to promote more environmentally friendly models for these industries, such as "jungle rubber" and "rubber inter-cropping" to reduce the environmental impact of these sectors. Employment in the construction industry has been increasing, particularly in building constructions. As such, it is important to promote alternative materials, technologies and low impact work practices, as well as environmental compliance, to reduce the environmental impact of this sector. In transport, jobs in public transport provision have remained steady, while jobs in river transport have declined. Jobs in solid waste management and in management of tourism destinations, such as national parks, have increased and there are signs of job quality improvement in this sector as well. Indeed, all jobs in the management of gardens, national parks and agro-tourism were considered to meet the criteria for decent work. Ecotourism accommodation and related services are still very limited in Central Kalimantan, providing an area for potential growth.

Source: ILO, 2013

The table below summarises the main outcomes of I-GEM analysis in terms of forest cover, production and economic value of forest products, employment in the forestry sector and CO_2 emissions

Table 32: Main results of the analysis for the forestry sector, under BAU and GE scenarios

Category	Unit	Scenario	2015	2020	2025	2030
Economic						
Timber value added	IDR billion/year	BAU	71,228	86,884	102,540	117,694
		GE	74,610	145,575	236,687	342,313
NTFP value added	IDR billion/year	BAU	47,429	43,044	38,799	34,676
		GE	48,271	48,123	48,035	48,000
Medicinal herbs value added	IDR billion/year	BAU	9,947	9,028	8,137	7,272
		GE	10,124	10,093	10,074	10,067
Economic value of carbon sequestration	IDR billion/year	BAU	325	309	294	279
		GE	327	323	319	315
Environmental						
Total forest cover	Thousand Km^2	BAU	883	837	793	750
		GE	890	880	870	861
Timber production	Thousand m^3/year	BAU	50,954	49,916	48,752	47,788
		GE	51,516	55,890	60,044	64,068
NTFP production	Thousand ton/year	BAU	509	462	416	372
		GE	518	516	515	515
Medicinal herbs production	Thousand ton/year	BAU	346	314	283	253
		GE	352	351	350	350
Social						
Total forestry employment	People	BAU	248,667	229,814	211,540	193,774
		GE	252,075	250,454	249,092	247,945
Forest sustainability employment	People	BAU	183,611	166,635	150,201	134,240
		GE	186,869	186,297	185,958	185,819
NTFP employment	People	BAU	23,904	21,694	19,554	17,476
		GE	24,328	24,254	24,210	24,192
Emissions						
Cumulative annual CO_2 emissions 2015-2030	Million TCO_2	BAU	0	850	1,677	2,484
		GE	0	241	470	689
Annual CO_2 emissions from forests	Million TCO_2/year	BAU	172	168	163	160
		GE	50	47	45	43

Source: Authors' estimation, resulting from I-GEM simulations

Chapter 5. Recommendations for REDD+ Implementation and Investments

5.1. REDD+ Context in Indonesia

The significance of deforestation and forest degradation in terms of climate change has led to the emergence of REDD+, a global mechanism to reduce emissions from deforestation and forest degradation, promote the conservation and sustainable management of forests, and enhance forest carbon stocks. In its core, REDD+ seeks to create an economic value of standing forests to incentivise forest conservation, thereby reconciling both environmental and economic goals. By compensating developing countries for the reduction of their forest carbon emissions, REDD+ could set in place a long-term structure to protect forests and forest ecosystem services.

Successful implementation of REDD+ entails developing the institutional capacity of governments across several fronts, including the development of robust national Monitoring, Reporting and Verification (MRV) system, financing and benefit sharing system, and safeguards information system. A large number of developing countries around the world are currently at various stages of preparation to achieve REDD+ readiness.

Since 2007 Indonesia has been at the forefront of the global effort to promote REDD+, a mechanism which recognises and rewards reductions in emissions from deforestation and forest degradation, the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. The initial work for REDD+ was led by the Ministry of Forestry through the Indonesia Forest Climate Alliance (IFCA), partly in preparation for the UNFCCC Conference (COP13) in Bali in 2007. The following year, IFCA produced a report to lay out the process to prepare Indonesia for REDD+, which subsequently led to the development of several regulations and decrees to open the door for REDD+ funding and projects.

In 2010, Indonesia signed a letter of Intent (LoI) with Norway to reduce forest-based emissions in Indonesia, with Norway promising up to USD 1 billion in performance-based REDD+ payments for Indonesia. To date, this bilateral partnership has led to, among other things, a moratorium suspending the issuance of new licences for an area covering 64 million hectares of forestland in 2011, which was extended a first time in 2013 and again in 2015. Equally important, the LoI has led to the establishment of the National REDD+ Agency (BP REDD+), the world's first cabinet-level institution devoted entirely to REDD+. BP REDD+ succeeded the REDD+ Taskforce in 2013 and operated as an independent institution until January 2015, when it was merged with the newly formed Ministry of Environment and Forestry (MoEF).

The country has also seen a rapid development of REDD+ pilot and voluntary market projects, of which one is fully certified. The REDD Desk - the Global Canopy Programme's internet platform - summarises a list of pilot activities being undertaken by several provinces and non-government actors (The REDD Desk, 2015). In addition, Indonesia is an active member of both the UN-REDD Programme and the World Bank's Forest Carbon Partnership Facility (FCPF), receiving readiness assistance of USD 5.2 million from the former and USD 3.6 million from the latter (The REDD Desk, 2015).

As highlighted throughout this study, Indonesia's forests are disappearing at a fast pace, causing a huge amount of GHG emissions. REDD+ could play an important role in reversing this trend through the rehabilitation of Indonesia's forests and peatlands. As shown by the I-GEM modelling, average annual emissions from deforestation could be as low as 46 million tCO_2 between 2015 and 2030 under the GE scenario, compared to 165 million tCO_2 under BAU, corresponding to an average annual reduction of 72.2

percent. However, this will depend on the capacity to attract financing through both private and public investments, which need to be significantly scaled up. REDD+ could potentially deliver part of the investments needed through generating between USD 9 billion and USD 18 billion in international funds, conditional on a carbon price of between 5 USD and 10 USD per ton of carbon. While REDD+ financing will be insufficient to cover all costs, it can acts as a catalyst to mobilise other sources of investments such as green forest bonds.

5.2. Recent Legal Changes Affecting REDD+

At the G-20 Summit in Pittsburgh in 2009, former Indonesian President Susilo Bambang Yudhoyono announced Indonesia's plan to reduce its greenhouse gas emissions by at least 26 percent by 2020 or up to 41 percent with financial support from the international community, whilst simultaneously realising sustained 7 percent annual economic growth.[13] Development must therefore be based on Low Emission Development (LED) planning, and REDD+ is expected to be a significant contributor to achieving this target. The 2015-2019 National Mid-Term Development Plan (*Rencana Pembangunan Jangka Menengah Nasional* (RPJMN)) reflects this commitment by including Indonesia's GHG emission reduction targets, of 26% outlining how REDD+ and climate change mitigation in general are mainstreamed into Indonesia's development planning. The RPJMN 2015-2019 is in line with the Presidential Regulation No 61/2011 on the National Action Plan for Greenhouse Gas Emission Reductions (RAN-GRK) set the framework for Indonesia's emissions reduction.

However, there are numerous challenges to overcome, most notably tenure insecurity, poor governance and weak law enforcement in forest areas. These challenges are exacerbated by the incomplete gazettement of Indonesia's forest zones and overlapping land claims, among other things. In recognising these challenges, the Government of Indonesia has embarked on reforming land tenure and improving governance, as evident in the changes made to Indonesia's legal and institutional landscapes through the enactment of Law 23/2014 on Regional Governance, Law 6/2014 on Village Governance and the introduction of Forest Management Units which are mandated as part of the foresty law 41/1999.

While details are being worked out in terms of implementation, the aforementioned legal changes could provide a strategic framework to mobilise resources to address underlying drivers of deforestation and support the implementation of REDD+. Firstly, Law 23/2014 on Regional Governance has withdrawn district governments' authority in forest management, allocating it to provincial governments, which act as the representatives of the central government. Secondly, the government aims to establish an additional 509 Forest Management Units by 2019 that could potentially serve as the smallest jurisdictional unit for REDD+, responsible directly to provincial governments. Thirdly, Law 6/2014 devolves significant authority and resources to villages to manage their villages according to local needs and aspirations, providing an opportunity to steer village development towards more sustainable pathways.

Nevertheless, major challenges remain, especially for forests and peatlands outside of the forest zone boundaries, due to the demand for pulp and paper and the threat of land use change for palm oil

[13] Susilo Bambang Yudhoyono, "Intervention by H E DR Susilo Bambang Yudhoyono, President of the Republic of Indonesia on Climate Change", The G-20 Leaders Summit, 25 September 2009, Pittsburgh, PA, available at http://forestclimatecenter.org/files/2009-09-25%20Intervention%20by%20President%20SBY%20on%20Climate%20Change%20at%20the%20G-20%20Leaders%20Summit.pdf (accessed 5/2/2015).

smallholdings, as well as coffee, cocoa and mining. It is clear that the successful implementation of REDD+, requires the development and execution of investment strategies that can alleviate the underlying drivers of deforestation and forest degradation. Since a wide range of macro and micro economic drivers impact forest land-use change, these investment strategies must create synergies across multiple sectors including energy, infrastructure, agriculture, and transport. Through better cross-sectoral coordination, REDD+ can play a crucial role in promoting an overall shift towards a green economy.

5.3. FMUs and Jurisdictional and Nested REDD+

Given that most of Indonesia's landmass falls within the forest zone, REDD+ implementation requires synchrony of entire national and sub-national jurisdictions. Taking this into account, FMUs could serve as local jurisdictional units 'nested' within broader provincial and national REDD+ implementation. FMUs can act through Public Private Partnership arrangements, which can vary from private sector entities managing a forest ecosystem restoration license to setting up special purpose business vehicles that could be used to rehabilitate production forests. Although more work still needs to be done to assess the various opportunities, it seems that the so-called Jurisdictional and Nested REDD+ (JNR), based on FMUs, fits best to implement REDD+ in accordance to local contexts whilst ensuring their integration to broader jurisdictional REDD+ programmes. This approach implies a departure from an earlier district-based approach, and present the following advantages. Firstly, FMUs are responsible for actual forest protection, oversight of concessions and implementation of forestry zoning, making the implementation of REDD+ easier to measure, report and verify. Secondly, it can foster joint REDD+ activities by villages within an FMU jurisdiction, which are managed and overseen by the local FMU. Thirdly, it could be built on experiences gained through ecosystem rehabilitation licences, similar to those currently applied in the extractive industries. Fourthly, ecosystem licences could be made available to oil palm and other concessionaires that are planning to set aside land as high carbon value forest. Moreover, this approach could also be built on existing legal frameworks and requires no new legalisation, which could greatly speed up REDD+ readiness.

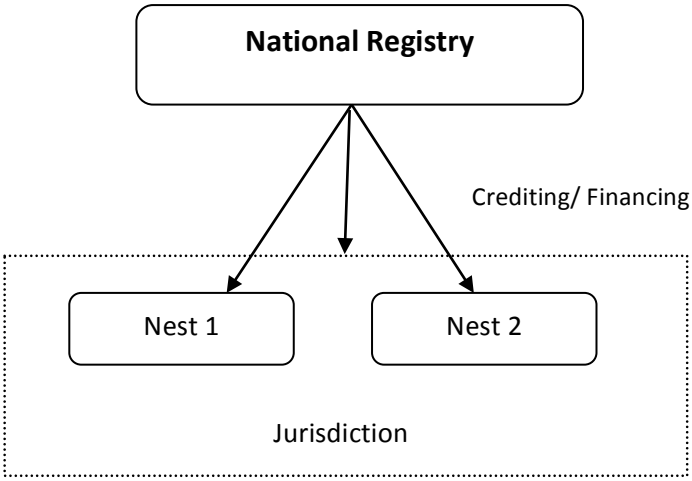
In practice, these arrangements would follow the same logic as a multi-tiered REDD+ implementation and MRV. This concept, promoted by the Verified Carbon Standard, seeks to identify different tiers of jurisdictions in host nations and provides multiple options for accounting and benefit-sharing mechanisms across these jurisdictions. In the case of Indonesia, this will involve:

- Provincial level MRV systems, which are compiled and corrected for inter-provincial leakages at the national level. This implies that provinces act as the jurisdictional level, while national-level registry manages payments. In REDD+ target provinces, this capacity is already built.
- Implementation and supervision of REDD+ activities at the FMU level, which can be implemented by:
    - FMUs through forest rehabilitation in protected and/or conservation areas, demarcation of forest boundaries, peat dome management and/or management of multiple forest landscapes within the forest estate.
    - The private sector through existing ecosystem restoration concessions, reduced impact logging and/or peatlands rewetting/reforestation.
    - Communities through community-based forest management frameworks, including *Hutan Adat* and *Hutan Desa.*

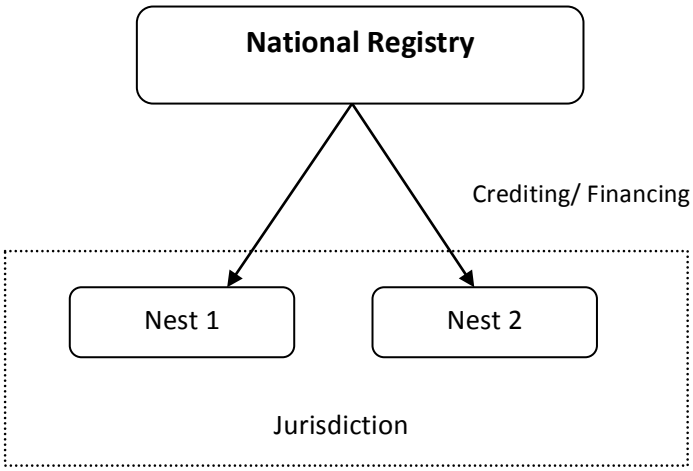
It has to be noted that the Ministry of Forestry through the IFCA and the REDD+ Taskforce (Satgas REDD+) endorsed sub-national REDD+ implementation, as outlined in the National REDD+ strategy. This seemed to be the most viable option given the size of the country and its geographic and ecological diversity. The MoF had also developed a concession-based approach in which REDD+ proponents can apply for an ecosystem restoration concession to market the carbon sequestered through restoration activities. Districts, communities and the national government were to receive part of a levy raised over the sale of such credits.

While the government had previously opted for a district-based jurisdictional approach, in which districts had a key responsibility in implementing and managing REDD+ activities, monitored and supervised by the provincial government, districts now lack the authority to manage REDD+ as stipulated in Law 23/2014 on Regional Governance. In this case, a JNR approach provides an excellent alternative by allowing for the nesting of individual projects within FMU jurisdictions. This will make project-level REDD+ accounting and crediting for the voluntary markets easier, improve oversight over concessionaires, address tenure issues and enhance forest governance at the local level, thereby supporting the overall achievement of REDD+ goals at the national level. The JNR framework allows for various options for accounting emissions reductions and crediting, which are illustrated in Figure 18.

Figure 18: JNR crediting scenarios

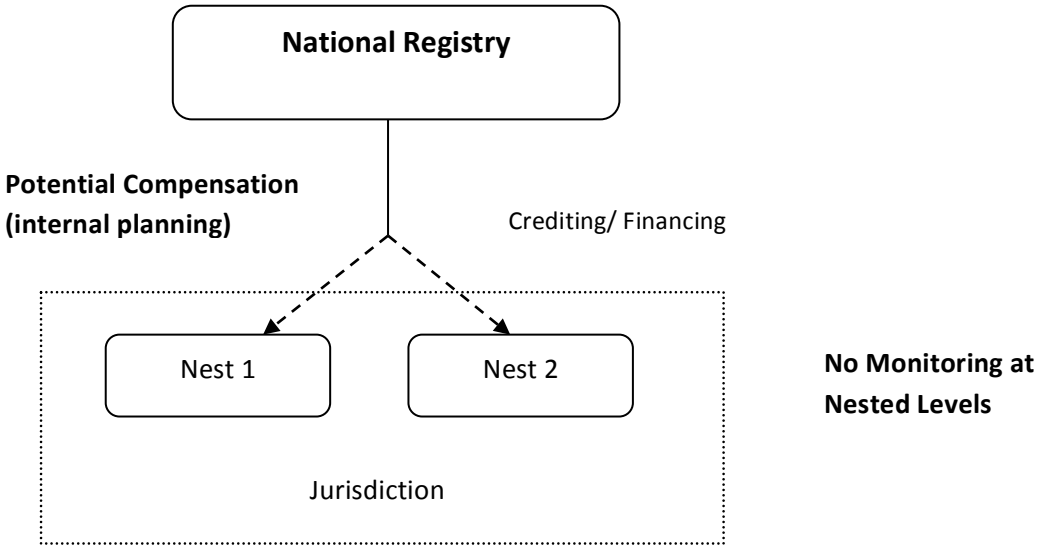


Jurisdictional Scenario 1: Jurisdictional program with crediting at both jurisdiction and project levels



Monitoring at both Jurisdictional and Nested Levels

Jurisdictional Scenario 2: Jurisdictional program with baseline and crediting at nested level only

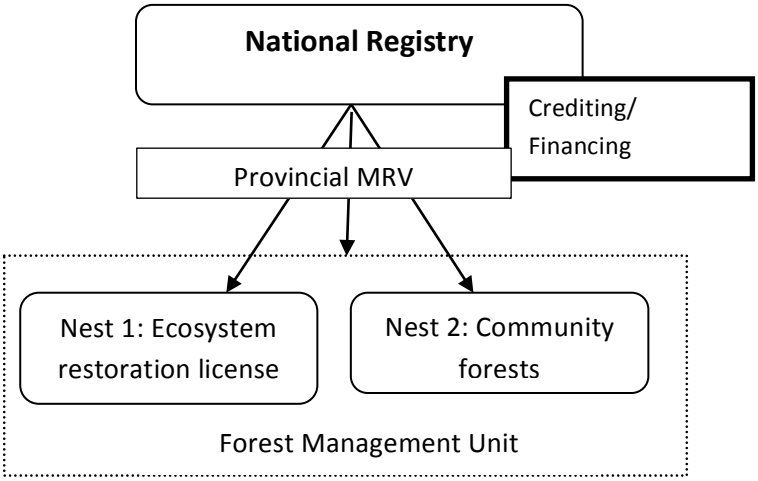


Jurisdictional Scenario 3: Jurisdictional program with baseline and crediting at jurisdiction level only

Source: Adapted from Verified Carbon Standard (2014)

Locally appropriate mitigation and adaptation activities can form effective bases of a ground-up transition to a green economy by investing in activities suited to different local contexts. JNR allows for policy and planning reducing deforestation at the local level. Further, demonstrating the business case for REDD+ can provide a strong incentive for policy planners to foster Indonesia's green economy transition.

Figure 19: Most opportune REDD+ implementation modality in Indonesia



Source: Compiled by authors.

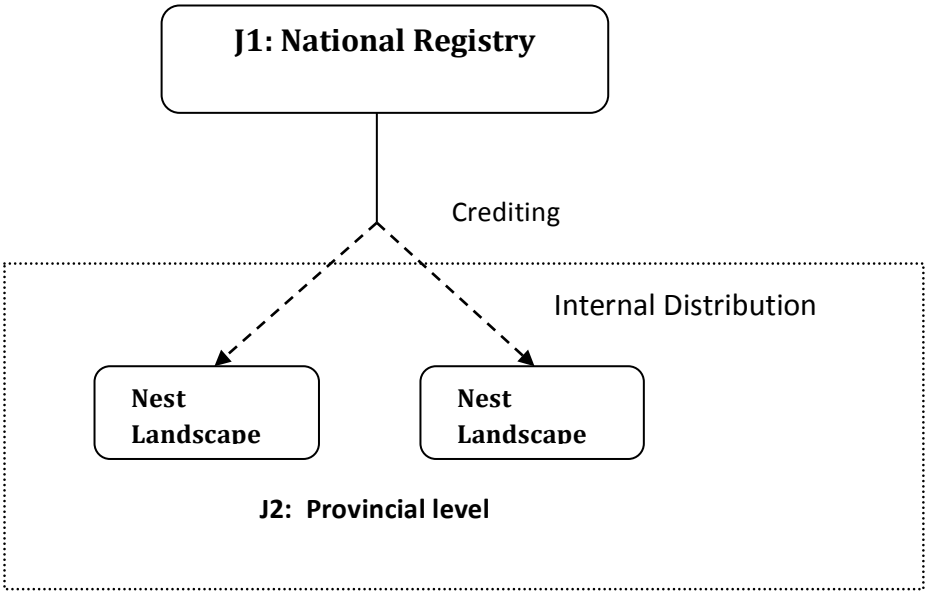
5.4. Proposed Option for JNR for Indonesia

As outlined in the previous sections, REDD+ implementation has to take into account the following elements:

- Changes in regional autonomy. All decisions on forest and land use planning now rest with central government, i.e. the Ministry of Environment and Forestry, as enacted by Law 23/2014.
- The establishment of FMUs, which will cover production forests and protected forests. FMUs will be reporting directly to the provincial government and the Ministry of Environment and Forestry.
- The ability to mobilise innovative financing.
- Forests and peatlands outside of the national forests estate. These are under the jurisdiction of the districts, and correspond to a significant share of land.
- Forests and peat forests within the forest estate, which will be managed by a FMU.
- Peat domes. Due to their specific nature, ecological and hydrological management of peat domes are intertwined. Hence, to effectively reduce peat-related emissions, peat dome management must reside with one entity, which will have the authority to make decision on the water table and the impact this has on land use. In the case where a peat dome is located in the forest estate, it could be managed by the relevant FMU. In others, suitable arrangements have to be developed.

This study team conducted a stakeholder consultation process, including functionaries from the Ministry of National Development Planning (BAPPENAS), the REDD+ Agency, donors and non-governmental organisations. Taking into account the views expressed by the stakeholders and existing regulations, a FMU-based JNR framework is recommended for Indonesia (see Figure 20).

Figure 20: FMU-based JNR framework for Indonesia



Source: Compiled by authors

The FMU-based JNR framework will allow for a better management of local drivers of deforestation and degradation and a larger scope for community involvement in the planning and implementation of forest management. This approach will also enable a synchronisation of national forestry and rural development across different jurisdictions, since FMUs can serve effectively as local jurisdictions where the GE approach can be piloted and results monitored. In addition, the monitoring framework for REDD+ will enable accurate assessments of the performance of national forest conservation and development schemes.

Conclusions

This study has highlighted the important roles that Indonesian forests play in the national economy and society. Historically, forests have been considered mainly as a source of economic growth, generating income from large-scale timber exploitation. However, as shown in this study, the contribution of the timber industry to Indonesia's economy has been dwindling in recent years. On the other hand, the economic contribution of Non-Timber Forest Products, which was largely overlooked in the past, is increasing. In addition to the provisioning services they provide, Indonesian forests play a paramount role in delivering regulating services, such as soil conservation, ground water augmentation and carbon sequestration. These particular services are analysed in this study, demonstrating the immense environmental and economic benefits derived from them.

However, rapid economic development and population expansion are increasing demand for the clearing of forested land for other land uses. Consequently, forest cover continues to reduce at a fast pace, entailing a decrease in the capacity of forests to provide the benefits showcased throughout this report. An increasing awareness of the significance of natural resources and ecosystem services has led the Government of Indonesia to commit to policies and strategies to promote a green economy transition. Forest management is expected to play a crucial role in meeting Indonesia's commitments to inclusive green growth, since an increase in forest cover could generate multiple environmental, social and economic benefits, as highlighted in this study. While the investments required to implement green economy strategies are considerable, this study demonstrates that the benefits would far outweigh the initial costs. Within this framework, REDD+ has the potential to deliver the necessary investments to synergise economic development with forest conservation in Indonesia.

The FEVS was carried out with the purpose of identifying, assessing and highlighting the contribution of forests to Indonesia's economy and society. However, as stated throughout the report, the challenges in undertaking the economic valuation of forest ecosystem goods and services have been numerous. In acknowledging these limitations, this study should be considered as a first step toward a more thorough understanding of the role of forest ecosystem services in Indonesia. More importantly, it lays the foundation for further region specific research and assessments. Key socio-economic trends driving forest cover change need to be better understood, as well as the impact of climate change on the future capacity of forests to continue to provide vital services, both from a quantitative and qualitative point of view. Furthermore, it would be worthwhile to undertake an assessment of the regulating services evaluated in the FEVS for all the provinces of Indonesia in order to gain a more complete picture of the significance of these services.

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Annex 1. Example of Domestic Prices of Timber in Indonesia

According to 'The International Tropical Timber Organization' (ITTO) Tropical Timber Market (TTM) Report, the domestic prices of timber in Indonesia in 2014 are as follows.

Table 33: Domestic log prices in Indonesia, 2014

Type of log	USD per m3
Plywood logs (core logs)	210-240
Sawlogs (Meranti)	220-250
Falcata logs	180-230
Rubberwood	105-130
Pine	135-160
Mahoni (plantation mahogany)	140-180

Source: ITTO TTM Report, August 2014

Table 34: Domestic ex-mill sawn wood prices in Indonesia, 2014

Construction material, domestic Kampar (Ex-mill)	USD per m3
AD 3x12-15x400cm	400-440
KD	-
AD 3x20x400cm	590-630
KD	-
Keruing (Ex-mill)	
AD 3x12-15x400cm	360-400
AD 2x20x400cm	490-520
AD 3x30x400cm	415-440

Source: ITTO TTM Report, August 2014

Table 35: Domestic prices of plywood in Indonesia, 2014

MR plywood	USD per m3
9mm	380-440
12mm	355-400
15mm	300-330

Source: ITTO TTM Report, August 2014

Annex 2. List of Wood Products Considered for Calculating Export Value of Wood Products

HS Code	Item Name
4401100000	Fuel wood,in logs,in billets,in twigs faggots or in similar forms
4401210000	Coniferous, wood in chips or particles
4401220000	Non-coniferous wood in chips or particles
4401310000	Wood pallets sawdust&wood waste and scrap, whether or not agglomerated in log
4401390000	Other Sawdust&wood waste&scrap, whether or not agglomerate in logs,briquet,pellet
4402100000	Wood charcoal(includinguding shell or nut charcoal), of bamboo
4402901000	Other than wood charcoal(includinguding shell or nut charcoal), of bamboo
4402909000	Other wood charcoal(includinguding shell or nut charcoal), of coconut shellHS2012 Description
4403101000	Baulks,sawlogs&vener logs wood in the rough,whether or not atripped of bask
4403109000	Other baulk,sawlog,pit-props,poles,piles treated with paint
4403201000	Baulks sawlog & veneer log of coniferous , meranti bakau not treated
4403209000	Other than wood of coniferous in the rough, not treated
4403411000	Baulks sawlog & veneer log of dark&light red meranti, meranti bakau not treated
4403419000	Other than wood of dark&light red meranti, meranti bakau,in the rough,not treated
4403491000	Baulks sawlog & veneer log of Other tropical wood not treated
4403499000	Other than wood of other tropical wood in the rough, not treated
4403911000	Baulks sawlog & veneer log of oak not treated
4403919000	Other than wood of oak in the rough, not treated
4403921000	Baulks sawlog & veneer log of oak
4403929000	Other than wood of beech in the rough, not treated
4403991000	Baulks sawlog & veneer log of other tree not treated
4403999000	Other than wood of Other tree in the rough, not treated
4404100000	Hoopwood, split poles;piles, picket & the like of coniferous
4404201000	Hoopwood, split poles;piles, picket & the like of non coniferous
4404209000	Other than Hoopwood, split poles;piles, picket & the like of non coniferous
4405001000	Wood wool,
4405002000	Wood wool, wood floor.
4406100000	Railway or tramway sleepers(cross-ties) of wood not impregnated
4406900000	Other Railway or tramway sleepers(cross- ties) of wood impregnated
4407100000	Wood sawn/ chipped length of a thick > 6 mm.of Coniferous,Planed sanded
4407211000	Wood sawn/ chipped length of a thick> 6 mm.of Mahogany,Planed,sanded end-jointed
4407219000	Wood sawn/ chipped length of a thick > 6 mm.of Mahogany,not planed,not sanded
4407221000	Wood sawn/ chipped of a thick > 6 mm.of Virola,Imbuia&Balsa,Sanded/ end-jointed
4407229000	Wood sawn/ chipped of a thick > 6mm.of Virola,Imbuia&Balsa,not planed,not sand
4407251100	Wood sawn/ chipped of a thick > 6mm.of dark&light red meranti,Sanded/end joint
4407251900	Wood sawn/ chipped of a thick > 6mm. of dark&light red meranti,Sanded/ end-joint
4407252100	other wood sawn/ chipped of a thick > 6 mm .of meranti bakau,planed
4407252900	Other than Wood sawn/ chipped of a thick > 6 mm.of meranti bakau,not planed
4407261000	Wood sawn/ chipped of a thick > 6mm.of White Lauan,Seraya,yellow meranti
4407269000	Wood sawn/ chipped of a thick > 6mm.of White Lauan,Seraya,not planed, not Sand
4407271000	Wood sawn/ chipped of a thick > 6 mm.of Sapelli,Sanded or end-jointed

4407279000 Wood sawn/ chipped of a thick > 6 mm.of Sapelli,not planed, not Sanded
4407281000 Wood sawn/ chipped of a thick > 6 mm.of Iroko,Sanded or end-jointed
4407289000 Wood sawn/ chipped of a thick > 6 mm.of Iroko,not planed, not Sanded
4407291100 Wood sawn/ chipped of a thick > 6 mm.of Jelutong,Planed
4407291900 Other than wood sawn/ chipped of a thick > 6 mm of Jelutong,Not planed, not Sanded
4407292100 Wood sawn/ chipped of a thick > 6 mm of Kapur,Sanded or end-jointed
4407292900 Other than wood sawn/ chipped of a thick > 6 mm.of Kapur,Not planed, not Sanded
4407293100 Wood sawn/ chipped of a thick > 6 mm.of Kempas,Planed sanded or end-jointed
4407293900 Other than Wood sawn/ chipped of a thick > 6 mm.of Kempas,Not planed, not Sanded
4407294100 Wood sawn/ chipped of a thick > 6 mm.of Keruing,Planed,sanded or end jointed
4407294900 Wood sawn/ chipped of a thick > 6 mm.of Keruing,Not planed, not Sanded
4407295100 Wood sawn/ chipped of a thick > 6 mm.of Ramin,Sanded or end-jointed
4407295900 Wood sawn/ chipped of a thick > 6 mm.of Ramin,Not planed, not Sanded
4407296100 Wood sawn/ chipped of a thick > 6 mm.of Teak,Sanded or end-jointed
4407296900 Wood sawn/ chipped of a thick > 6 mm.of Teak,Not planed, not Sanded
4407297100 Wood sawn/ chipped of a thick > 6 mm.of Balau,Sanded or end-jointed
4407297900 Other wood sawn/ chipped of a thick >6 mm.of Balau,Not planed, not Sanded
4407298100 Wood sawn/ chipped of a thick > 6 mm.of Mengkulang,Sanded or end-jointed
4407298900 other than wood sawn/chipped of a thick > 6mm of Mengkulang,Not planed,not Sanded
4407299100 Wood sawn/ chipped of a thick > 6 mm.of Jongkong & Merbau,Sanded or end-jointedHS2012 Description
4407299200 Wood sawn/ chipped of a thick > 6 mm.of Jongkong & Merbau Other
4407299300 Other sanded or end jointed&of a thick > 6 mm jongkok & merbau
4407299910 Other albasia sanded or end jointed&planed ,thickness>6mm
4407299920 Other rubber,sanded or end jointed&planed, thickness>6mm
4407299990 Other than tropical wood, other sanded or end jointed&planed,thickness>6mm
4407911000 Wood sawn/ chipped of a thick > 6 mm.of Oak,Sanded or end-jointed
4407919000 Other wood sawn/ chipped of a thick > 6 mm of Oak,Not planed, not Sanded
4407921000 Wood sawn/ chipped of a thick > 6 mm.of beech,Planed
4407929000 Wood sawn/ chipped of a thick > 6 mm.of beech,Not planed, not Sanded
4407931000 Wood sawn/ chipped of a thick > 6 mm.of Maple,Sanded or end-jointed
4407939000 Other than wood sawn/ chipped of a thick > 6 mm.of Maple,Not planed, not Sanded
4407941000 Wood sawn/ chipped of a thick > 6 mm.of Cherry,Sanded or end-jointed
4407949000 Other wood sawn/ chipped of a thick > 6 mm of Cherry,Not planed, not Sanded
4407951000 Wood sawn/ chipped of a thick > 6 mm.of Ash,Planed or end-jointed
4407959000 Other wood sawn/ chipped of a thick > 6 mm of Ash,Not planed, not Sanded
4407991000 Other than wood sawn/ chipped of a thick > 6 mm.of Other tree,Planed
4407999000 Wood sawn/ chipped of a thick > 6 mm.of Other tree,Not planed, not Sanded
4408101000 Cedar wood slats prepared for pencil manufacture radiata pinewood coniferous
4408103000 Face veneer sheets, coniferous
4408109000 Other Coniferous, other cedar wood slats,face veneer sheets
4408310000 Dark red meranti, light red meranti and meranti bakau of the tropical wood
4408391000 Jelutong wood slats of a kind used for pensil manufact dark red meranti
4408399000 Other jelutong wood and other wood prepared for pencil manufact
4408900000 Other than sheets for veneering and of the tropical wood of thickness < 6 mm
4409100000 Coniferous wood cotinuously shaped along any of its edge ,ends/faces
4409210000 Non coniferous of bamboo
4409290000 Other non-coniferous other teak strips friezes for parquet flooring

4410110000 Particle board & similar board of wood or other ligneous materials
4410120000 Oriented strand board of wood
4410190000 Other particle board, oriented strand board (osb) of wood
4410900000 Other than Particle board & similar board of other ligneous materials
4411120000 Medium density fiberboard (mdf) of a thickness < 5mm
4411130000 Medium density fiberboard (mdf) of a thickness > 5mm and < 9 mm
4411140000 Medium density fiberboard (mdf) of a thickness > 9 mm
4411920000 Other fiberboard of a density >0.8g/cm3
4411930000 Other fiberboard of 0,5g/cm<density <0,8g/ cm3
4411940000 Other fiberboard of a density <0.5g/cm3
4412100000 Plywood, veneered panel&similar laminated wood of bamboo
4412310000 Other plywood,consisting solaly <6mm thinkness w/ at least one outer
4412320000 Other plywood, each thick.<6mm with at least one outer ply of non-coniferous
4412390000 Other plywood consisting solely of sheets of wood of each thick < 6 mm
4412940000 Other plywood,veneered panels&similar wood of blockboard,laminboard&battenboard
4412990010 Veneered panels&similar w/at least one other wood
4412990090 Veneered panels&similar w/at least one other wood
4413000000 Densified wood, in blocks,plates,strips of profile shapes.
4414000000 Wooden frames for paintings, photographs mirrors or similar objects.
4415100000 Cases, boxes, crates, drums & similar packings; cable-drums
4415200000 Pallets,box pallets& other load boards; pallet collars
4416001000 Staves casks,barrels,yats,tube and other coopera products and parts of wood
4416009000 Casks,barrels,vats,tubs&Other coopers products & parts thereof, of wood
4417001000 Tools,tool bodies,tool handles,broom or brush bodies & handles, of wood
4417009000 Other Tools,tool bodies,tool handles,broom or brush bodies & handles, of wood
4418100000 Windows,french-windows&their frames of woodHS2012 Description
4418200000 Doors & their frames & thresholds of wood
4418400000 Shuttering for concrete construal work of wood
4418500000 Shingles & shakes of wood
4418600000 Posts and beams
4418710000 Assembled flooring panels
4418720000 Other multilayer bullders joinery and carpentry of wood
4418790000 Other assembled flooring panels of wood
4418901000 Other Cellular wood panels
4418909000 Other builders joinery & carpentry of wood
4419000000 Tableware and kitchenware, of wood.
4420100000 Statuettes & other ornaments, of wood
4420901000 Other wooden articles of furniture not falling in chapter 94
4420909000 Other wood marquetry and inlaid, casket and similar articles of wood
4421100000 Clothes hangers of wood
4421901000 Spools, cops & bobbins, sewing thread reels and the like of wood
4421902000 Match splints
4421903000 Wooden pegs or pins for footwear
4421904000 Candy-sticks, ice-cream sticks & Ice cream spoons
4421907000 Fans & handscreens, frames & handles of wood
4421908000 Tooth picks of wood
4421909300 Prayer beads

4421909400 Other beads
4421909900 Other wooden articles
4501100000 Natural cork, raw / simply prepared;wast a cork,crushed,granulated/ground cork
4501900000 Other Natural cork,raw/ simply prepared; wasta cork,crushed,granulated/ground cork
4502000000 Natural cork,debarked or roughly squared or in rectangleangleular (includingude square)blocks
4503100000 Corks and stoppers
4503900000 Other articles of natural cork.
4504100000 Blocks, plates, sheets & strip; tiles of any shape; solid cylinders, includinguding discs
4504900000 Other agglomerated cork and articles of agglomerated cork
4601210000 Mats, matting and screens of vegetable materials of bamboo
4601220000 Mats, matting and screens of vegetable materials of rattan
4601290000 Other mats,matting & screens of vegetable of material
4601921000 Plaits and similar products of plaiting material of bamboo
4601929000 Other of bamboo
4601931000 Plaits and similar products of plaiting material, or not assembled of rattan
4601939000 Other of rattan
4601941000 Plaits and similar products of plaiting materials, whether of vegetable materials
4601949000 Other of other vegetable material
4601991000 Mats and matting of other vegetable materials
4601992000 Plaits & similar products of plaiting of other materials, whether/not assembled
4601999000 Other Plaits & similar products of plaiting of other materials, whether
4602110000 Basketwork, wickerwork & other articles, of vegetable material of bamboo
4602120000 Basketwork, wickerwork & other articles, of vegetable material of rattan
4602190000 Other than basketwork, wickerwork & other articles, vegetable material
4602900000 Other basketwork, wickerwork & other articles, of other materials
4701000000 Mechanical wood pulp.
4702000000 Chemical wood pulp, dissolving grades.
4703110000 Chemical wood pulp, soda, other than dis solving grades,unbleached,coniferous
4703190000 Chemical wood pulp, soda, other than dis solving grades,unbleached,non coniferous
4703210000 Chemical wood pulp, soda, other than dis solving grades,bleached,coniferous
4703290000 Chemical wood pulp, soda, other than dis solving grades,bleached,non coniferous
4704110000 Chemical wood pulp,sulphite,other than dis solving grades,unbleached,coniferousHS2012 Description
4704190000 Chemical wood pulp,sulphite,other than dis solving grades,unbleached,nonconiferous
4704210000 Chemical wood pulp,sulphite,other than dis solving grades,bleached,coniferous
4704290000 Chemical wood pulp,sulphite,other than dis solving grades,bleached,non-coniferous
4705000000 Wood pulp obtained by a combination of mechanical & chemical pulping processes
4706100000 Cotton linters pulp
4706200000 Pulps of fibers derived from recovered (waste & scrap) paper or paperboard
4706300000 Pulps of fibers derived from recovered of other than bamboo
4706910000 Mechanical pulps of fibers derived from recovered paper or paperboard
4706920000 Chemical pulps of fibers derived from recovered paper or paperboard
4706930000 obtained by a combination of mechanical& chemical processes recovered/paperboard
4707100010 Recovered Unbleached kraft paper & paper board for paper making purpose
4707100090 Recovered Unbleached kraft paper & paper board for paper other purpose
4707200010 for paper making purpose Recovered bleached chemical pulp,
4707200090 Recovered bleached chemical pulp, for other purpose
4707300010 Recovered mechanical pulp paper or paperboard for paper making purpose

4707300090 Recovered mechanical pulp paper or paperboard for other purpose
4707900010 Recovered unsorted waste &scrap paper & paperboard for paper making purpose
4707900090 Recovered unsorted waste and scrap paper & paperboard for other purpose
4801001000 Newsprint, in rolls or sheets. Weighing not more than 55 g/m2
4801009000 Newsprint, in rolls or sheets. Weighing more than 55 g/m2
4802100000 Hand-made paper and paperboard
4802201000 Paper and paperboard of a kind used as for photo sensitive, heat-sensitive
4802209000 Other Paper and paperboard of a kind used as for photo sensitive, heat-sensitive
4802401000 Wallpaper base in rolls of not more than 15 cm in width rectangleangleular exceeds36 cm
4802409000 Other paper and paperboard, not containing fibers obtained by a mechanical
4802541100 Paper, no fibers used in manufactured gyps board computercards,weight <40g/m
4802541900 Other paper and paperboard, not containing fibers Weighing < 40 g/m2
4802542100 Alumunium base paper, not containing fibers Weighing < 40 g/m2
4802542900 Alumunium base paper, not containing fibers Weighing < 40 g/m2
4802543000 Alumunium base paper, not containing fibers Weighing < 40 g/m2
4802549000 Alumunium base paper, not containing fibers Weighing < 40 g/m2
4802552000 Fancy paper and paperboard, purpose 40< weight <150 g/m,roll
4802553100 Paper,no fibers, for Other purpose 40< weight <150 g/m,roll
4802553900 Other paper,no fibers, for Other purpose 40< weight <150 g/m,roll
4802554000 Base paper of a kind used manifature fib res, for other purpose 40<weight<150 g/ml
4802555000 Paper,no fibers, for Other purpose 40< weight <150 g/m,roll
4802559000 Other paper,no fibers, for Other purpose 40< weight <150 g/m,roll
4802562000 Fancy paper and paperboard, in rectangleangleular =<36cm other side =15cm
4802563100 with no side exceeding 36 cmin the unfolded state 40< weight <150 g/m,roll
4802563900 Paper,no fibers, for Other purpose 40< weight <150 g/m,sheet
4802569000 Other than Paper,no fibers, for other purpose 40< weight <150 g/m,sheet
4802571100 Other paper & paperboard, weight>40g/m2 and =< 150g/m2
4802571900 Other paper & paperboard, weight>40g/m2 and =< 150g/m2
4802579000 Other paper & paperboard, weight>40g/m2 and =< 150g/m2
4802582100 Fancy paper&paperboard,in roll width <=1 5cm/in rectangleanglele sheet<36cm&otherside15cm
4802582900 Other fancy paper & paperboard, other in roll width<=15cm/in rectangleangle sheet<36cm
4802589000 Other paper,no fibers, for Other purpose weight >150 g/m
4802613000 Paper, fibers>10%, aluminium paper paper ,in rolls
4802614000 Paper, fibers>10%, other aluminium paper, banknotes,printing,writing,in rolls
4802619000 Other Paper, fibers>10%, other aluminium paper , banknotes,printing,writing,in rolls
4802621000 Paper, fibers, aluminium paper base in sheets with 435< one side <297mm
4802622000 Paper,fibers,banknotes,manuf of gypsum board,in sheets 435<oneside<297 mm
4802629000 Other paper, fibers, for Other purpose, in sheets with 435< one side <297mmHS2012 Description
4802690000 Other paper, fibers, for other not purpose, of fibers>10%, paper in roll
4803003000 Of Cellulose wadding or of web cellulose fibers toilet or farcial tissue stock
4803009000 Other of cellulosa wading&tissue paper/ toilet/facial tissue stock&similar paper
4804110000 Kraftliner paper&paperboard,in rolls or sheets,unbleached
4804190000 Other kraftliner paper&paperboard
4804211000 Sack kraft paper for making cement bag in rolls or sheets,unbleached
4804219000 Other sack kraft paper for making cement bag in rolls or sheets,unbleached
4804290000 Other composite papers, in rolls or sheets
4804311000 other kraft paper and paperboard, weighing 150 g/m,unbleached

4804313000 Wet strength 40g to 60g, for plywood adhesive tape,weigh 150g/m,unbleached
4804314000 Other kraft paper&wet strength weighing 150 g/m,unbleached
4804315000 Other kraft paper&wet strength weighing 150 g/m,unbleached
4804319000 Other than kraft paper & wet strength weighing 150 g/m,unbleached
4804391000 Of a wet Adhesive tape,40-60g,used in mnfact. weight <= 150g/m2,bleached
4804392000 Adhesive tape,40-60g,not used in mnfact weigh <= 150g/m2,bleached foodpaper
4804399000 Other Adhesive tape,40-60g,not used in mnfact weigh <= 150g/m2,bleached
4804411000 Elect grade insulating kraft paper, 150< weighing< 225 g/m,unbleached
4804419000 Other elect grade insulating kraft paper, 150<weighing <225 g/m,unbleached
4804420000 Bleached uniformly throughout the mass& >95% wood fibers,150<weigh<225 g/m
4804491000 Other kraftpaper& paperboard 150< weighing < 225 g/m foodboard
4804499000 Other kraftpaper& paperboard 150< weighing< 225 g/m
4804511000 Elect grade insulating kraft paper,press board weighing >600g/m,unbleached
4804512000 Other wet strength 40g to 60g,for plywood adhesive tape,weigh>225g/m,unbleached
4804513000 Other wet strength 40g to 60g,/plywood adhesive tape,weigh>225g/m,unbleached
4804519000 Other than wet strength 40g to 60g,/ply wo od adhesive tape,weigh>225g/m,unbleached
4804520000 Bleached of kind used in the manufact of gypsum boards
4804590000 Other kraftpaper& paperboard weighing 225 g/m or more
4805110000 Other uncoated paper&paperboard,in rolls fluting paper,
4805121000 Uncoated paper&paperboard,straw fluting paper,weighing>150g/m2or<225gm2
4805129000 Uncoated paper&paperboard,other semi chemical,straw flutingpaper.rolls,sheets
4805191000 Uncoated paper&paperboard,other fluting paper
4805199000 Other uncoated paper and paperboard, in rolls or sheets
4805240000 Uncoated paper&paperboard,testliner weighing 150 g/m2 or less
4805251000 Uncoated paper&paperboard,testliner weighing >= 150 g/m2
4805259000 Uncoated paper&paperboard,testliner other of weighing >= 150 g/m2
4805301000 Paper,sulphite wrapping paper, colored match wrapping paper
4805309000 Paper,sulphite wrapping paper, other colored match wrapping paper
4805400000 Filter paper and paperboard
4805500000 Felt paper and paperboard
4805911000 Paper used as packing of flat glass product, resin<0,6%,wg<150g/m
4805912000 Uncoated paper&paperboard,other blotting, &joss paper,weighing150g/m or less
4805919000 Uncoated paper&paperboard,other blotting, &joss paper,weighing150g/m or less
4805921000 Multi-ply paper and paperboard of 150<weighing<225g/m
4805929000 Uncoated paper&paperboard of other 150<weighing<225g/m
4805931000 Multi-ply paper and paperboard of weighing > 225g/m2
4805932000 Blotting paper of Other weighing > 225g/ m2
4805939000 Other Multi-ply paper&Blotting paper of Other weighing > 225g/m2
4806100000 Vegetable parchment
4806200000 Greaseproof papers
4806300000 Tracing papers
4806400000 Glassine and Other glazed transparent or translucent papers
4807000000 Composite paper and paperboard not surface-coated or impregnated
4808100000 Corrugated paper&paperboard,whether or not perforated,in rolls or sheetsHS2012 Description
4808400010 Sack kraftpaper, creped, crinkled, whether, not embossed /perforate, rolls / sheets
4808400090 Other kraftpaper, creped or crinkle, whether or not embossed or perforated
4808902000 Paper&paperboard,other embossed fancypaper used printing,cover,lining

4808903000 Paper&paperboard,embossed paper fancypaper used printing,cover,lining
4808909000 Other than Paper&paperboard,other embossed fancypaper used printing,cover,lining
4809200000 Self-copy paper
4809901000 Other self-copy paper
4809909000 Other self-copy paper
4810131100 Paper&paperboard for photo,heat,elect. in rolls papers of width <15cm
4810131900 Paper&paperboard for photo,heat,elect. in rolls papers of other width <15cm
4810139110 Paper&paperboard for photo,heat,elect. in rolls papers of other width <15cm
4810139190 Paper&paperboard for photo,heat,elect. in rolls papers of width <15cm
4810139910 Banknotes paper in rolls of a width >15 cm
4810139990 Paper & paperboard for writing or printing in rolls of a width >15 cm
4810141100 Paper&paperboard for photo,heat,elect. Sensitive 297<one side<435mm,in sheets
4810141900 Paper&paperboard for photo,heat,elect. of width < 15cm
4810149110 Banknotes Paper in sheets & unfolded of a width >15cm
4810149190 Paper&paperboard for photo,heat,elect. sensitive 297<one side<435mm,in sheets
4810149910 Banknotes Paper in sheets & unfolded of a width >15cm
4810149990 Paper & paperboard for writing or printing in sheets & unfolded of a width >15cm
4810191100 Other Paper & paperboard for writing or printing in sheets
4810191910 Other Banknotes paper
4810191990 Other Paper & paperboard for writing or printing in sheets
4810199110 Other Banknotes paper
4810199190 Other Paper & paperboard for writing or printing in sheets
4810199910 Other Banknotes paper
4810199990 Other Paper & paperboard for writing or printing in sheets
4810221100 Light weight coated paper,Electcardiogrp ,Ultrasonograph,spirometer,etc
4810221900 Light weight coated paper; Other Elect, cardiograph,Ultrasonograph,etc
4810229100 Other light weight coated paper,in roll of a width 15cm<one side<36cm,unfolded
4810229900 Other light weight coated paper
4810291100 Other paper of a kind used for printing, elect,cadiograp,ultrasonograp,etc
4810291900 Other paper of a kind used for printing,other electcadiograp,ultrasonograp,etc
4810299100 Other paper of a kind used for printing,wid th 15cm<one side<36cm,unfolded
4810299900 Other paper of a kind used for printing
4810313100 Base paper of a kind used to manufacture aluminium coated paper,<=150 g/m2
4810313900 Other Base paper of a kind used to manufacture aluminium coated paper,<=150 g/m2
4810319100 Kraft paper,paperboard, not for writing, printing, Other grafic purpose, <=150 g/m2
4810319900 Other kraft paper,paperboard,not for wrtng printing, Other grafic purpose, <=150 g/m2
4810323000 Kraft paper,paperboard, not for writing, width<=15cm,side<=36cm,weight>150g/m2
4810329000 Kraft paper,paperboard, not for writing, Other weight>150g/m2
4810393000 Other kraft paper,paperboard, not for writing in rolls width<=15cm,side<=36cm
4810399000 Other kraft paper,paperboard, not for writing
4810924000 Other paper & paperboard, multiply rectangleangle < 15 x 36 cm2
4810929000 Other paper & paperboard, multiply other rectangleangle < 15 x 36 cm2
4810994000 Other paper and paperboard of multiply rectangleangle < 15 x 36 cm2
4810999000 Other paper and paperboard of multiply other rectangleangle < 15 x 36 cm2
4811102100 Floor covering on a base of paper or paperboard,in roll <15cm, rectangle<15x36cm2
4811102900 Other bituminised/asphalted paper& paperboard in roll <15cm, rectangle<15x36cm2
4811109100 Floor covering on a base of paper or paperboard,in Other size

4811109900 Other bituminised/asphalted paper &paper board,in Other size
4811412000 Gummed or adhesive paper&paperboard, self-adhesive,rectangleangle<15x36cm2
4811419000 Gummed/adhesive paper&paperboard,other self-adhesive,in Other sizeHS2012 Description
4811492000 Other gummed or adhesive paper& paperboard in roll <15cm, rectangle<15x36cm2
4811499000 Other gummed or adhesive paper& paperboard,in Other size
4811513100 Floor covering on a paper coated, impregntd wth plastic,bleached,wg>150g/m
4811513900 Other paper coated,impregnated/covered with plastic,bleached,wg>150g/m
4811519100 Floor covering on a paper coated, impregntd wth plastic,bleached,other size
4811519900 Other paper coated, impregnated/covered with plastic,bleached,other size
4811592000 Other paper coated,impregnated/covered with plastics&aluminium foil
4811594100 Floor covering on a paper coated,impreg wth plastic,unbleached,rectangle<15x36cm2
4811594900 Other paper coated,impregnated/covered with plastic,unbleached,rectangle<15x36cm2
4811599100 Floor covering on a paper coated,imptd with plasticun,bleached,other size
4811599900 Other paper coated,impregnated/covered with plastic,unbleached,Other size
4811602010 Paper coated,impregnated/covered with wax,paraffin,stearin,oil,rectangle<15x36cm2
4811602090 Other Paper coated,impregnated/covered wth wax,paraffin,stearin,oil,rectangle<15x36c
4811609010 Paper coated,impregnated/covered with wax,paraffin,stearin,oil,other size
4811609090 Other Paper coated,impregnated/covered with wax,paraffin,stearin,oil,other size
4811904100 Flooring covering a paper,cellulose wadd web of cell fibr roll<15cm,rectangle<15x36cm
4811904900 Other paper, paperboard,cellulose wadding web of cell fibr roll<15cm,rectangle<15x36cm2
4811909100 Flooring covering a paper,cellulose wadd web of cell fibers,Other size
4811909900 Other paper, paperboard,cellulose wadding web of cell fibers,Other size
4812000000 Filter blocks,slabs&plates,of paper pulp
4813100000 Cigarette paper,in the form of booklets or tubes
4813200000 Cigarette paper,in the form in rolls of a width not exceeding 5 cm
4813901000 Cigarette paper,other in the of booklets, tubes & in rolls,width <5 cm, coated
4813909000 Cigarette paper,other in the of booklets, tubes & in rolls
4814200000 Wallpaper&similar wall coverings,consist of peper coaled with a grained, colored
4814900000 window transparencies of paper
4816201000 Self-copy paper (Other than of 48.09)in rolls of a width 25<oneside<36cm
4816209000 Other self-copy paper (Other than of 48.09)
4816901000 Carbon paper
4816902000 Other copying paper
4816903000 offset plates of paper
4816904000 Heat transfer paper
4816909000 Other heat transfer paper & offset plates of paper
4817100000 Envelopes
4817200000 Letter cards,plain postcards and corresp ondence cards
4817300000 Boxes,pouches,wallets & writing compendiums, of paper or paperboard
4818100000 Toilet paper
4818200000 Handkerchiefs, cleansing or facial tissues & towels
4818301000 Tablecloths
4818302000 Serviettes
4818500000 Articles of apparel & clothing, of paper pulp ,paper
4818900000 Other articles of apparel & clothing, of paper pulp,paper
4819100000 Cartons, boxes & cases, of corrugated paper or paperboard
4819200000 Folding cartons,boxes&cases,of non-corru gated paper or paperboard

4819300000 Sacks&bags,having a base of a width of 40 cm or more
4819400000 Other sacks and bags, includinguding cones
4819500000 Other packing containers, includingude record sleeves
4819600000 Box files,letter trays,storage boxes& similar articles,used in offices,shops
4820100000 Registers,account books,note books,order books,diaries &similar articles
4820200000 Exercise books
4820300000 Binders(Other than book covers),folders and file covers
4820400000 Manifold business forms& interleaved carbon sets
4820500000 Albums for samples or for collections HS2012 Description
4820900000 Other exercise book,binders,manifold, albums
4821101000 Printed, labels of a kind for jewelryry, including objects personal carried in pocket
4821109000 Printed,other labels of a kind for jewelry ,including objects personal carried in pocke
4821901000 Other printed,labels of a kind for jewelry ,including objects personal carried in pocke
4821909000 Other printed,other labels of a kind for jewelry, including objects personal carried in
4822101000 Cone of pulp of a kind used for winding textile yarn
4822109000 Bobbins,spools,cops&similar of pulp,other of a kind used for winding textile yarn
4822901000 Other Cone
4822909000 Other bobbins,spools,cops & similar
4823201000 Filter paper in rolls or sheets,in strips,rolls or sheets
4823209000 Other filter paper in rolls or sheets
4823402100 Cardiograph recording paper
4823402900 Other paper for electro-medical apparatus
4823409000 Other rolls,sheets&dials,printed for self- recording apparatus
4823610000 Trays,dishes,plates,cups&the like,of paper or paperboard of bamboo
4823690000 Trays,dishes,plates,cups&the like,of paper or paperboard of other than bamboo
4823700000 Molded or pressed articles of paper pulp
4823901000 Cocooning frames for silk-worms
4823902000 Display cards for jewelry, including objects personal carried in pocket,in handbag
4823903000 Dia-cut polyethylene coated peperboard of a kind for manufacture of paper cups
4823904000 Paper tube sats of kind used for the manufacture of fireworks
4823905100 Kraft paper,in rolls of a width of 209 mm weight 150 g/m2 or less
4823905900 Kraft paper,in rolls of a width of 209 m Other weight
4823906000 Punched jacquard cards
4823907000 Fans & hands screen
4823909200 Joss paper
4823909400 Cellulose wadding and webs of cellulosa Fibers,coloured or marbled all
4823909500 Othere floor coverings on a base of paper Paperboard
4823909600 Other, cut to shape Other than rectangleangleular or square
4823909900 Other,cut to size/shape,Other than in Strips, rolls or sheets
4901100000 Printed books,brochures and similar print in single sheets, whether or not folded
4901910000 Dictionaries and encyclopedias, and serial instalments thereof
4901991000 Educational, technical, scientific, historical or cultural books
4901999000 Other printed books,brochures, and similar printed
4902100000 Newspapers,journals & periodicals appearing at least four times a week
4902901000 Newspapers, journals & periodicals Other appearing at least four times a week
4902909000 Other newspapers,journals & periodicals
4903000000 Childrens picture,drawing or coloring books.

4904000000 Music,printed or in manuscript,whether or not bound or illustrated.
4905100000 Globes
4905910000 Maps & hydrographic/similar charts of all kinds,in book form
4905990000 Other maps&hydrographic or similar charts of all kinds
4906001000 Plans&drawings,includinguding photographic reproductions on sensitised paper
4906009000 Plans&drawings,includinguding photographic reproductions on carbon copies
4907001000 Banknotes, being legal tender
4907002100 Postage stamps, unused
4907002900 revenue and similar stamps, unused
4907004000 Stock,share/bond certificates&similar documents of title; cheque forms
4907009000 Other similar stamps of current/new issue in the country in which they have
4908100000 Transfers (decalcomanias), verifiable
4908900000 Other transfers (decalcomanias), verifiable
4909000000 Printed/illustrated postcards, card greetings, messages/announcements
4910000000 Calendars of any kind, printed, including calendar blocks.HS2012 Description
4911101000 Catalogues listing only education historical or cultural books & publication
4911109000 Other trade advertising material, commercial catalogues and the like
4911912100 Wall pictures, anatomical or botanical diagrams and charts
4911912900 Other wall picture & diagrams for instructional purposes
4911913100 Printed picture & photograph, anatomical/ botanical diagram/charts
4911913900 Other printed picture & photograph other anatomical/botanical diagram/charts
4911919000 Other picture, designs & photograph
4911991000 Printed card for jewelry, small object personal adornment/articles in pocket
4911992000 Printed labels for explosives
4911993000 Educational, technical, scientific, historic or cultural printed on a set of cards
4911999000 Other printed card, printed labels, educational printed on a set of cards

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