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Policy brief

Natural Capital Accounts and Policy in Indonesia

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WAVES

Natural Capital Accounts and Policy in Indonesia

Natural capital accounting is a system for assessing sustainability and resilience of the economic growth model

(photo in cover)
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Indonesia is a diverse archipelago nation of more than 300 ethnic groups and has the largest economy in Southeast Asia. Indonesia has the world's fourth largest population, 10th largest economy in terms of purchasing power parity, the 14th largest in area and a member of the G–20. From 2000 to 2010, Indonesia sustained an average economic growth rate of about 6% owing it to a large extent to its rich natural asset base. Continuous growth has allowed the country to become a middle-income country reducing the poverty rate from 70% in 1984 to less than 10% today. [1]

Development in Indonesia has resulted in reduced poverty but has been accompanied by significant pressure on natural capital, which is likely to threaten prospects for sustaining future growth. Indonesia's high economic growth relies largely on natural resources, with agriculture, forestry and fishing contributing 11.4% to GDP. Agriculture has mainly relied on expansion into new lands, particularly for oil palm, causing many environmental problems, including loss of forests (22 million ha between 1990 and 2014), reduced biodiversity and high carbon emissions (1,454 $MtCO_2$-eq. in 2016). The resulting air pollution from these emissions have caused serious health effects in Indonesia's population and recent estimates indicate that the total annual cost of premature deaths from air pollution is equivalent to about 3.5% of Indonesia's GDP (2015).[2]

The Government of Indonesia has become increasingly aware of the overall importance of natural capital and is proactively addressing the challenges of managing it. Indonesia's National Medium-Term Development Plan (RPJMN) made a strong commitment to sustainable development.[3] The Government has also pledged to achieve the Sustainable Development Goals (SDGs), deliver on the country's Nationally Determined Contribution (NDC), and green Indonesia's growth trajectory. Crucial to reaching these

1 Indonesia Systematic Country Diagnostic (World Bank, 2015); World Bank Data (World Bank: PovcalNet, n.d.); WB staff calculations World Bank Data (World Bank, 2018); Indonesia Country Partnership Framework (World Bank, 2015)

2 Closing the Development Gap: Development Policy Review 2019 (Word Bank, 2019) These estimates do not include the burden of air pollution on Indonesia's neighbor countries. Measuring them will add accuracy and transparency to the estimations.

3 Indonesia's economic planning follows a 20–year development plan, spanning from 2005 to 2025. It is segmented into 5–year medium-term plans, called the RPJMN (Rencana Pembangunan Jangka Menengah Nasional) each with different development priorities. The current medium-term development plan – the third phase of the long-term plan – runs from 2015 to 2020.

4 The standard international agreed methodology to develop NCA is the System of Environmental-Economic Accounting (SEEA) which provides the basis for assessing the contribution of natural capital to the economy, and for evaluating the impacts of the economy to the environment. Further information on this methodology can be found at https://seea.un.org/

targets is a credible and reliable natural capital accounting (NCA) system for assessing sustainability and resilience of country's economic growth model.[4]

Amongst the many actions the government is taking towards a sustainable growth pathway, three are of special relevance given their forward looking perspective and the policy impact they are having. These actions include: (a) development and strengthening of an Indonesian System of Environmental-Economic Accounts (SISNERLING) that can inform policy decisions, emphasizing the need to provide a better understanding of the relationship between the economy and the environment, (b) development of a comprehensive analysis on opportunities for low carbon development and green growth in collaboration with a broad alliance of partners, including the World Bank, and, (c) adoption of legislation on natural capital accounting as part of a broader set of recent policies and legislation.

The World Bank led Wealth Accounting and the Valuation of Ecosystem Services (WAVES) made important contributions on the three aspects mentioned above. These contributions, including the main findings of the accounts developed, the focus of the Synthesis Report. Indonesia formalized its association to WAVES in 2015, with the objective to introduce a systematic approach to NCA that could be institutionalized and that could inform policy dialogue, with a special focus on the national medium-term development plan (RPJMN). NCA implementation was developed through a National Steering and Technical Committee guided by a group of agencies led by the Ministry of Planning (BAPPENAS), the Statistical Agency (BPS), and the Ministry of Finance (MOF). Highlights from WAVES contributions include:

01

The process of building the accounts to strengthen SISNERLING and the results obtained were useful to increase the recognition of natural capital as an important element in Indonesia's economic growth narrative.[5]

Under the WAVES Program new accounts were developed. Land cover accounts were developed at the national level, and ecosystem extent accounts were developed for Sumatra and Kalimantan. Feasibility of implementation and an initial pilot water account was developed for the Citarum Watershed. Ecosystem Accounts for Peatlands were developed for Sumatra and Kalimantan for three types of ecosystem services: provisioning services (timber, oil palm, biomass, and paddy production), regulating services (CO_2 sequestration) and, cultural services (protected habitat). Some key findings from these accounts are extracted in this summary and detailed in the core part of the document.

5 Indonesia has been using the System of Environmental-Economic Accounts (SEEA – or SISNERLING its acronym in Bahasa) for NCA for 30 years. See www.wavespartnership.org.

02

Comprehensive analysis of prospects of a low carbon economy allowed Indonesia's Government to understand ways to grow sustainably and reduce pressure to natural capital.

Bappenas, in cooperation with several development partners, including the World Bank, introduced the Low Carbon Development Initiative for Indonesia (LCDI) to explicitly incorporate GHG emissions reduction targets into the country's RPJMN 2020–2025, along with other interventions for preserving and restoring natural resources.[6] The research carried out under the LCDI built on previous work and expanded the analysis to develop forecasts using a systems approach.[7]

Technical assistance under WAVES contributed to this approach and overall modelling exercise through development of natural capital methodologies, protocols, models and SEEA compliant data that were particularly useful to introduce and analyze carrying capacity, which is a concept that helps understand how growth could be constrained by the limits of natural capital stocks to provide ecosystem services (i.e. provisioning, regulating and cultural services). Arguably this represents one of the main contributions in terms of policy uptake, as this work underpins decisions that will be made in the next five-year policy cycle. One of the key findings of the LCDI report is that a low carbon growth path can deliver an average GDP growth rate of 6% annually until 2045. Through the sustainable utilization of its natural resources, and by reducing its carbon and energy intensity, Indonesia's total GHG emissions can fall by nearly 43% by 2030.

This surpasses Indonesia's target in its national climate action plan, or Nationally Determined Contribution (NDC), presently set at 41% below baseline. In these scenarios, forested land is also predicted to expand, while fish stocks should remain stable, and peat degradation largely avoided. Investments totaling between US$ 14.6 billion to US$ 22.0 billion per year for the period 2020–2024, are required to realize such improvements. This is equivalent to between 1 and 1.7% of GDP: it compares well to Gross Fixed Capital Formation, which has been in the order of 30% of GDP over the last ten years.

(below)
Photo by Kelly Lacy from Pexels.com

6 Indonesia's nationally determined contributions (NDC) includes a unilateral reduction target of 29% (~2,869 $MtCO_2$-eq) below Business as Usual (BAU) emissions of Greenhouse gases (GHGs) by 2030, plus a conditional target of up to 41% reductions below BAU with sufficient international support. (Bappenas, 2019) It targets 2030 emissions of 2,037 $MtCO_2$-eq. under the unconditional target and emissions as low as 1,693 $MtCO_2$e under the conditional target. (WRI, 2017)

7 World Bank Low Carbon Development: A paradigm Shift Towards a Green Economy in Indonesia (Bappenas, 2019)

03

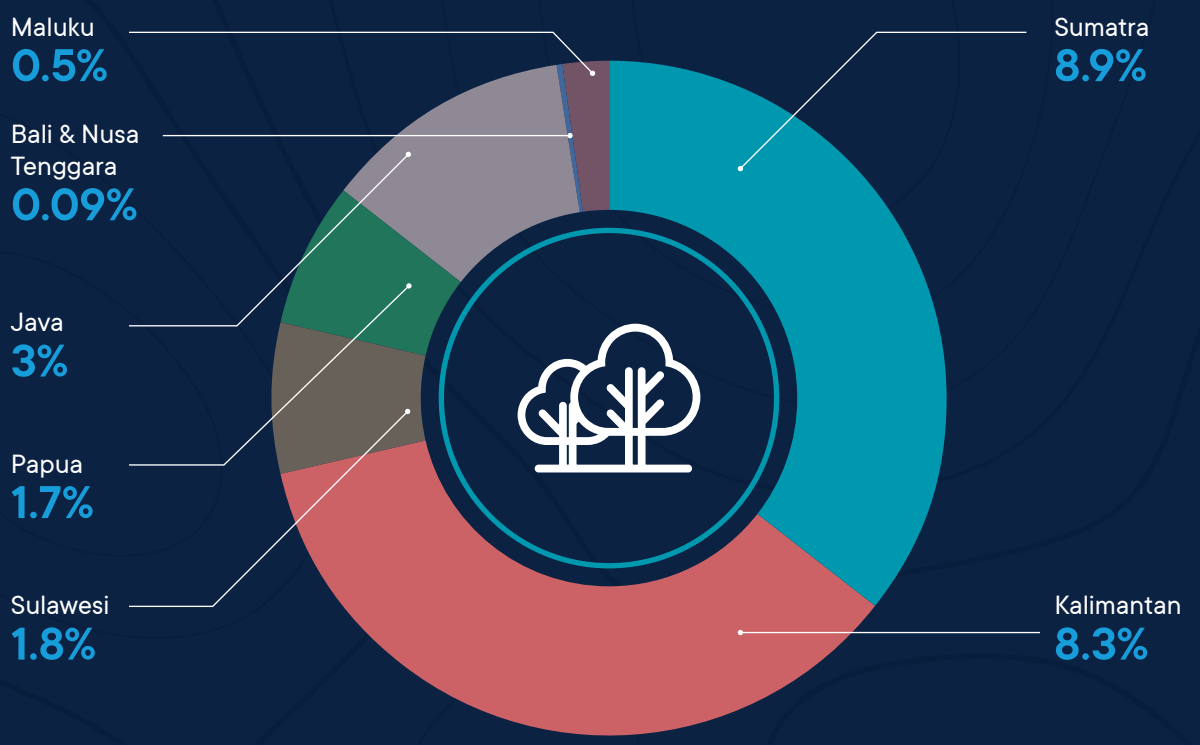
Accounts were institutionalized through innovative legislation as part of the broader legislation on natural capital and economic instruments.

Interagency coordination played a key role to WAVES effective support in Indonesia for setting the basis for institutionalization of the user-producer coordination mechanisms. Recognizing that good data are essential for evidence-based policy, the Government of Indonesia made improved information on natural capital legally mandated since 2009.[8] Building on this previous legislation, WAVES facilitated interagency collaboration on data and policy, largely owing to an institutionalized Steering Committee that led the Deputy Minister of Maritime and Natural Resource of Bappenas to issue a new Decree Number KEP.53/DEP.3/10/2017, replacing the previous Decree Number KEP.41/DEP.V/03/2016, on the establishment of the Coordinating Group for SISNERLING implementation. Furthermore, the engagement with BPS and other agencies informed the development of the draft strategic Plan for SEEA Implementation (SEEA Roadmap) which is a critical instrument for BPS to institutionalize accounts efforts. In the context of related legislation, WAVES' support to the Ministry of Finance (MOF) fed into policy dialogue towards the regulation on Fiscal Potential of Natural Resources, with the new draft regulation -still under discussion and not public- largely based on the WAVES Program lessons learned from other countries and as part of the capacity building activities developed with the MOF.

(below)
Photo by Tom Fisk from Pexels.com

8 Law No.32/2009 on Environmental Protection and Management

Figure 1. Indonesia: Forest cover loss by Island between 1990 and 2014
Million hectares and percentages

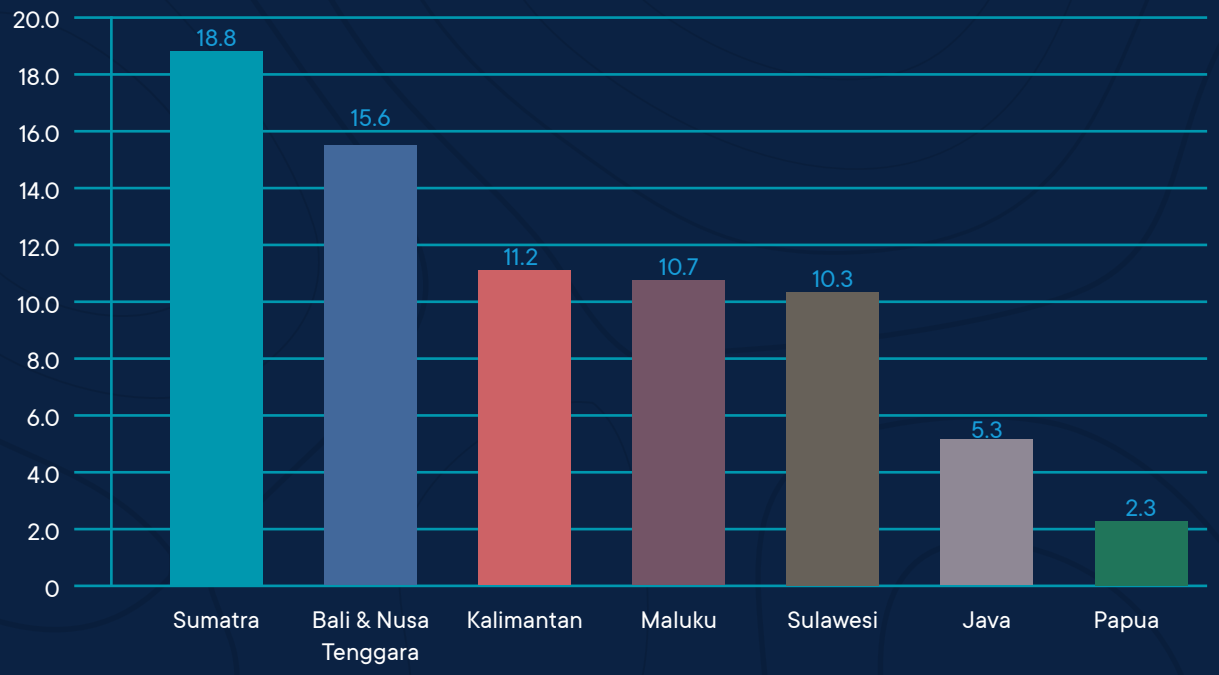


Source: Indonesia Land Account (BPS with WAVES Support)

Land accounts developed under WAVES provided important insights on how forests and peatlands are threatened by agricultural expansion, particularly in Sumatra and Kalimantan. Indonesia lost about 22 million ha of natural forest between 1990 to 2014 and around 6 million ha of forest became perennial crop, mostly dominated by oil palm plantations but also acacia, mainly for pulp and paper production.[9] With an average annual loss of 0.9 million ha between 1990 to 2014, Sumatra and Kalimantan had the highest forest losses with 8.9 and 8.3 million ha of forests lost in the same period, respectively (Figure 1 and 2). The Island of Bali and Nusa Tenggara however had the highest forest cover loss with respect to their entire land area.

9 Indonesia Land Account (BPS, Forthcoming)

Figure 2. Forest cover lost relative to Island area (%)



Peatlands cover approximately 8% of Indonesia's land surface and are important for oil palm cultivation, one of the main agricultural commodities currently produced in Indonesia. Other agricultural products (provisioning services)[10] important to Indonesia's economy include timber and paddy production, and biomass production for pulp. Yet given the increasing scarcity of unused land, the pressure to convert peatland to cropland or plantation forestry areas are still expanding.

The Ecosystem Account for Peatlands was divided in four main categories to analyze the state and trends of this critical ecosystem: extent accounts, conditions accounts, ecosystem services accounts and carbon accounts. The account compiled was limited to the best available information at the time and therefore some aspects relevant for these types of ecosystems were left out, for example some ecosystem services such as flood protection, forest fire prevention and hydrological services were not included.

The extent account for peatlands revealed that 52% of peat forests in Kalimantan and Sumatra have been converted to other types of land cover between 1900 and 2014. In both Sumatra and Kalimantan plantation areas and agricultural land

10 Ecosystem services are the benefits that people derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems and which may include food, freshwater, timber, fibers, and medicinal plants; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes and which may include surface water purification, carbon storage and sequestration, climate regulation, protection from natural hazards; (iii) cultural services, which are the non- material benefits people obtain from ecosystems and which may include natural areas that are sacred sites and areas of importance for recreations and aesthetic enjoyment; and (iv) supporting services, which are the natural processes that maintain the other services and which may include soil formation, nutrient cycling and primary production (MEA).

expanded drastically during the same period. This led to increases in the production of plantation crops such as oil palm fruit, rubber and acacia. However, this changes also lead to various environmental impacts such as high carbon emissions, degraded peatlands, fire and smog formation with associated health impacts. Over time, agricultural activities will not be maintained because of soil subsidence in drained peatlands and subsequent flood risks.[11]

Three selected indicators in the ecosystem condition account revealed an overall and increasing degradation of peatland ecosystems:

a. Vegetation Biomass:

In addition to carbon in soils, peatlands also store noteworthy amounts of carbon in vegetation. The reduction of vegetation density in peat forests by fires, deforestation and land conversion, decreases the carbon content due to biomass loss and peat decomposition. Total dry biomass in Sumatra and Kalimantan peatlands decreased 35% and 27% respectively between 1990 and 2015. Around 91% (Sumatra) and 95% (Kalimantan) of total biomass in 1990 was stored in forests, but this number decreased to 46% and 76% respectively by 2015.

b. Water Level:

Ideally, to prevent subsidence and fire, groundwater levels should be maintained between 40 cm below and 100 cm above the peat surface.[12] The indicator used for the account only includes the annual average groundwater depth, but the level varies within a year. The estimations showed that the annual average of water level in 2013 varied from 0–117 cm in Sumatra and from 0–96 cm in Kalimantan. The deepest drainage was in the areas of perennial crop, plantation forest, bare land and degraded peat swamp forest in the distance less than 500 m from those areas. It was deeper in north-eastern parts of Sumatra.

c. Forest Fire:

The number of fires is used as indicator to track the temporal and spatial distribution of fire incidents in peatlands. Between 2006 to 2014, the total number of fires in peatlands increased by 36 percent in Sumatra and 24 percent in Kalimantan and they occurred in peatlands covered by wet shrubland in all the years that where measured (2006, 2009 and 2014).

The ecosystem services account that tracked six main ecosystem services provided by Indonesian peatland, including the production of oil palm, biomass for pulp, paddy, timber, CO_2 sequestration, and protected land as biodiversity habitat. However, in economic analyses of land use options in peatlands also externalities (such as health effects of peat fires and CO_2 emissions) and the long-term forecasts of production need to be considered. The current and future increases in flood occurrence in peatlands due to soil subsidence are not yet included in the accounts, and this is a priority for further work, so the peat accounts can more meaningfully be used to advice policy makers.

11 Indonesia Ecosystem Account for Peatlands (BPS, Forthcoming)

12 See Wosten et al http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.504.3121&rep=rep1&type=pdf

The pattern of land use and land use change observed in peatland since 2000 has resulted in large carbon emissions. The combined effect of peat drainage (which releases carbon stored in peat, resulting in CO_2 via oxidation upon contact with the atmosphere), land use change and forest fires caused an increasing amount of CO_2 emissions from peatlands in Sumatra and Kalimantan, in the order of over 40% (or more) of total GHG emissions in Indonesia; the bulk of peatland emissions (some 95% on average) comes from oxidation in drained soils and from fires (Table 1). These figures are telling in terms of the key role that peatland management will have in the near future for Indonesia's contribution to global climate action. The share of peatlands in the country's total emissions will be even larger once Papua's peatlands are included in the tally.

Table 1. CO_2 emissions from peatlands in Sumatra and Kalimantan (Million Tons)

Sources of emissions	1995 (a)	2000	2005 (a)	2010	2014	Average share (2005–2014) (b)
Land use change (c)	73.40	108	45	58.75	28.8	4%
Oxidation (d)	240	273	294	333	387	34%
Fire (e)			704	508	610	61%
Total	313	381	1,043	900	1,026	100%
Total Emission Indonesia (f)	1,435	1,315	1,749	2,285	2,472	
Peatland emissions in Sumatra and Kalimantan relative to total emissions (g)			60%	39%	42%	46%

Source: Indonesia Ecosystem Account for Peatlands (BPS with WAVES Support)[13]

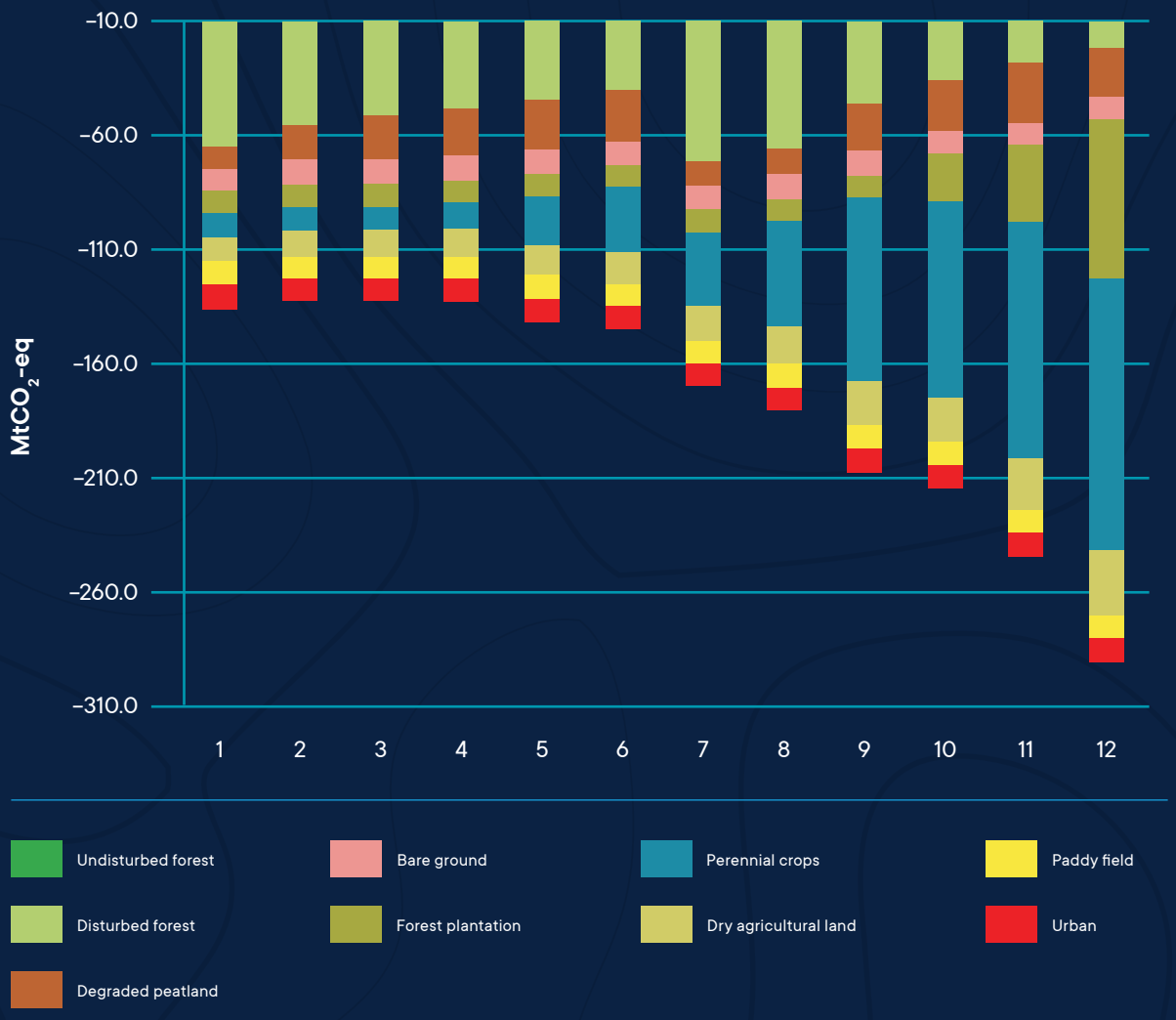
Notes

(a) : estimates for each year were published the following year (e.g. the emissions for 1995 were published in 1996)
(b) : emissions related to the release of carbon stored in above-ground biomass following land clearance
(c) : the figure is the average just for the three years included in the period (i.e. 2005, 2010 and 2014) and not over the whole period 2005 to 2014
(d) : the figures oxidation-related emissions are likely to be under-estimated because they are based upon conservative assumptions regarding the area of peatland covered with plantations, the occurrence of peatlands (both are in line with government data) and the drainage level in plantations. The numbers are based on government data on land cover (KLHK map).
(e) : estimates for forest fires-related emissions are not available for 1995 and 2000
(f) : Source: WRI ClimateWatch/ CAIT, which includes FAO estimates for Forestry and Other Land use emissions. FAO indicates that CH4 and N2O, and additional CO_2 emissions are estimated for fires and drainage of organic soils which mean that their estimates include oxidation-related emissions (http://www.fao.org/faostat/en/#data/GL)
(g) : Peatland emissions refer only to Sumatra and Kalimantan. Once other islands (and in particular Papua) are included, the share in total emissions would probably be higher

13 These are preliminary figures and the numbers are based on government data on land cover (KLHK map).

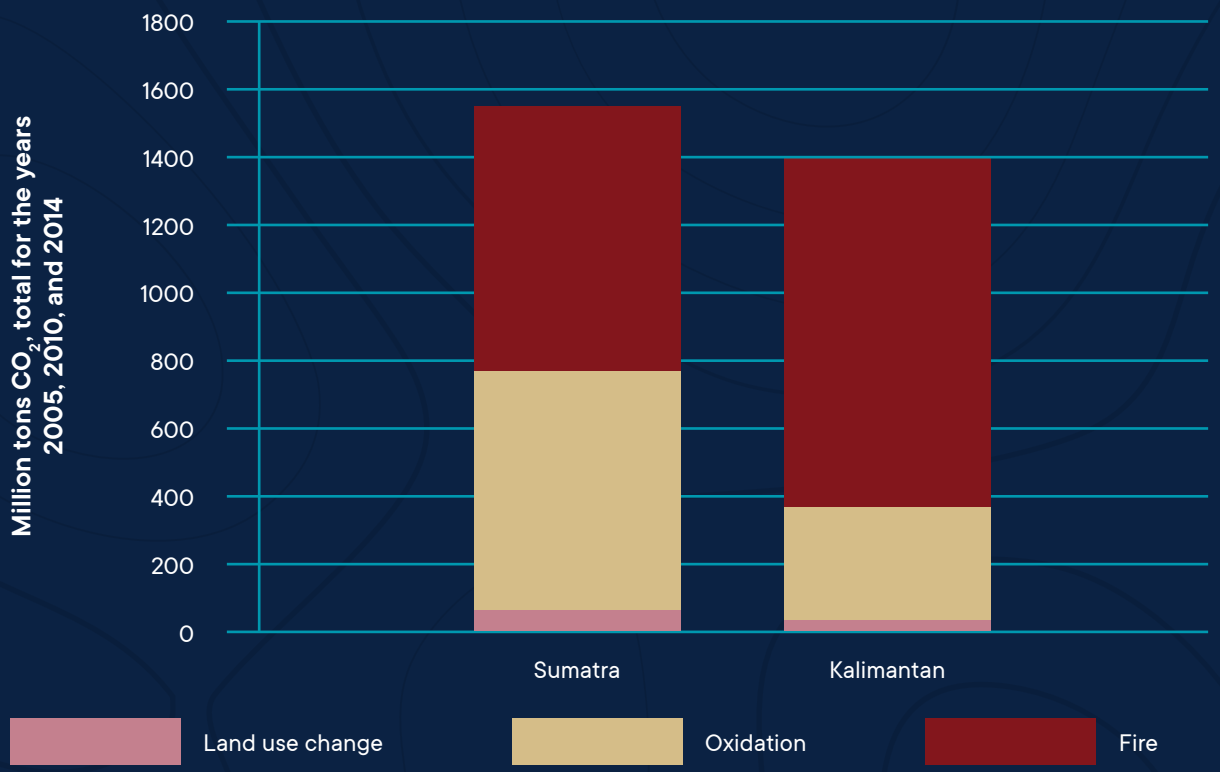
In terms of spatial patterns of peatland emissions, Sumatra's contribution to the total was larger than Kalimantan, and featured a larger share of oxidation in total emissions (Figure 3). In terms of spatial patterns of peatland emissions, Sumatra's contribution to the total was larger than Kalimantan, and featured a larger share of oxidation in total emissions (Figure 2a). Conversion of forests to perennial crops (palm oil in particular) and plantations, as well as disturbance to forest, were the leading drivers of emissions caused by oxidation in peatlands were most severe in Sumatra than Kalimantan (Figure 4). Peat drainage leading to atmospheric oxidation of organic carbon means that the net carbon (CO_2) emissions increased by 57% to 387 $MtCO_2$/year over a 25-year period.

Figure 3. CO_2 emissions in peatlands from oxidation



Source: Indonesia Ecosystem Account for Peatlands (BPS with WAVES Support)

Figure 4. CO_2 emissions in peatlands by Island



While WAVES made important contributions in terms of account development, stakeholder engagement and initial policy impacts, there is still wide scope for fully mainstreaming natural capital in development planning and decision making. A key aspect is to demonstrate the full potential of the accounts to examine trade-offs faced when making development decisions, between the gains achieved by transforming natural capital into productive assets, and the losses associated with a reduction in the ecosystem services that natural capital delivers.

This type of assessment requires additional modeling and monetary valuation of non-market services, not included in the scope of the WAVES Program. Land and ecosystem accounts show that peatlands would be a natural candidate for such a more in depth, forward looking analysis.[14]

14 Indonesia has 45% of the world's tropical peatlands and it is estimated they are among the world's largest carbon pools, storing around 13.6 to 40 Gt of carbon (50–145 Gt on CO_2), which is equivalent to 1.3 to 4 years of global emissions of CO_2 from fossil fuel sources. An appraisal of Indonesia's immense peat carbon stock using national peatland maps: uncertainties and potential losses from conversion (Warren, Hergoualc'h, Kauffman, Murdiyarso, & Kolka, 2017)

Wealth Accounting and the Valuation of Ecosystem Services

WAVES is a World Bank-led global partnership that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts.

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