Pilot ecosystem account for Indonesia peatlands in Sumatera and Kalimantan

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BPS-Statistics Indonesia
SEEA IMPLEMENTATION IN INDONESIA

1990
BPS started to compile SISNERLING

2012
SEEA-CF was adopted by UNSC as international statistical standard

2014
Indonesia was chosen by FAO as pilot country to test SEEA-AFF

2015
WAVES program concept for Indonesia was approved by World Bank

2016
Implementation of SEEA-CF 2012 in SISNERLING Indonesia
- BPS start to compile Land Account, with 2-weeks internship at ABS

2017
BPS started to compile flow accounts, with support from UNSD & Statistic Denmark

Pilot ecosystem account, with help from intern student from Wageningen University

Coverage of Natural Resources Accounts in SISNERLING 2017

Timber Asset Account
- Physical
- Monetary

Mineral & Energy Asset Account
- Physical
- Monetary

Land Account
- Physical
2017 Pilot peat ecosystems in Indonesia focused on:
1. Extent account: changes of peatland land cover
2. Condition account: changes in the environmental state of precipitation, hotspot, water level and vegetation biomass
3. ecosystem services account: oil palm, biomass for pulp, paddy, timber, CO₂ sequestration, and biodiversity habitat
4. carbon account: to monitor the change in carbon stocks and emissions (net carbon flux and peat forest fires) in peatlands

(Source: MoARI (2011))

- Indonesia has 14.9 Mha peatlands (7.9% of its land cover)
- The peatlands scatter mainly 43% in Sumatra, 32% in Kalimantan, and 25% in Papua

(Based on internship report by Resti Salmayenti, master student at the Wageningen University)
Summary table

<table>
<thead>
<tr>
<th>Ecosystem condition</th>
<th>Sumatra</th>
<th>Precipitation</th>
<th>mm/year</th>
<th>2633</th>
<th>2571</th>
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<tbody>
<tr>
<td></td>
<td>Hotspots</td>
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<table>
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<tr>
<th>Ecosystem services</th>
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<th>Timber production</th>
<th>1000m³</th>
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<td>Biodiversity habitat</td>
<td>1000ha</td>
<td>1089</td>
<td>885</td>
<td>679</td>
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<td>Kalimantan</td>
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<td>1000m³</td>
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<td>Biodiversity habitat</td>
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<table>
<thead>
<tr>
<th>Carbons</th>
<th>Sumatra</th>
<th>Carbon stocks</th>
<th>MtCO₂</th>
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<td>Kalimantan</td>
<td>Carbon stocks</td>
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</table>

Note: *ES based on land cover data, *vegetation, *average value in plantation and agricultural lands, *net carbon flux, *from peat forest fires

(Based on internship report by Resti Salmayenti, master student at the Wageningen University)
Main results

1. It is found that 52% of peat forests in Kalimantan and Sumatra in 1990 have been converted to other land uses in 2014. Conversion of peat forests in Sumatra was more significant compared to peat forest conversion in Kalimantan.

2. Oil palm production has expanded significantly and generated the highest monetary value.

3. Around 31% of carbon stocks in 1990 was lost in 2014.

4. Meanwhile, the total emissions from net carbon (CO2) flux increased by 74% during the same period. Depending upon the costs attribute to the emitted carbon, the costs of these emissions may exceed the benefits of the plantation cropping.
Challenges

- Firstly, land cover maps from MoEFRI are only able to distinguish the land cover between perennial crop, forest plantation, wet and dry agricultural land. In fact, peatlands are converted to diverse agricultural purposes such as oil palm, rubber, coconut palm, paddy, sago, and other types of horticultural and seasonal plant. This limits the study to analyse more detailed information about economic activities (provisioning services) in peatlands.

- Second, the prediction of the future condition is essential to support policy-making process. This information is not provided in the accounts because the framework of SEEA is based on the historical and current data. Even though there is an ecosystem asset account in SEEA that is able to predict the net present value (NPV) of the ecosystem assets. This account is developed for a specific discount period, like for 15-25 years, to evaluate future cash flows based on the present value.
### Table 2. Indicators for physical value of specific ES provided by peatland ecosystem in Indonesia

<table>
<thead>
<tr>
<th>Type of ES</th>
<th>ES specification</th>
<th>Indicator</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning</td>
<td>Timber production*</td>
<td>Annual timber harvested (m(^3)/year)</td>
<td>Timber production rate(*)total forest area (excluding forest in protected area)</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil palm</td>
<td>Annual fresh fruit branch (FFB) of oil</td>
<td></td>
<td>Oil palm (FFB) production rate(*)total area of oil palm plantation</td>
</tr>
<tr>
<td>production</td>
<td>palm harvested (ton/year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>Annual acacia biomass harvested (m(^3)/year)</td>
<td></td>
<td>Biomass (acacia) production rate(*)total area of acacia plantation</td>
</tr>
<tr>
<td>production</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>for pulp*</td>
<td>Annual paddy harvested (ton/year)</td>
<td></td>
<td>Paddy production rate(*)total area of paddy field</td>
</tr>
<tr>
<td>Paddy production*</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Regulating</td>
<td>(\text{CO}_2) sequestration*</td>
<td>Net carbon ((\text{CO}_2)) flux of undisturbed forests (ton (\text{CO}_2)/year)</td>
<td>Net carbon ((\text{CO}_2)) flux of undisturbed forests(*)total area of undisturbed peat forest</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural</td>
<td>Biodiversity habitat*</td>
<td>Total area of peat swamp forests inside protected areas that are not converted to other land uses since 2000 (ha)</td>
<td>Total area of peat forest in protected area</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
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</tbody>
</table>

*ES estimated from MoEFRI land cover data
<table>
<thead>
<tr>
<th>Type of ES</th>
<th>ES specification</th>
<th>Indicator</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning</td>
<td>Timber production*</td>
<td>Resource rent (IDR/year)</td>
<td>(Timber price*total production) - production cost</td>
</tr>
<tr>
<td>services</td>
<td>Oil palm production*</td>
<td>Resource rent (IDR/year)</td>
<td>(FFB price*total production) - production cost</td>
</tr>
<tr>
<td></td>
<td>Biomass production for pulp*</td>
<td>Resource rent (IDR/year)</td>
<td>(Biomass price*total production) - production cost</td>
</tr>
<tr>
<td></td>
<td>Paddy production*</td>
<td>Resource rent (IDR/year)</td>
<td>(Paddy price*total production) - production cost</td>
</tr>
<tr>
<td>Regulating</td>
<td>CO₂ sequestration*</td>
<td>Social cost of carbon (IDR/year)</td>
<td>Total CO₂ sequestration*cost of carbon (CO₂)</td>
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<tr>
<td>services</td>
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<tr>
<td>Cultural</td>
<td>Biodiversity habitat*</td>
<td>Restoration cost (IDR/year)</td>
<td>Total area of peat forest in protected area*restoration cost</td>
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<tr>
<td>services</td>
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</tbody>
</table>

*ES estimated from MoEFRI land cover data

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