Earth Observation to support sustainable development – providing objective evidence for development cooperation

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New satellites - new monitoring possibilities

Number of available scenes per year

Source: GEO-Wetlands Community Portal
Deforestation of the Amazon

Rondônia, Brazil

1984-2014
General requirements for EO in development cooperation

- Understanding of the political and institutional framework
- Integrative and actor-specific solutions
- Demonstrating benefits at technical working level and policy level
- Easy access and use of EO products
- Sustainability of EO solution
- Capacity development on various levels
- Institutionalization
EO supporting development cooperation (simplified)

Political & legal bodies and authorities (mandates)

- Status (assess)
- Priorities (identify)
- Effects (learn)

Intervention

Outcomes:
Improved knowledge for evidence-based decision making
(policies, risk profiling, intervention strategy, community awareness)
Benefits for development cooperation

EO can provide a **holistic approach**

- **Wetland Extent**
  - SDG Target 6.6

- **Wetland use intensity**
  - SDG Target 2.4
  - SDG Target 15.3

- **Wetland cover types**
  - SDG Target 15.1
  - SDG Target 15.3

- **Water Occurrence**
  - SDG Target 6.1
  - SDG Target 6.4
  - SDG Target 6.6

- **Population density near water**
  - SDG Target 6.4

- **Malaria risk**
  - SDG Target 3.2
  - SDG Target 3.3

- **Potential breeding sites**
  - SDG Target 6.3
Benefits for development cooperation

EO can support the **planning of interventions**:

Priority maps ideally linked to interventions, value chains, economic viability
Benefits for development cooperation

Supporting the **evaluation of interventions:**

- EO can provide measurable, comparable and quantitative parameters for evaluating the impact of programmes/projects (success indicators)
- Only development cooperation projects with successfully measured indicators can promote further implementation
- Should be considered already in the planning phase of programmes

Spatial variables used as indicators for success of fragmentation of fire risk areas through fire management.

![Spatial variables table]

<table>
<thead>
<tr>
<th></th>
<th>2013 max. fuel fragment [ha]/total fragment area [ha]</th>
<th>2016 max. fuel fragment [ha]/total fragment area [ha]</th>
<th>Percentage difference</th>
<th>2013 mean fuel fragment size [ha] with SD</th>
<th>2016 mean fuel fragment size [ha] with SD</th>
<th>Percentage difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMZ 1</td>
<td>0.34</td>
<td>0.30</td>
<td>~10%</td>
<td>102.5 ± 568.7</td>
<td>74.4 ± 545.9</td>
<td>~38%</td>
</tr>
<tr>
<td>FMZ 2</td>
<td>0.89</td>
<td>0.16</td>
<td>~81%</td>
<td>322.3 ± 2474.8</td>
<td>50.0 ± 257.5</td>
<td>~545%</td>
</tr>
<tr>
<td>FMZ 3</td>
<td>0.49</td>
<td>0.45</td>
<td>~8%</td>
<td>268.7 ± 1672.3</td>
<td>121.9 ± 971.2</td>
<td>~120%</td>
</tr>
<tr>
<td>FMZ 4</td>
<td>0.39</td>
<td>0.75</td>
<td>92%</td>
<td>90.6 ± 484.8</td>
<td>110.5 ± 1422.3</td>
<td>18%</td>
</tr>
<tr>
<td>FMZ 5</td>
<td>0.41</td>
<td>0.39</td>
<td>~4%</td>
<td>79.9 ± 461.2</td>
<td>145.0 ± 1186.6</td>
<td>45%</td>
</tr>
<tr>
<td>FMZ 6</td>
<td>0.76</td>
<td>0.19</td>
<td>~75%</td>
<td>98.9 ± 799.9</td>
<td>35.5 ± 167.9</td>
<td>~179%</td>
</tr>
<tr>
<td>FMZ 7</td>
<td>0.48</td>
<td>0.16</td>
<td>~66%</td>
<td>46.3 ± 348.2</td>
<td>14.6 ± 80.2</td>
<td>~217%</td>
</tr>
<tr>
<td>FMZ 8</td>
<td>0.27</td>
<td>0.66</td>
<td>140%</td>
<td>106.4 ± 435.5</td>
<td>38.8 ± 507.8</td>
<td>~174%</td>
</tr>
<tr>
<td>FMZ 9</td>
<td>0.65</td>
<td>0.59</td>
<td>~9%</td>
<td>297.7 ± 2376.6</td>
<td>71.6 ± 955.8</td>
<td>~316%</td>
</tr>
</tbody>
</table>
Capacity development
Indonesian Peat Mapping Challenge

- 1 Mio. USD for the most accurate, timely, and cost-effective peatland mapping method
- 44 researcher teams competed over 2 years
- The Scientific Advisory Board selected the International Peat Mapping Team (IPMT)
- Geospatial Information Agency (BIG) defined this method as a standard and issues a regulation on peatland mapping
- The methodology and the final peat maps serves Indonesian government’s One Map Policy.
- Development of a fuel load mapping approach in support of integrated fire management
- Direct support of federal protected area management
- National and state level authorities have successfully institutionalized the approach
- A draft bill of an IFM National Fire Policy has been submitted to the Parliament for approval

Key Messages

- Earth Observation can support development cooperation in the assessment, planning and evaluation of interventions
- Helps to prioritize interventions and to understand their impacts
- Institutionalization is key for implementing sustainable EO approaches
- Identification of co-benefits following a holistic approach
- Quantitative spatial indicators are needed to measure socio-ecological impacts of development cooperation programmes
- Best practices of evidence-based decision support through EO can directly influence policies
Thank you for your attention!
Background and objectives

- Sumatra 480,000 km²
- Kalimantan 536,000 km²
- Papua 460,000 km²
Sentinel-1 mosaic Borneo – Burned areas in high spatial detail

Burned area map in 20 m spatial resolution
Burned area and fire emissions derived from Sentinel-1

- **Burned area** for Indonesia’s fire catastrophe:
  - 2015: 46,046 km²
  - 2016: 1,751 km²

- **Emissions** include aboveground vegetation and peat emission estimates:

  
<table>
<thead>
<tr>
<th>Year</th>
<th>Vegetation (Gt CO2e)</th>
<th>Peat (Gt CO2e)</th>
<th>Total (Gt CO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>0.49</td>
<td>0.40</td>
<td>0.89</td>
</tr>
<tr>
<td>2016</td>
<td>0.07</td>
<td>0.05</td>
<td>0.12</td>
</tr>
</tbody>
</table>

**GFED:**
1.75 Gt CO2e

Less emissions compared to GFED, result from considering the number of recurrent fires and peat consumption*

*Lohberger et al. 2017 Global Change Biology

*Konecny et al. 2016 Global Change Biology
Results Burned Area 2015

Sumatra: 15,181 km² 3.34%

Kalimantan: 22,684 km² 4.23%

Papua: 8,181 km² 2%

Total burned area: 46,047 km² 3.29%
The ratio of emissions from aboveground biomass to peat changes over time.

In the past proportionally more emissions from aboveground biomass burning.

In recent years proportionally more emissions from peat burning.
Qualitative yield prediction per micro-field (Burkina Faso)

Indonesia's Fire and Haze Crisis 2015

**HEALTH IMPACT**

~ 50 million humans affected in SE-Asia

**CLIMATIC IMPACT**

Emissions from burning fossil fuels (GFED)

Global (2014): 35.9 Gt CO₂

Indonesia (2015): 1.8 Gt CO₂

Equals 5% global emissions

**ECONOMIC IMPACT**

*Worldbank:* Estimated total costs for the Indonesian economy: USD 16 billion (twice as much as tsunami clean-up)