EXAMPLES OF THE USE OF RAPIDEYE IMAGERY TO CLIMATE CHANGE: REDD PROGRAM

James Durana
Asia Pacific Region
Jakarta
RapidEye AG

- A global imagery and service provider
- 5 satellite constellation
- 5 m imagery
- 5 bands (including red edge)
- Empowering global land-use decisions
RAPIDYE Mission Drivers

Full Operational Capacity

Acquisitions – Directed

Background Mission (BGM)
- High Interest Areas
- Natural Disaster Assessment Monitoring
- National Level Coverages
- REDD Program
- Agriculture Monitoring & Forecasting

Build Extensive Archive
- Continuous Record of the Earth’s Surface, 2009 – 2019 and beyond
5 Bands: Spectral Resolution

400 nm | 500 nm | 600 nm | 700 nm | 800 nm

B | G | R | RE | NIR

440 – 510 nm | 520 – 590 nm | 630 – 685 nm | 690 – 730 nm | 760 – 850 nm

RapidEye | www.rapideye.com
The Red Edge Band

The Red-Edge band is used to monitor vegetation health, improve species separation and measure Chlorophyll, Protein and Nitrogen content.
RapidEye 5 m Resolution Imagery:
For details

- Notice Roofs
  - True blue band
- Notice Runway Centerline
  - Right amount of detail
- Notice Airplanes
  - Identify individual features
- Positional Accuracy
  - 1:25,000 map scale possible

Beijing, China International Airport
Rural Cadaster:
Digitization of Field Boundaries
RapidEye: Daily coverage over China
The importance of temporal resolution

Quick vegetation regrowth after fire impact
Deforestation

Short-term changes

22.05.2009

28.07.2009
Take Home Message

5,000,000 km²

Daily collection capacity – the new industry benchmark

2019
Life extended until at least

Data Continuity
Focus for 2013
What is REDD+

**REDD** stands for internationally funded efforts undertaken at the national level to **Reduce Emissions from Deforestation and forest Degradation**

The + stands for: Additionally fostering conservation, sustainable management of forests, and enhancement of forest carbon stocks in participating countries
Greenhouse gas emissions by sector

Global GHG Emissions (2005)

- Electricity & Heat: 26.6%
- Manufacturing & Construction: 11.2%
- Transportation: 11.6%
- Land-use Change and Forestry: 16.3%
- Agriculture: 13.1%
- International Bunkers: 2.1%
- Waste: 3.1%
- Industrial Processes: 4.0%
- Fugitive Emissions: 3.8%
- Other Fuel Combustion: 8.2%

Source: www.conservation.org
Greenhouse gas emissions (2005)

Source: wikipedia.org
What is REDD+

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REDD "Requirements"

- Regular, reliable monitoring wall-to-wall
- Data continuity
- Detailedness (MMU 0.5 ha) perfect for forest degradation
- Availability through BGMs
- Positional accuracy, but more important co-registration for change detection
MONITORING LOW INTENSITY LOGGING

RapidEye time series showing a peat swamp forest in Central-Kalimantan and the progress of selective logging.
Forest degradation by logging
Forest degradation by logging

Landsat, 30 meters

Forest degraded by illegal logging

RapidEye, 6.5 meters
Forest Disturbance Assessment
Comparison with Landsat

Landsat 7 ETM+ 22/05/2009
RapidEye 22/05/2009
Example forest monitoring
2009-2012 (Brazil)
Example forest monitoring
2009-2012 (Brazil)
Example forest monitoring
2009-2012 (Brazil)

Sete de Setembro Indigenous Land, Mato Grosso, Brazil
Forest Monitoring 2009 - present

Legend
- Red: Deforestation/Degradation 2009-2010
- Orange: Deforestation/Degradation 2010-2011
- Green: Forest
- Light Gray: Other land cover

Data Source:
RapidEye, acquired on
24/05/2011
(c) RapidEye (2011), provided
under EC/RSA GSC-IDA

Projection:
WGS 1984, UTM Zone 20S

Processing:
Project: REDD-FLAME
Production: Remote Sensing Solutions GmbH

RapidEye | www.rapideye.com
September 16, 2013
Slide 23
Example forest monitoring
2009-2012 (Brazil)

Sete de Setembro Indigenous Land, Mato Grosso, Brazil
Forest Monitoring 2009 - present

Legend
- Deforestation/Degradation 2009-2010
- Deforestation/Degradation 2010-2011
- Deforestation/Degradation 2011-2012
- Forest
- Other land cover

Data Source:
RapidEye, acquired on
01/06/2012

(c) RapidEye (2011), provided
under EC/ESA GSC-DA

Projection:
WGS 1984, UTM Zone 20S

Processing:
Project: REDD-FLAME
Production: Remote Sensing Solutions GmbH

Scale:
0 0.5 1 2 Kilometers
The area of Chiapas is covered by 158 RapidEye tiles (98750 km²)
The high repetition rate of the RapidEye system allows for collection of imagery over large areas with minimized cloud cover in short time windows. In 2011 Chiapas was imaged within 3 months (23 revisits) with a cloud cover less than 2%.
The classification into Forest and NON-Forest relies on a machine learning algorithm being integrated into the proprietary RapidEye workflow.

**Result:**

Mapped forest cover of Chiapas amounts to 33,131.56 km²

This equals **45.15% forest cover**

(based on 73,375.20 km² land area >>>CONABIO Shape File)

Or

**43.81% forest cover**

(based on 75,674.00 km² land area >>>Wikipedia)
In the shapefile "b220111nalcms_chiapas.shp", which is containing the reference points for Chiapas landcover/landuse, Point ID 72863 is declared as CROPLAND (Level 2, 15). The RapidEye classification results at this point in the class FOREST. GoogleEarth confirms, that there is tree cover.
FOREST LOSS MAPPING Chiapas 2010 - 2011
Correctly detected forest change (forest loss)
Correctly detected forest change (forest loss)
Correctly detected forest changes (forest loss); some of the changes do not cover the entire change area, especially, when vegetation (forest) changes to vegetation (e.g. grassland)
Correctly detected forest change (forest loss), probably caused by fluvial erosion
## RapidEye’s Key Advantage

<table>
<thead>
<tr>
<th>RapidEye Advantages</th>
<th>Contribution to REDD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Archive</strong></td>
<td>Over one billion square kilometers of EO data is added to RapidEye’s archive every year</td>
</tr>
<tr>
<td><strong>High resolution imagery</strong></td>
<td>Five meter pixel size is suitable for a Minimum Mapping Unit (MMU) of 0.5 ha.</td>
</tr>
<tr>
<td>(five meter pixel size)</td>
<td></td>
</tr>
<tr>
<td><strong>Multiple country coverages</strong></td>
<td>EyeFind makes it easy to find out quickly. Visit eyefind.rapideye.com</td>
</tr>
<tr>
<td>already available</td>
<td></td>
</tr>
<tr>
<td><strong>Collection capacity</strong></td>
<td>RapidEye collects up to five million km² of earth every day. Wall-to-wall national coverages in short time frames</td>
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<td><strong>Multi-temporal</strong></td>
<td>Multiple imaging opportunities due to daily revisit possibilities over the same point on earth (always &lt; 20 degrees off-nadir)</td>
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<td>Reliable collection of data in narrow time windows</td>
<td>Allowing for reference mapping and change detection based on various coverages over large areas</td>
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<td>Multi-spectral sensor with five bands (including Red Edge)</td>
<td>RapidEye’s sensors were built with the visible bands of Blue, Green and Red as well as Near-Infrared and the Red Edge band</td>
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<td>Proven track record in global REDD efforts</td>
<td>Several current REDD projects rely on RapidEye for monitoring (Mexico, Guyana, Nepal, Costa Rica, Panama and more…)</td>
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<td>Guaranteed data continuity</td>
<td>RapidEye is committed to providing a long-term data source</td>
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Large Imagery Archive

REDD Coverage maps available at www.rapideye.com/redd/index.html
REDD country coverage overviews

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