Using RS for ecosystem accounting,
brief synthesis of experiences to date

Earth Observation for Ecosystem Accounting

27 March 2017

Copenhagen

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Content

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Part 1

Identifying ecosystem extent in the Philippines

(WAVES: Wealth Accounting and the Valuation of Ecosystem Services)

- Radar and optical satellites used to analyse land use.
- Focus is on distinguishing different types of perennial crops (oil palm versus coconut, mango, coffee, banana)
- Tested to date: Sentinel (1 and 2), Palsar, LandSat.

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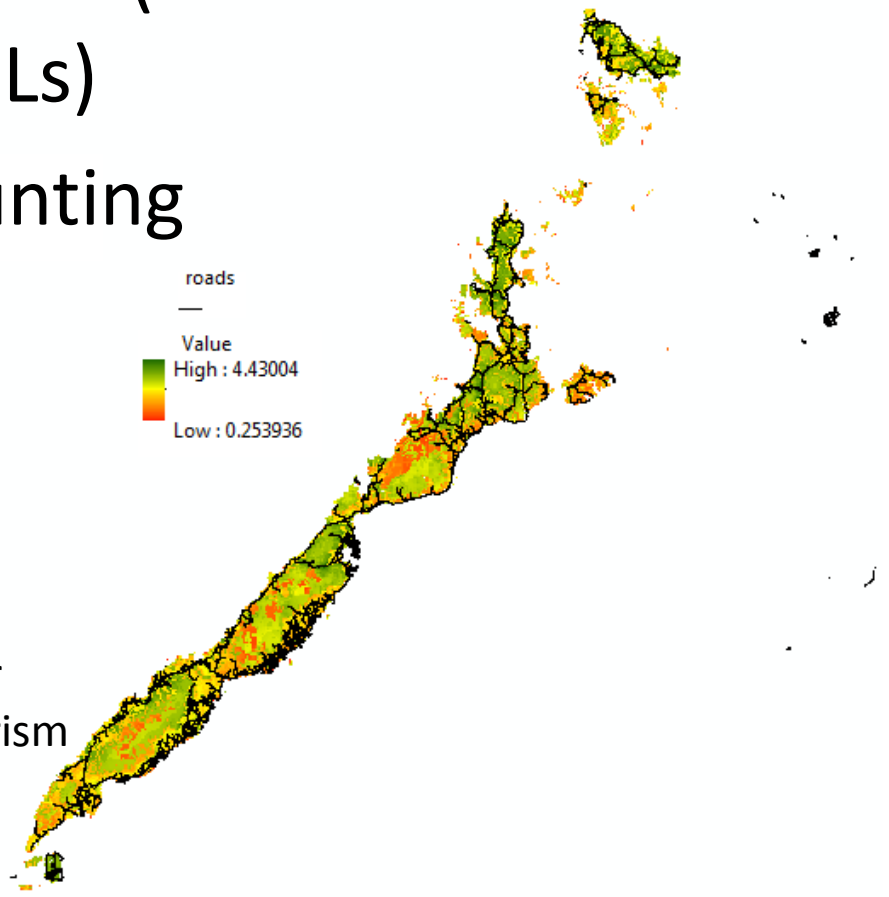
Identifying ecosystem extent in the Philippines

Intermediate outcomes

- Land use mapping strongly influenced by topography, a detailed DEM is required (in the Philippines, a 15m resolution DEM was developed based on IFSAR)
- Mapping requires a sub-national approach, i.e. developing signatures per main island.
- Where detailed GoogleEarth data are available these can be combined with the RS images for 'groundtruthing' – but only partially available for the Philippines.
- Uncertainty in results to date is high, more accurate analysis requires 1 to 1.5m resolution data on land use (e.g. Spot).
- Still need to test accuracy of mapping biomass with radar/optical and NPP (and how this compares to MODIS images)
- Important project component: training and making data stacks available to Philippines Mapping Agency NAMRIA to continue province by province analyses in the coming year

Further progress Philippines

- Development of model to spatially allocate the tourism ES to ecosystems (in line with pilots conducted for the NLs)
- Progress with water accounting



Example: Recreational Opportunity Spectrum of Palawan island, i.e. attractiveness of landscape for tourism. This will be used to spatially allocate tourism values to the landscape. Work by Arnan Araza, supported by L. Hein and G. Castillo

Part 2

Observation of forest conservation around plantations in Indonesia

- Joined project SarVision, Airbus Defence and Space and The Forest Trust (TFT)
- Radar and optical satellites used to monitor forest conservation

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Indonesia : observation of forest conservation around plantations (SarVision)

- Use of Spot images for baseline in combination with Sentinel-1 for monitoring change in vegetation.
- Advantage: Spot images need to be analysed only once or with long time intervals; radar images available for every 2 weeks independent of cloud cover
- System is already operational: Airbus/SarVision/TFT Starling System, first customers have signed up

Starling System

More information Starling system:

http://www.tft-earth.org/stories/news/airbus-defence-space-tft-sarvision-provide-unprecedented-accuracy-verification-zero-deforestation-commitments/

Part 3

Mapping flood frequency with radar in Indonesia

- PALSAR ScanSAR is used to detect flooding
  - Large area
  - Can be used in areas with persistent cloud covers
  - Can detect flooding under vegetation

Flood frequency and wetland mapping with radar

- Radar has the unique capability of providing flooding information over large areas (fast and frequent), even in areas of persistent cloud cover.

- Short wavelengths, like C-band utilised by Sentinel-1, is well capable of detecting open water. Large wavelengths, like L-band utilised by PALSAR, have larger penetration capabilities and can even detect flooding under vegetation.

- For this reason JAXA acquires PALSAR data over the World's wetlands systematically (PALSAR-1 for 2006-2011 and PALSAR-2 2014 onwards).

- Wetland monitoring is studied within the K&C Wetland theme. Examples of the first published maps are shown in the next slide.

Interim report WetlandVision project, Dirk Hoekman, 2015

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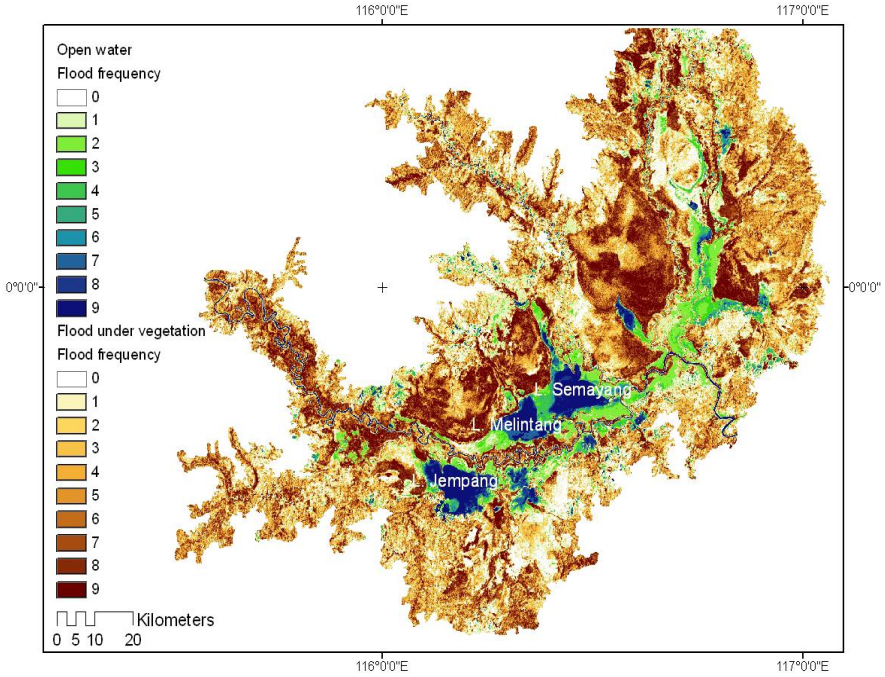
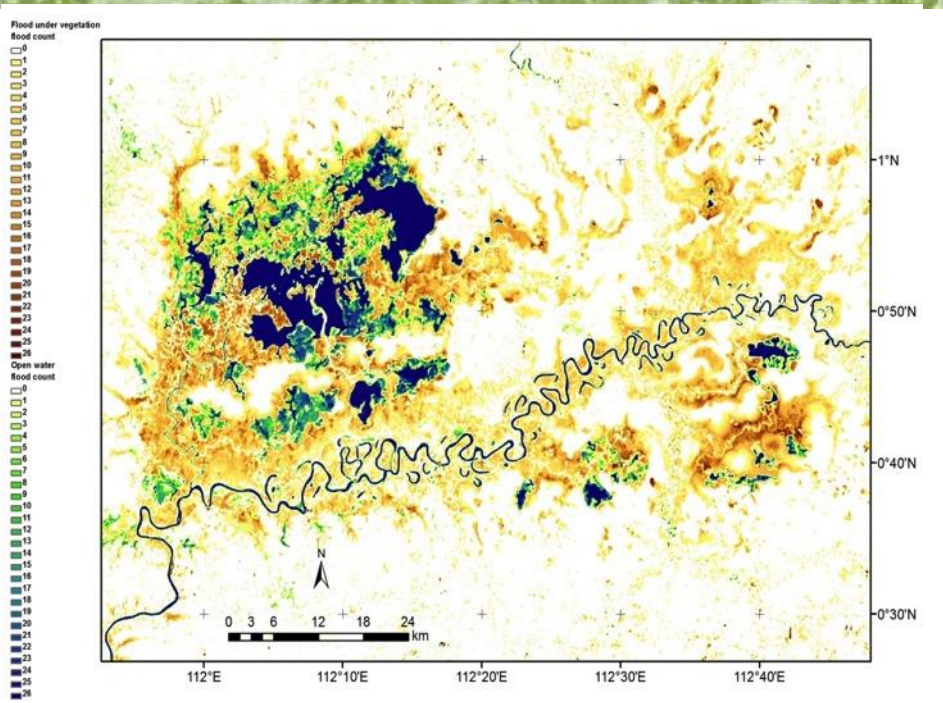
Flood frequency derived from PALSAR ScanSAR



Flood frequency of the **Mahakam watershed** derived from PALSAR ScanSAR images of the 2008-2009 period.

Open water (light green – dark blue)
Flooding under vegetation (light – dark brown)

Ref. Hidayat, H., D. H. Hoekman, M. A. M. Vissers, and A. J. F. Hoitink, 2012, Flood occurrence mapping of the middle Mahakam lowland area using satellite radar. *Hydrology and Earth System Sciences*, Vol.16, pp.1805-1816.



Flood frequency in the **Upper Kapuas area** derived from PALSAR ScanSAR images of the 2007–2010 period.

Ref. Hidayat, H., D. H. Hoekman, M.A.M. Vissers, Md. Monowar Hossain, A.J. Teuling, G.S. Haryani, 2014, Inundation mapping of the upper Kapuas wetlands using time series of radar images, *Int. Conference on Ecohydrology*, Yogyakarta, November 2014.

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Conclusions

- RS always needs to be combined with spatial models for ES flow, capacity and asset.
- In the tropics, a detailed baseline (e.g. Spot6/7, with 1m – 1.5m resolution) in combination with radar for change monitoring works well for monitoring land use change
- Need to develop further applications e.g. on yield forecasting. SarVision has started working on it (e.g. on rice) but collaboration and funding needed.
- Radar provides complimentary information on other ecosystem aspects such as on flooding, applications are also being developed by SarVision (but funding is a constraint)

Acknowledgements

Organisatie	Teamlid
SarVision	Martin Vissers
	Boris Kooij
	Dirk Hoekman
WUR	Lars Hein