MAMAFOREST

Monitoring system for mangrove forests using optical and radar data

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Mangrove forests

Carbon storage (Donato et al., 2011)

Coastal protection (Walters et al., 2008)

Support of fisheries (Walters et al., 2008)

Source of wood and other forestry products (Spalding et al., 2010)

Figure 1. Mangrove Species Richness: Native distributions of mangrove species
Taken from Polidoro et al. (2010). doi:10.1371/journal.pone.0010095
Mangrove forests

Figure 1. Mangrove Species Richness: Native distributions of mangrove species
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- Land conversion
- Deforestation
- Disruption hydrological cycles
- Climate change
Matang Mangrove Forest Reserve

Location Matang Mangrove Forest Reserve (MMFR), Peninsular Malaysia. Taken from Weidmann et al. (2010) and Landsat 8 (February 2014) USGS Products
Matang Mangrove Forest Reserve

Managed for charcoal and pole production since 1902 with a 30-year rotation cycle

Charcoal production at Matang Mangrove Forest Reserve. © Behara Satyanarayana

Harvest is focused on:
* Rhizophora apiculata* Bl.
* Rhizophora mucronata* Lamk

Location Matang Mangrove Forest Reserve (MMFR), Peninsular Malaysia. Taken from Weidmann et al. (2010) and Landsat 8 (February 2014) USGS Products
Integrate time series of optical and radar remote sensing data to evaluate the viability and sustainability of logging within the Matang Mangrove Forest Reserve (MMFR)
Local Management MMFR

Field data

Optical RS:
Landsat 4,5,7 and 8 WorldView-2 stereo data

Radar RS:
JERS-1, ALOS-PALSAR, TanDEM-X, SRTM

DATA

REMOTE SENSING PRODUCTS

UAV protocol

Clear-felling map

Recovery time map

Age forest maps

Canopy height and canopy cover maps

Above ground biomass maps
Field-work and UAV data collection
Field-work and UAV data collection

Otero (2019)
Field-work and UAV data collection

Lucas et al. (2019)
Field-work and UAV data collection

Lucas et al. (2019)

Analysis of clear-felling and regeneration using Landsat data
Detection clear-felling events

Landsat annual time-series from 1988 to 2015

NDMI and NDVI time series from 1988 to 2015

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<tbody>
<tr>
<td>1.</td>
<td>30-year-old forest stand</td>
<td>2.</td>
<td>Recently clear-felled stand</td>
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<td>3.</td>
<td>7-year-old forest stand</td>
<td>4.</td>
<td>14-year-old forest stand</td>
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Otero et al. (2019). Remote Sensing 11, 774
Recovery time quantification

![Diagram showing recovery time quantification with NDMI values and time in years.]
Clear-felling and recovery time maps

Otero et al. (2019). Remote Sensing 11, 774
Structural Composition of Mangroves Achieved Through Combining Multiple Sources of Remote Sensing Data
Age estimation using optical and radar data

Age estimation using optical and radar data
Canopy height estimation

a. SRTM (2000)
c. WorldView-2 (2016)
d. DJI Phantom 3 Pro (2016)
Above ground biomass
Dissemination
Workshops with Forestry Department of Malaysia and local stakeholders

End of a successful Workshop in Ipoh. Thanks to all forest rangers and administrative personnel to learn the EarthTrack App, to come with us to the field at #Matang #Mangrove #Forest #Reserve to collect App data and to analyse it to understand sustainability of the managed forest.

Thank you @MamaforestP and all partners to come and appreciate the fieldwork in 15, 30 and 40 year old #mangroves stands.cn #MangroveSoilday.

Richard Lucas giving a seminar on @GlobalMangroves Watch and @MamaforestP for @UoBEcology and @UoBResilience students and researchers. He shows how combined optical and radar imagery can reveal mangrove height, biomass and wood volume and explains the limits. @jamestb @Johncn.
Dissemination

Logging cycles at Matang: 1958 to 2050

On the assumption of the 30 year logging cycle, estimates of forest age were generated back in time (to 1985) and forward (to 2050) giving the most comprehensive assessment for the MMFR.


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Prof. Dahdouh-Guebas, Viviana Otero
Prof. Satyanarayana, Prof. Lokman
Ruben Van De Kerchove
Prof. Richard Lucas