K&C Phase 3 – Brief project essentials

Climate-Relevant Modernization of the National Forest Policy and Piloting of REDD+ Measures in the Philippines

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Science Team meeting #17 – Phase 3
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Project areas: Philippines

Sub-national REDD+ Pilot Sites

1. Southern Sierra Madre mountain range
2. Leyte island
3. Victoria-Anepahan mountain range, Palawan island
K&C Project Collaborators and Partners

Project Collaborators
1. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
2. Fauna & Flora International (FFI)
3. Department of Geodetic Engineering, University of the Philippines (UP-DGE)

Partners & Supporting Agencies
1. Non-Timber Forest Products – Task Force / Exchange Programme
2. TEaM Energy Foundation in the Philippines (supported by Tokyo Electric Company & Marubeni)
3. European Commission
For each of the three identified REDD+ pilot sites, the project aims to:

1. Establish baseline forest carbon stocks
2. Pilot forest carbon inventory and monitoring methods in support of validating ALOS PALSAR imageries
3. Determine reference deforestation rate
Updates

LEYTE ISLAND
Leyte: Systematic Cluster Distribution

Cluster Center Point
Distance 50 m

Forest Points - Coverage above 2/3 in 124 m diameter circle
NonForest Points - Coverage between 1/3 and 2/3 in 124 m diameter circle

Sampling Point center
6 m radius 113 m² – trees 06-20 cm DBH
12 m radius 452 m² – trees > 20 cm DBH
Leyte Island FRA Update

• **Total of 123 of 200 clusters in Southern Leyte assessed**
  • 81 clusters inside pilot area
  • 42 clusters outside pilot area

• **Total of 15 of 50 clusters assessed in (Northern) Leyte**
  • 15 clusters inside Energy Development Corporation area
  • 13 clusters in dense natural forest
  • 2 clusters in forest plantation – non-native species
Variability/Change Detection

Same Polarizations Stack

R: 2007 HV
G: 2008 HV
B: 2009 HV
Some challenges: Leyte island
Updates

SOUTHERN SIERRA MADRE & PALAWAN
Some background

- In the Philippines, 12 natural forest formations have been described based on physical characteristics (Fernando et al 2008; Whitmore 1984)

- Limitations of previous national mapping efforts:
  1. Multi-spectral data affected by cloud cover
  2. Different forest classification schemes employed
  3. Only partially reflects various Philippine forest formations

- Forest classification scheme by Whitmore (1984) was adopted in the 1997 NBSAP, but still not adopted by DENR

- Some previous efforts to map the extent of Philippine forests using satellite remote sensing:
  1. 1987 SSC land cover map using 15m SPOT imagery
  2. 2002 NAMRIA/FMB land cover map using 30m Landsat data
Forest formations of the Philippines

Forest types, elevation, rainfall, and temperature

Some factors shaping forest structure and growth

## Comparison of forest classification

<table>
<thead>
<tr>
<th>Forest formations</th>
<th>1987 SSC</th>
<th>2002 NAMRIA/FMB</th>
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<tbody>
<tr>
<td>Lowland evergreen forest</td>
<td>Closed canopy, mature &gt;50%</td>
<td>Closed broadleaf forest</td>
</tr>
<tr>
<td>Lower montane forest</td>
<td>Open canopy, mature &lt;50%</td>
<td>Open broadleaf forest</td>
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<tr>
<td>Upper montane forest</td>
<td>Mossy forest</td>
<td>Coniferous forest, closed</td>
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<tr>
<td>Subalpine forest</td>
<td>Pine forest</td>
<td>Coniferous forest, open</td>
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<tr>
<td>Forest over limestone</td>
<td>Mangrove forest</td>
<td>Mixed forest</td>
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<td>Forest over ultramafic</td>
<td>Marshy area and swamp</td>
<td>Mangrove forest</td>
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<tr>
<td>Beach forest</td>
<td>Submarginal forest</td>
<td>Forest plantation, broadleaf</td>
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<tr>
<td>Mangrove forest</td>
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<td>Forest plantation, coniferous</td>
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<td>Peat swamp forest</td>
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<td>Forest plantation, mangrove</td>
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<td>Freshwater swamp forest</td>
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<tr>
<td>Semi-evergreen forest</td>
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<td>Moist deciduous forest</td>
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Methodology: image processing

ALOS/PALSAR 2010 Mosaic 25m, HH+HV

Ancillary Data (e.g., DEM)

Radar Backscatter Calculation

Textural Analysis

Modeling and Regression

Image Segmentation / Object-Based Classification

Accuracy Assessment/Validation

Forest Formation Maps

Forest Plot Inventory Data
Methodology: field sampling design
(biodiversity transects and forest carbon plots)

Area per plot = 50m x 50m = 2,500 sq.m
Total plots per transect = 9
Total area for plots = 22,500 sq.m (2.25 ha.)
Considerations:
accessibility
elevation gradients
sampling intensity per strata
**ALOS**

2009
50-meter mosaic
ALOS/PALSAR

Victoria-Anepahan mountains

Unsupervised classification

Initial 11 forest carbon plots

Legend
- **Red**: Forest ?
- **Green**: Transition ?
- **Blue**: Lowland ?

![Map of Victoria-Anepahan mountains with color-coded areas indicating forest, transition, and lowland regions.](image-url)
Methodology: carbon estimation modeling

- GPS coordinates of Plots
- Slope Corrected Image
- DN values from plots (HH, HV, HH/HV)
- Forestry Inventory Plots
- Compute Individual Trunk Vol (merchantable ht)
- Compute Individual Trunk Vol (total height)
- Sum of Trunk Vol (merchantable height)
- Sum of Trunk Vol (total height)
- REGRESSION
- Resulting GRAPHS
# Project schedule

<table>
<thead>
<tr>
<th>Main Activities</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<td></td>
<td>S1</td>
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<tr>
<td>1. Image processing</td>
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<td>2. Forest carbon inventories and biodiversity assessments</td>
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<tr>
<td>3. Image post-processing, analysis, change detection</td>
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<td>4. Report writing</td>
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Legend:  
- **Sierra Madre**
- **Leyte**
- **Palawan**
Support to JAXA’s global forest mapping effort

1. Sharing of in-situ data from forest inventories and other field activities from REDD+ sites
2. Validation of JAXA forest/non-forest cover maps and land use/land cover change maps
3. Input to development of algorithms for forest classification, carbon stock assessment, and forest stratification

The in-situ data that will be shared with JAXA includes: broad habitat and land cover types; location/GPS coordinates; tree diameter, merchantable tree height, and tree species; tree canopy cover; leaf litter; and deadwood.
Deliverables

The project envisions the following results:

- Forest cover and change maps produced
- Deforestation rates determined
- Baseline forest carbon stocks established
- Image processing methodologies and accuracy assessments documented