Evidence-based Land Use Planning Process: Piloting In Bago Region, Myanmar

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General introduction
Myanmar Contexts
Scope and Limitation
Approach to Zoning for Land Use Management
  Background Information
  Pilot Study on Zoning Approach for Land Use Management
Results
Conclusion
General Introduction

- Precise and evidence based balance among economic development, sustainable use of natural resources and environmental conservation
- A common approach- Ensuring accurate geospatial and socio-economic data by software tools to produce valid and relevant spatial plans.
- National and regional land use management/zoning plans- Ensuring the National development goals and objectives.
- Landscape scale zoning - first step for planning in order to proceed more detailed spatial planning.
- GOM: in the process of promoting effective land use planning and refining the zoning methodologies to implement its National Land Use Policy-NLUP 2016.
- This presentation will introduce:
  - The emerging approach to zoning for land use management
70% of total country population is concerning with agriculture sector according to 2014 Myanmar Population and Housing Census.

Over 100 national races-Different culture, custom and traditions related to land uses.

GOM has been trying its best for the sustainable development of the nation through launching political, economic and social reforms.

There are significant efforts concerning with land governance; development of NLUP and reform strategies for the effective, systematic and sustainable utilization of natural resources.

Myanmar is facing many challenges concerning with land related issues and conflicts across the country.
Land Cover/Land Use Changes in Myanmar

2000

2000

2000

2015

2015

2015

Source: LandSat 7 ETM+ (2000)

Source: LandSat 8 (2-03-2015)
Forest Cover Status (%) at Five Different Years (Source FRA)

- **1990**
  - Open forest: 46.64%
  - Closed forest: 12.02%
  - Other wooded land: 15.04%
  - Other land: 22.29%
  - Inland water bodies: 0%

- **2000**
  - Open forest: 37.71%
  - Closed forest: 15.59%
  - Other wooded land: 22.97%
  - Other land: 21.37%
  - Inland water bodies: 10%

- **2005**
  - Open forest: 25.82%
  - Closed forest: 29.49%
  - Other wooded land: 19.87%
  - Other land: 27.09%
  - Inland water bodies: 0%

- **2010**
  - Open forest: 14.74%
  - Closed forest: 22.97%
  - Other wooded land: 17.09%
  - Other land: 21.37%
  - Inland water bodies: 10%

- **2015**
  - Open forest: 22.97%
  - Closed forest: 29.49%
  - Other wooded land: 15.59%
  - Other land: 29.49%
  - Inland water bodies: 10%
Scope and Limitation

- Evidence-based land use planning by using only available data sources; i.e. secondary data/documents/records, satellite-based information and biophysical data.
- Limitation for field validation
- Challenges were concerned to define the land representation
- Soico-economic data could not be used as the data sources available are not enough at current.
- The process is ongoing and consultation meetings with various stakeholders are being planned in order to finalize the Evidence-based land use planning for regional level.
Piloting: Evidence-based Land Use Planning Process:
Background on Pilot Study

- **2013** April IMG / EU participated at LUASC workshop.
- **Uncertainty raised on precision** of data on land use reported by the survey.
- RS based method proposed using Rapideye data.
- **August 2013** – started pilot RS/GIS study for Taungoo, Thayarwaddy and Bago Districts.
- **December 2013**- finished land use mapping of Taungoo
- **January 2014**- Field verification
- **February 2014**- Consultation meeting for zoning and participatory mapping
- **Up to now**: On going to finalize regional level
Location of Pilot Study Area

3 Districts within Bago Region

Myanmar

Taungoo District
Taungoo region- famous in **Burmese history** for the **Taungoo Dynasty** (between the 16th and 18th centuries)

- Taungoo- the capital of Burma in 1510–1539 and 1551–1552.
- District Area-10644 km² (6 townships, 72 wards and 251 village tracts)
- District Population (2014 census)
  - 21% urban and 79% rural
  - 48% male and 52% female
- 46.18% forest cover (closed and open forest) (FRA 2010) and 54% of total land area is under Permanent Forest Estate.
Main Three Stages of Pilot Study

I. Prepare baseline data on LULC for direct planning at district level,

II. Demonstration of a decision support tool in district level land management planning and land use zoning,

III. Public consultation through the participatory mapping approach and zoning.
Total 92 Rapideye images acquired during April 2013 were used.

Images processed using a mix of automatic classification (Segmentation by using ENVI) and manual interpretation (in ArcGIS).

22 LULC classes were identified.

Reference to Landsat 1999, 2003 for historical land use information.

New Landsat 8 data were used to resolve inaccuracies caused by seasonal effects.

Using of Google Earth.
<table>
<thead>
<tr>
<th>No</th>
<th>Land Categories</th>
<th>Sub-categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Man-made Land use/infrastructure</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Town/village</td>
<td>Fish ponds</td>
</tr>
<tr>
<td></td>
<td>Buildings</td>
<td>Shrimp ponds</td>
</tr>
<tr>
<td></td>
<td>Road Network</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Forestry sector related land use</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Degraded forest</td>
<td>River/stream</td>
</tr>
<tr>
<td></td>
<td>Forest Plantation</td>
<td>Lake</td>
</tr>
<tr>
<td></td>
<td>Closed forest</td>
<td>Dams/ Reserviors</td>
</tr>
<tr>
<td></td>
<td>Open forest</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bamboo break forest</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Agricultural sector related land use</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paddy/ Irrigated agriculture</td>
<td>Grazing, grass land</td>
</tr>
<tr>
<td></td>
<td>Active taunggya</td>
<td>Scrub land</td>
</tr>
<tr>
<td></td>
<td>Fallow taunggya</td>
<td></td>
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<tr>
<td></td>
<td>Tree crops</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Permanent dry land agriculture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial agriculture</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><strong>Aquaculture</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Waterbody</strong></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><strong>Wetland</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><strong>Livestock and grazing land</strong></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><strong>Burdan land</strong></td>
<td></td>
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<tr>
<td>Land Use/ Land Cover</td>
<td>LULC 2013 km²</td>
<td>Percent</td>
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<tr>
<td>-------------------------------------</td>
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<td>Broadleaved forest closed</td>
<td>173.93</td>
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<td>Degraded Forest</td>
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<td>Broadleaved forest open</td>
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<td>Permanent dryland ag.</td>
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<td>3.47</td>
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<td>Settlements</td>
<td>261.75</td>
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<td>Active Taungya</td>
<td>113.36</td>
<td>1.05</td>
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<td>Grassland / Grazing Land</td>
<td>112.74</td>
<td>1.05</td>
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<td>Permanent Bare Land</td>
<td>58.50</td>
<td>0.54</td>
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<td>Tree Crops</td>
<td>36.69</td>
<td>0.34</td>
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<td>Roads</td>
<td>17.46</td>
<td>0.16</td>
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<td>Sandbars</td>
<td>13.48</td>
<td>0.13</td>
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<td>Buildings</td>
<td>3.75</td>
<td>0.03</td>
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<td>Commercial Agriculture</td>
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<td>0.03</td>
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<td>Fish Pond</td>
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<td>0.01</td>
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<td>Settlement</td>
<td>0.05</td>
<td>0.00</td>
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<td>Fallow Taungya</td>
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<td>Scrubland</td>
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<td>Forest Plantation</td>
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<td>Bamboo</td>
<td>15.24</td>
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<td>Water - Lakes</td>
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<td>Water - Rivers</td>
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<td>Swamp / Wetland</td>
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<td>0.52</td>
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<td><strong>Total</strong></td>
<td><strong>10784.239</strong></td>
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<td>Information</td>
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<tr>
<td>2013 Land Use / Land cover</td>
<td>22 Land Use/cover classes</td>
<td>Spatial data of land use and land cover</td>
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<tr>
<td>Slope</td>
<td>3 Slope classes</td>
<td>potential erosion risk</td>
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<tr>
<td>Forest Administration status</td>
<td>3 Land Admin classes</td>
<td>Admin responsibility</td>
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<td>Soil types</td>
<td>5 Soil Classes</td>
<td>Soil quality and agricultural suitability</td>
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<tr>
<td>Rainfall</td>
<td>3 Classes</td>
<td>potential erosion risk</td>
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<tr>
<td>Conservation Zones</td>
<td>2 Zones</td>
<td>Protection zones</td>
</tr>
</tbody>
</table>
3 Slope classes in Degrees

- > 20 Steep
- 10-20 Medium
- 0-10 Flat

30m Elevation Model
1. Permanent Forest Estate (PFE)
   - reserved forest
   - protected public forest

2. Outside PFE
5 Main Soil Types

- Yellow Brown Indaing soils
- Yellow Brown Forest soils
- Highest fertility alluvial soils
- High fertility meadow
- Meadow alluvial soils
3 Classes of Mean Annual Rainfall (mm/year)

Soil erosion risk
Water availability

Mean Annual Rainfall (mm)
High : 3205
Low : 961

<1714 (low)
1714-2441 (medium)
>2441 (high)
Catchment Protection zones (upstream of reservoirs)
Combination of all possible types (six GIS layers)
- Matching of actual land conditions with logical management options

1500 types but 250 Combinations account for 99% of land area

Linking existing govt policy / law to land
Land Management Plan for Taungoo District based on 6 physical factors

42 class LMP for Taungoo district using logical ‘rules’ which assign use according to combination of 6 factors
42 Land Management Classes proposed using rule based decision tree

- Allow regrowth as Slope Protection Forest
- Degazette Paddy or PDA from RF
- Zone as intensive subsistence or commercial agriculture
- Do enrichment planting or degazette and manage as intensive subsistence or commercial agriculture
- Establish Forest Plantations
- Maintain as Agroforestry
- Maintain as forest or agroforest
- Maintain as Slope Protection Forest
- Maintain as Slope Protection Forest or develop agroforestry
- Maintain use as forest or agroforest
- Manage as agroforest
- Allow regrowth, manage as agroforest
- Manage as intensive subsistence agriculture
- Manage as long fallow taung ya or agroforestry
- Manage as long fallow taung ya or agroforestry; use soil conservation measures
- Manage as Slope Protection Forest or develop agroforestry
- Manage forest sustainably
- Manage forest sustainably, limit clear felling
- Stop harvesting, do enrichment planting
- Zone as ecological reserve
- Zone for intensive subsistence or commercial agriculture
- Allow regrowth, manage as forest or agroforest
- Allow regrowth, manage strictly as agroforest or forest
- Allow regrowth, stop land clearance, manage strictly as agroforest
- Degazette and zone as subsistence agriculture
- Degazette and zone as subsistence or commercial agriculture
- Degazette Paddy or PDA from RF
- Degazette Paddy or PDA from RF; use soil conservation agriculture
Public Consultation in Land Use Planning
Public Consultation in Land Use Planning
42 Categories simplified into 5 general land use zones of similar type

- Land Management (42 categories)
- Continue using (14 categories)
- Need remedial measures (28 categories)
- Evidence based land use management

Land Use Zoning with simplified decision rules
‘Continue current use’: Within PFE

<table>
<thead>
<tr>
<th>Continue Current - RF Land</th>
<th>Hectares</th>
<th>%</th>
<th>Acres</th>
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<tbody>
<tr>
<td>Continue current use: Water - Lakes</td>
<td>14,859.1</td>
<td>47.66</td>
<td>36,718.4</td>
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<td>Continue current use: Forest Plantation</td>
<td>11,995.5</td>
<td>38.48</td>
<td>29,642.8</td>
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<td>Continue current use: Grassland / Grazing Land</td>
<td>1,300.6</td>
<td>4.17</td>
<td>3,212.7</td>
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<td>Continue current use: Settlements</td>
<td>729.2</td>
<td>2.34</td>
<td>1,802.7</td>
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<tr>
<td>Continue current use: Water - Rivers</td>
<td>596.6</td>
<td>1.91</td>
<td>1,474.8</td>
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<td>Continue current use: Permanent Bare Land</td>
<td>529.8</td>
<td>1.70</td>
<td>1,307.1</td>
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<td>Continue current use: Tree Crops</td>
<td>445.1</td>
<td>1.43</td>
<td>1,098.9</td>
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<td>Continue current use: Roads</td>
<td>423.1</td>
<td>1.36</td>
<td>1,046.9</td>
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<td>Continue current use: Buildings</td>
<td>166.1</td>
<td>0.53</td>
<td>410.1</td>
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<td>Continue current use: Sandbars</td>
<td>131.0</td>
<td>0.42</td>
<td>323.6</td>
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<td>Continue current use: Unclassified</td>
<td>2.2</td>
<td>0.01</td>
<td>5.3</td>
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<td><strong>Total</strong></td>
<td><strong>31,177.3</strong></td>
<td><strong>100.0</strong></td>
<td><strong>77,042.1</strong></td>
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</table>
'Continue current use': Outside PFE
Manage forest sustainably, limit clear felling
Maintain as Slope Protection Forest or develop agroforestry
<table>
<thead>
<tr>
<th>Hectares</th>
<th>%</th>
<th>Acres</th>
<th>Num</th>
<th>LULC</th>
<th>Soil</th>
<th>Admin</th>
<th>Catchment</th>
<th>Rainfall</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>16,341.4</td>
<td>1.53</td>
<td>40,380.6</td>
<td>8</td>
<td>Paddy / PDA</td>
<td>Yellow Brown, Meadow, Alluvial</td>
<td>RF</td>
<td>No</td>
<td>All3</td>
<td>Low / Flat</td>
</tr>
</tbody>
</table>
Reserved land

Zone as ecological reserve
For Wetland conservation

<table>
<thead>
<tr>
<th>Hectares</th>
<th>%</th>
<th>Acres</th>
<th>Num</th>
<th>LULC</th>
<th>Soil</th>
<th>Admin</th>
<th>Catchment</th>
<th>Rainfall</th>
<th>Slope</th>
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<tbody>
<tr>
<td>5,649.7</td>
<td>0.53</td>
<td>13,959.7</td>
<td>27</td>
<td>Swamp / Wetland</td>
<td>Alluvium / Outside</td>
<td>No</td>
<td>All 3</td>
<td>Low / Flat</td>
<td></td>
</tr>
</tbody>
</table>
Same Approach in Bago and Tharyarwady District

Land Use Assessment
Same Approach in Bago and Tharyarwady District

Land Use Management Plan
Challenges

- Institutional Strengthening
- Capacity Building
- Technical
- Budgets
- Human Resources

Limited updated data (e.g., Boundary, land Investment’s socio-economic data etc.)

Opportunity

- Cooperation with various organizations
- OneMap Myanmar- Spatial Data Platform
Conclusion

- NLUP, 2016- Parts II and III indicate that land information and land use management plan are key prerequisite for sustainable land governance.
- Decision-making in land use planning based on sound facts and evidences.
- Limited capacities and available/relevant/up to date data and tools.
- Current piloting approach is very initial stage and still need in order to upgrade.
- Standardization of land use and land cover categories among ministries is also very important in order to avoid the confusion.
- Effective land use planning should be developed step by step.
- This piloting approach would provide the basic information and good practices for future implementation of land use planning in Myanmar.
Thank you very much for your attention.