The role of spatial analysis in supporting REDD+ planning

REDD+ Academy
Expected Learning Outcomes

This module will provide an overview of the role of spatial analysis in supporting REDD+ planning. In particular, we will discuss:

- The importance of land-use planning in the context of REDD+, and the use of maps as decision-support tools for REDD+
- How information on spatial distribution of social and environmental benefits and potential risks, as well as costs, can be used for REDD+ planning
- How spatial information can be used to identify priority areas for REDD+ actions
Overview

• Part 1: Introduction: the role of spatial analysis in supporting REDD+ planning
• Part 2: Importance of stakeholder engagement
• Part 3: Multiple benefits, risks and costs of REDD+
• Part 3: Identifying priority areas for REDD+ actions
PART 1

INTRODUCTION: THE ROLE OF SPATIAL ANALYSIS IN SUPPORTING REDD+ PLANNING
Competing land uses

- Land subject to competing uses – including urban areas and infrastructure, agriculture, forests and other ecosystems
- Land-use planning for REDD+ helps to assess alternative uses for land (within limited resources) and identify priority locations for implementation of REDD+ actions, while enhancing potential benefits and avoiding potential risks
The Cancun Agreements (COP16, 2010)

Land-use planning is an important input for the development of a national REDD+ strategy:

1. National REDD+ strategy or action plan
2. National forest reference emission level and/or reference level
3. National forest monitoring system
4. SIS: System for providing information on how the REDD+ safeguards are being addressed and respected throughout the implementation of the activities
Land-use planning and the development of a national REDD+ strategy

- Reconciling different demands for land use
- Planning to avoid or minimize potential risks and costs of REDD+
- Land-use planning inputs contribute to the development of a national REDD+ strategy
- Identifying potential benefits that can be achieved, where and how
- Identifying suitable REDD+ actions & where these actions could be implemented
Developing maps to support land-use planning for REDD+

• Spatial planning can help to:
  – Map existing conditions relevant for land-use planning
  – Map areas where REDD+ actions could be implemented
  – Map potential benefits and risks of actions
  – Map priority areas for implementation of REDD+ actions

• Spatial analyses can support land-use planning for REDD+ that enhances benefits, reduces risks and minimizes costs
Maps as decision-support tools

- Maps can be used as decision-support tools for REDD+, helping planners and stakeholders to:
  - understand context for REDD+ planning, with e.g., maps of forest cover; land use; current/planned infrastructure development; population distribution
  - analyze suitability of locations for different land uses, and priority areas for REDD+ actions
  - provide inputs for further sub-national planning
Important considerations in using spatial analysis for REDD+ planning

- Be clear what question each map is intended to address
- Consult thoroughly with the users of the maps
- Validate the results and explore with stakeholders how they can best be presented
- Consider availability, resolution, scale, copyright and quality of spatial information, as all will affect mapping work for REDD+
  - There are numerous types of data of interest for REDD+ planning, but not all are relevant, not all can be presented spatially, and not all are available, accurate, recent or of high enough resolution
Different REDD+ actions may be implemented in different areas.
Potential **benefits**, **risks and costs** of REDD+ depend on where and how actions are implemented.
Identification of benefits and risks, in consultation with stakeholders at different levels

Evaluation of costs

Help decision-makers plan for REDD+ actions that enhance benefits, reduce or address risks and minimize costs
Addressing REDD+ benefits, risks and costs in land-use planning

1. Identify goals for REDD+ in the country or planning area (including tackling drivers, delivering benefits)
2. Identify REDD+ actions that can achieve those goals
3. Identify the potential risks and benefits as well as costs associated with these actions
4. Identify priority areas where REDD+ actions could be implemented
5. Design the implementation of the REDD+ actions to minimize risks and promote benefits
PART 2

IMPORTANCE OF STAKEHOLDER ENGAGEMENT
Importance of stakeholder engagement
Stakeholder priorities

• Different stakeholder groups place different values on forest; for example:
  – farmers may see soil protection and hydrological regulation as key services to be secured by maintaining forests
  – tourism workers may prioritize protection of forest in key tourism sites
  – indigenous peoples/local communities may value forests for spiritual importance
  – forest-dependent households may value subsistence and income opportunities forests provide through NTFPs such as medicinal plants, forest food, firewood and charcoal
A villager drying firewood used for cooking
Manuel Boissière, CIFOR-PMRV, 2013

A villager weaving a 'ronjong' basket using 'perupuk' leaves (a type of pandan) collected from the forest. They use the basket to carry harvested paddy.
Indah WB, CIFOR-PMRV, 2013
Forests: Safe drinking water for Jakarta
PART 3

MULTIPLE BENEFITS, RISKS AND COSTS OF REDD+
Forests, carbon and REDD+

- Central value REDD+ intended to protect and enhance is forest carbon
  - Maintenance and enhancement of forest carbon stocks important contribution to global climate change mitigation
- Information on location of forests and carbon stocks, as well as land cover change pressures, essential for REDD+ planning
Information can be used to assess land-cover change (including forest cover loss) quantitatively and identify possible priority areas for REDD+ actions to reduce deforestation. For example: Carbon stocks and areas of recent deforestation (2000-2009) in Central Sulawesi.
Pressures on forests

For example: Current oil and gas exploration licenses, applications and open acreage in Tanzania

Location of pressures, such as oil and gas exploration and population growth help identify where REDD+ implementation is feasible.
Why is it important to look at benefits beyond carbon?

• Carbon-only approach to REDD+ misses opportunities

• By securing benefits beyond carbon, REDD+ has potential to:
  – draw on wider social and political support, linking REDD+ to wider environmental and societal benefits and sustainable development goals
  – demonstrate it is realizing a broader range of benefits

• Securing additional benefits, avoiding significant risks and minimizing costs may be key to success of REDD+
MULTIPLE BENEFITS OF REDD+
Multiple benefits of REDD+

• While main aim of REDD+ is to reduce greenhouse gas emissions and increase carbon dioxide sequestration from the atmosphere, it has the potential to deliver additional environmental and social benefits.

• Multiple benefits of REDD+ are all of the benefits – social and environmental – that may result from the implementation of REDD+ (sometimes called “co-benefits”).

• Information on spatial distribution of social and environmental benefits and potential risks, as well as costs, can be used for REDD+ planning.
Types of multiple benefits

• REDD+ implementation can help to deliver multiple benefits beyond carbon, which include:
  – Enhancement of ecosystem services (goods and services provided by nature)
  – Biodiversity conservation
  – Livelihood and social benefits
  – Clarified tenure and improved governance of natural resources
How can spatial information be used to explore multiple benefits of REDD+?

- **Improved livelihoods for local communities:** location of areas with high poverty density; income inequality; community forestry areas
- **Conservation of biodiversity:** location of Key Biodiversity Areas; Important Bird Areas; wildlife corridors; endemic species; threatened species
- **Protection/enhancement of water quality:** location of watersheds; hydropower facilities; soil erosion risk
Benefits vary geographically

Biodiversity and ecosystem services distributed unevenly across space; spatial data helps identify areas important for different benefits and combinations of benefits.

**Biomass carbon stocks**

- Low (0 - 52)
- Medium low (53 - 82)
- Medium (83 - 123)
- Medium high (124 - 176)
- High (177 - 257)

**Importance for biodiversity**

**Importance for tourism**

**Importance for soil erosion control**

For example: individual benefits of forest in Panama.
Benefits can be overlaid

For example: overlaying individual benefits of forest in Panama
Benefits can be counted

- separate benefits can be added together to identify forest areas of potential importance for a larger number of benefits from REDD+
- all else being equal, greatest priority for REDD+ might be to focus on areas where action to retain or restore forests can potentially provide multiple benefits

For example: multiple benefits of forest in Panama
Areas of forest at risk of future deforestation can be highlighted. For example: forest areas with potential for multiple benefits at risk of future deforestation in Panama.
Country experience: Sub-national planning in Viet Nam

- Part of UN-REDD Viet Nam Phase II Programme focused on building capacity for spatial planning, to inform provincial-level REDD+ planning
  - Will present benefits and trade-offs associated with REDD+ actions in particular locations, land-use designations and ecosystems
Country experience: Sub-national planning in Viet Nam

- Initial identification of REDD+ priority areas for 6 pilot provinces used following layers:
  - Forest cover & forest cover change
  - Carbon stocks
  - Forest management categories
  - Poverty

- Overlaid this spatial data to show potential priority areas in provinces by commune

Current collaboration will build on this approach with:
- Stakeholder consultation at provincial level
- Capacity building for national and provincial spatial planners
- Incorporation of additional priority spatial information (e.g. future LU plans, biodiversity, ES provision, livelihoods)
POTENTIAL RISKS OF REDD+
Planning for potential risks of REDD+

• REDD+ also carries potential risks, which depend on specific actions and national and local contexts
  – Environmental risks could include:
    • Conversion of degraded natural forest to plantations
    • Displacement of pressures to areas important for biodiversity or ecosystem services
  – Social risks could include:
    • Reduced access to resources for forest users
    • Inequitable sharing of REDD+ benefits
    • Conflicts over land
    • Displacement of forest dependent communities
Cancun safeguards

- Cancun safeguards, agreed by Parties to UNFCCC, aim to guard against harm from REDD+ and enhance benefits
- Countries have agreed to promote and support the Cancun safeguards, and will decide how to apply them
- Designing REDD+ to deliver multiple benefits helps to fulfil the Cancun commitments
The Cancun Agreements: Safeguards for REDD+

- g. Reduce displacement of emissions
- f. Address risk of reversals
- e. Natural forest, biodiversity, social & environmental benefits
- d. Full and effective participation of relevant stakeholders, in particular IP & local communities
- c. Knowledge and rights of indigenous peoples & local communities
- b. Forest governance (transparency & effectiveness)
- a. Policy alignment (national & international)
How can spatial information be used to consider safeguards?

• Maps can help to identify locations where certain REDD+ actions may contravene safeguards (e.g. where natural forest is converted into plantations)

• Maps can help to identify where REDD+ actions can enhance social and environmental benefits (e.g. where biodiversity conservation can be promoted)

• Information from safeguards information systems (SIS) can feed data into maps for REDD+ planning, and spatial analyses can also be used to track indicators relevant to SIS
Using spatial information to support the Cancun safeguards

• Safeguard (e) notes REDD+ activities are **not to be used for the conversion of natural forests**, are instead to **incentivize the protection and conservation** of natural forests and their ecosystem services, and to **enhance other social and environmental benefits**

  • Conversion of natural forests to forest plantations or other land uses could lead to the loss of biodiversity.
The Cancun Agreements (COP16, 2010)

Spatial information can be used in the collection of data for safeguard information systems (SIS):

1. National REDD+ strategy or action plan

2. National forest reference emission level and/or reference level

3. National forest monitoring system

4. SIS: System for providing information on how the REDD+ safeguards are being addressed and respected throughout the implementation of the activities
COSTS OF REDD+
Planning for costs of REDD+

In addition to benefits and risks, there are also economic costs associated with REDD+, which vary spatially:

**Opportunity**
- Costs of income foregone from ‘business as usual’ (alternative to REDD+) land use

**Implementation**
- Variable costs associated with REDD+ actions
  - Investment at the beginning ('up-front costs')
  - Annual expenses

**Transaction**
- Costs of starting and maintaining a REDD+ programme
  - Development costs
  - Costs of bureaucratic processes (e.g. procurement)
Economic valuations and planning for REDD+

• Expressing potential REDD+ impacts on biodiversity and ecosystem services in monetary terms can inform land-use choices by providing information on full costs and benefits, and could change decisions about what REDD+ options are pursued
  – For example, in some areas with high agricultural productivity, carbon payments may not be able to compete with financial incentives for converting tropical forests; demonstrating monetary value of ecosystem services and biodiversity could make a difference
  – while identifying a value is not the same as deriving a direct monetary benefit, can still influence land-use decisions
# Estimating benefits and costs of REDD+

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Basic</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effort required</td>
<td>Review of existing country/regional relevant socio-economic data in reports and studies, otherwise minimal collection of data (no new primary data collection)</td>
<td>Extensive field work and modelling to collect and map information on relevant physical ecosystems, along with design and implementation of market/social/valuation surveys</td>
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</tbody>
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(note that a good understanding of a number of specialist economic tools and methodologies is required)
Combining information on benefits and risks with cost assessments of REDD+...

- can help decision-makers design and locate REDD+ actions that enhance benefits, mitigate risks and reduce costs
What types of spatially explicit economic information can be used to plan for REDD+?

**Costs**
- Opportunity costs
- Implementation costs
- Transaction costs

**Benefits**
- Soil erosion - impact of downstream water sedimentation on dams
- Non-timber for products - sustainable harvest levels of food, fibres and medicines, whether marketed or not
- Nature-based tourism - projected income from tourist expenditure
- Pollination - forest impacts on existing crop yields
Spatially explicit economic analyses for REDD+

A GIS tool that can be used for REDD+ planning is in development; it will be able to carry out a range of REDD+ spatial economic analyses by varying underlying cost and benefit assumptions; as a first step, an initial version will be developed for selected provinces in Cambodia.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Carbon price</th>
<th>Area identification</th>
<th>Location-specific costs</th>
<th>Mapping of net carbon value</th>
<th>Maximization (spatial)</th>
<th>Additional benefits maps</th>
<th>Additional benefits consideration</th>
<th>Overhead costs</th>
</tr>
</thead>
</table>
Country experience: Costs and benefits of REDD+ activities in Cambodia

- Ongoing work with national consultants and relevant government institutions to identify priority activities and actions relevant for REDD+ objectives in Cambodia.
- Plans to list specific actions identified for each of the REDD+ activities, and collate relevant average cost & benefit data (not spatially explicit).
  - Will develop spreadsheet model and present findings to stakeholders at national REDD+ planning meeting.
PART 4
IDENTIFYING PRIORITY AREAS FOR REDD+ ACTIONS
# Planning for REDD+ actions

<table>
<thead>
<tr>
<th>REDD+ activity</th>
<th>Example questions for planning</th>
<th>Example types of spatial information</th>
<th>Example actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reducing emissions from deforestation</td>
<td>Where is there forest? What other land uses and types of land cover occur in the landscape? Where are carbon stocks located? What areas are under pressure from deforestation?</td>
<td>Biomass carbon stock Forest cover Land use Land cover Future deforestation risk</td>
<td>Reduce conversion pressure by promoting conservation agriculture</td>
</tr>
<tr>
<td>Reducing emissions from forest degradation</td>
<td>Where is forest degradation occurring? What are the drivers of forest degradation?</td>
<td>Areas exposed to fire Charcoal production Observed NTFPs</td>
<td>Sustainable NTFPs harvesting/production; fuelwood alternatives/efficient cookstoves</td>
</tr>
<tr>
<td>Conservation of forest carbon stocks</td>
<td>Where are existing protected areas? Where is there current/planned infrastructure and development?</td>
<td>Protected areas Infrastructure (roads, mining, gas and oil concessions)</td>
<td>Strengthening existing protected areas</td>
</tr>
<tr>
<td>Sustainable management of forest</td>
<td>What are forest management categories? How is the population distributed?</td>
<td>Land-use designations Community-based forest management Population density</td>
<td>Reduced impact logging; community forestry</td>
</tr>
<tr>
<td>Enhancement of forest carbon stocks</td>
<td>What areas are suitable for forest restoration? What type of restoration is most appropriate?</td>
<td>Restoration potential Population density Roads Intensive agriculture Degradation</td>
<td>Forest restoration (through, e.g., assisted natural regeneration); afforestation</td>
</tr>
</tbody>
</table>
How can priority areas for REDD+ actions be identified?

- Based on existing conditions, where are the areas where REDD+ actions can be implemented?
- Which areas are under pressure?
- Which areas would maximize benefits, mitigate risks and reduce costs?
- Which areas should be included?
- What areas should be excluded?
What spatial information can be used to identify priority areas for REDD+ actions?

• Carbon, forests, drivers of deforestation/pressures
• Land designations, administrative boundaries and biophysical characteristics
• Multiple benefits
  • Biodiversity
  • Ecosystem services
  • Social benefits
• Risks (information relevant to the Cancun safeguards)
• Costs (opportunity, implementation, transaction)
Potential opportunities for **forest restoration** have been identified with national stakeholders, taking account of areas where restoration is less likely to be suitable or successful.

For example: Forest restoration opportunities in Paraguay
REDD+ efforts to restore forest in areas that provide **additional social or environmental benefits**, and where restoration is more likely to be successful, may be the best use of limited resources:

- support for **livelihoods**
- potential to conserve and enhance **biodiversity**
- importance of land for **soil erosion control**

For example: Multiple benefits of forest restoration in Paraguay.
Priority areas depend on benefits, risks & costs selected

• priority sites for endemic species (plants, amphibians, mammals and birds)
• areas considered of value to the diversity of habitat
• fragile ecosystems
• biodiversity corridors (GEF 2003)

For example: Multiple benefits of forest restoration in the Chaco region of Paraguay
Tools and data for spatial analysis

• Various tools are available to support spatial planning for REDD+
  – Should consider software and tools already being used in country for land-use and forest sector planning

• UN-REDD Programme/other publications have guidance on tools, methodologies and other resources for spatial planning, and case studies from countries and provinces/states designing and implementing REDD+
  – Most examples in this presentation are the result of direct mapping and GIS support from the UN-REDD Programme in collaboration with countries
  – [Exploring Multiple Benefits Mapping Toolbox](https://www.unep-wcmc.org) developed by UNEP-WCMC provides raster analysis tools to help identify, map and understand relationship between carbon stocks, ecosystem services and biodiversity
PART 5

SUMMARY AND CONCLUSIONS
Planning for REDD+

- Spatial analysis can support land-use planning for REDD+ that enhances potential benefits, reduces potential risks and minimizes costs.
- Spatial analysis can inform REDD+ strategy development:
  - Development of realistic options for a national REDD+ strategy – including identifying suitable REDD+ actions and priority locations for those actions – will help balance potential benefits and risks as well as costs of REDD+.
  - Sub-national scale spatial analysis, informed by multi-stakeholder discussion, can help identify priority areas for REDD+ actions.
  - Important to integrate stakeholder priorities and needs into wider consultation and planning processes for REDD+.
Thank you!