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Technical and Policy Issues Relevant for Implementing a REDD+ Mechanism

WINROCK INTERNATIONAL
Putting Ideas to Work

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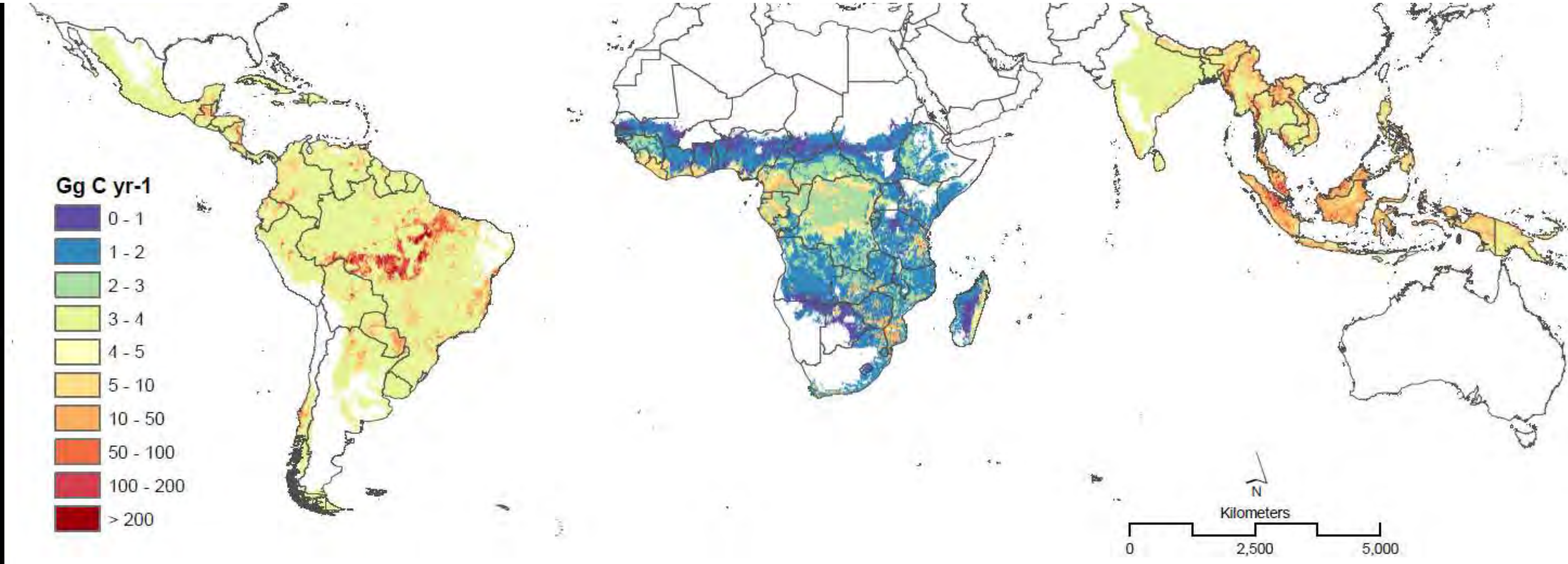
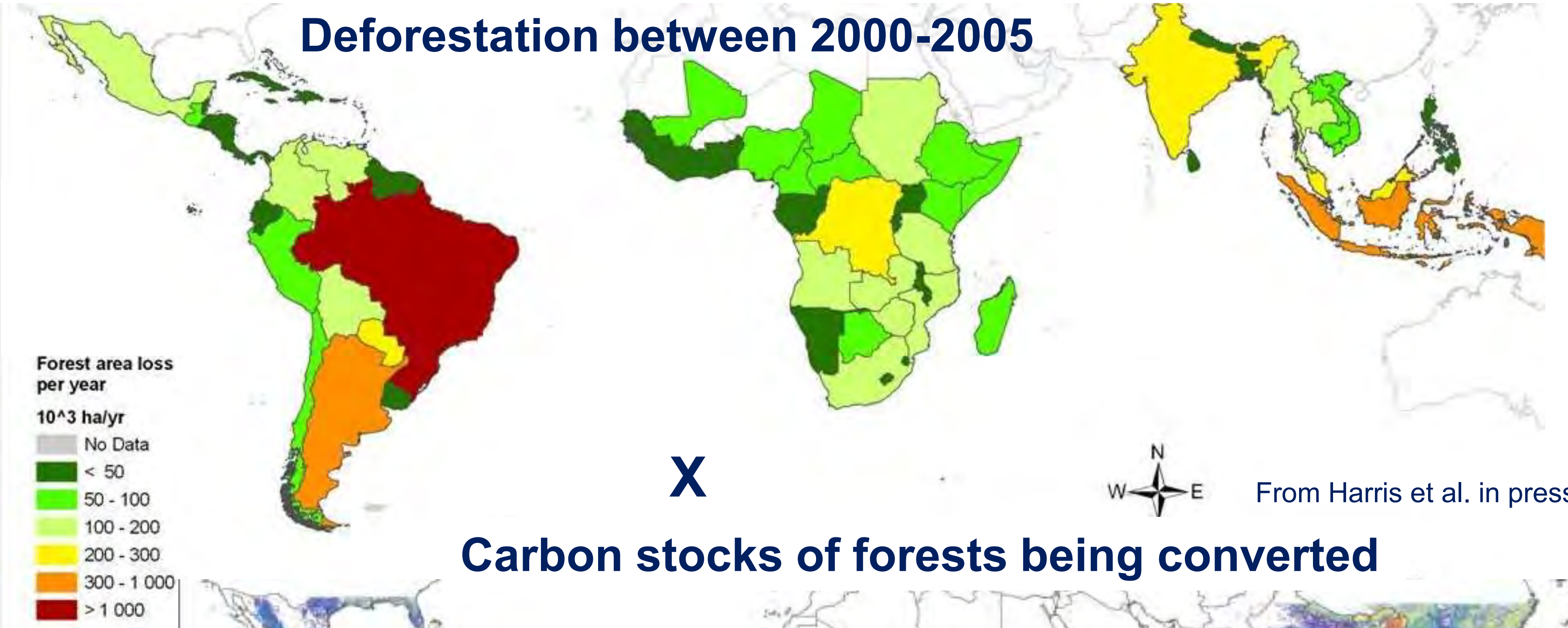
Carbon Emissions from Tropical Deforestation

- Between 2000 to 2005 emissions from deforestation are estimated at 0.81 Pg C yr-1, with a 90% prediction interval of 0.57 to 1.22 Pg C yr-1.
- Emissions are equivalent to 7 to 14% of total global anthropogenic emissions
- Reduction in rates provides opportunity to affect atmosphere and provide other socioeconomic and environmental benefits



From Harris et al. in press

Carbon emissions from tropical deforestation=



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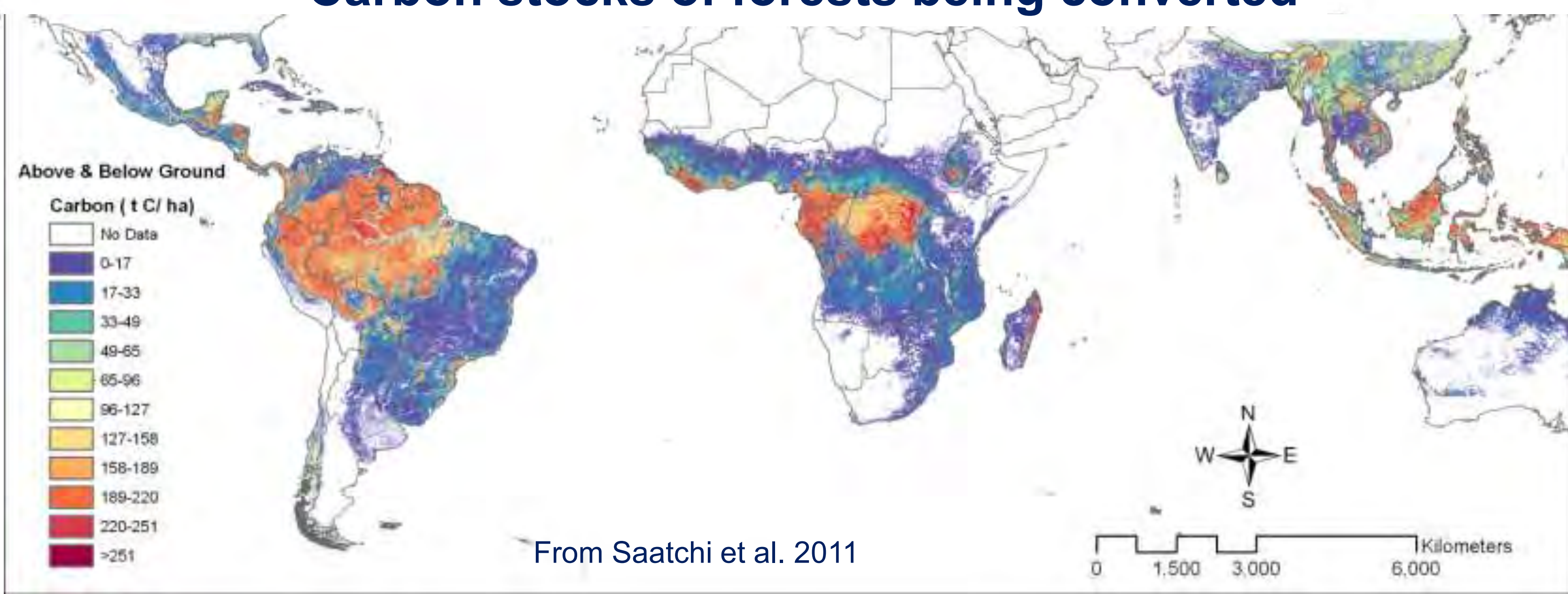


What is REDD+?

- Concept first brought table at UNFCCC as RED at the 2005 COP in Montreal by Costa Rica and PNG
- Much progress at Bali COP resulting in the Bali Action Plan—and expanded potential activities to REDD+

> *Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries*

What are Options for REDD+

- Reduction in deforestation
  - Enforce protected areas
  - Land tenure rights
  - Prevent conversion to grazing practices, crops, biomass energy plantations
- Reduction in forest degradation
  - Reduction of illegal logging
  - Provide improved stoves and establish fuelwood/charcoal plantations to replace use of native forest
  - Reduce incidence of fire

What are Options for REDD+

- Sustainable forest management
  - Improved logging practices (e.g. reduced impact logging)
  - Improve regulation of existing forestry laws
- Enhancement of forest carbon stocks
  - In forest remaining forest
    - Lengthen forest-fallow cycle
    - Enrichment planting to increase stocks
    - Extend rotation
    - Remove animal grazers
  - Conversion of other lands to forests
    - Afforestation/reforestation
    - Restore and rehabilitate forests on degraded lands

Progress on Key Technical Issues for REDD+ Since Bali

- SBSTA decisions presented to COP-15
  - ..use the most recent **IPCC guidance and guidelines**..... as a basis for estimating anthropogenic forest-related greenhouse gas emissions ..
  - ..establish, according to national circumstances and capabilities, robust and transparent national forest monitoring systems and, if appropriate, sub-national systems …
  - Use a combination of remote sensing and ground-based forest carbon inventory approaches…
  - Provide estimates that are transparent, consistent, as far as possible accurate, and that reduce uncertainties...and suitable for review as agreed by the COP

Progress on Key Technical Issues for REDD+ Since Bali

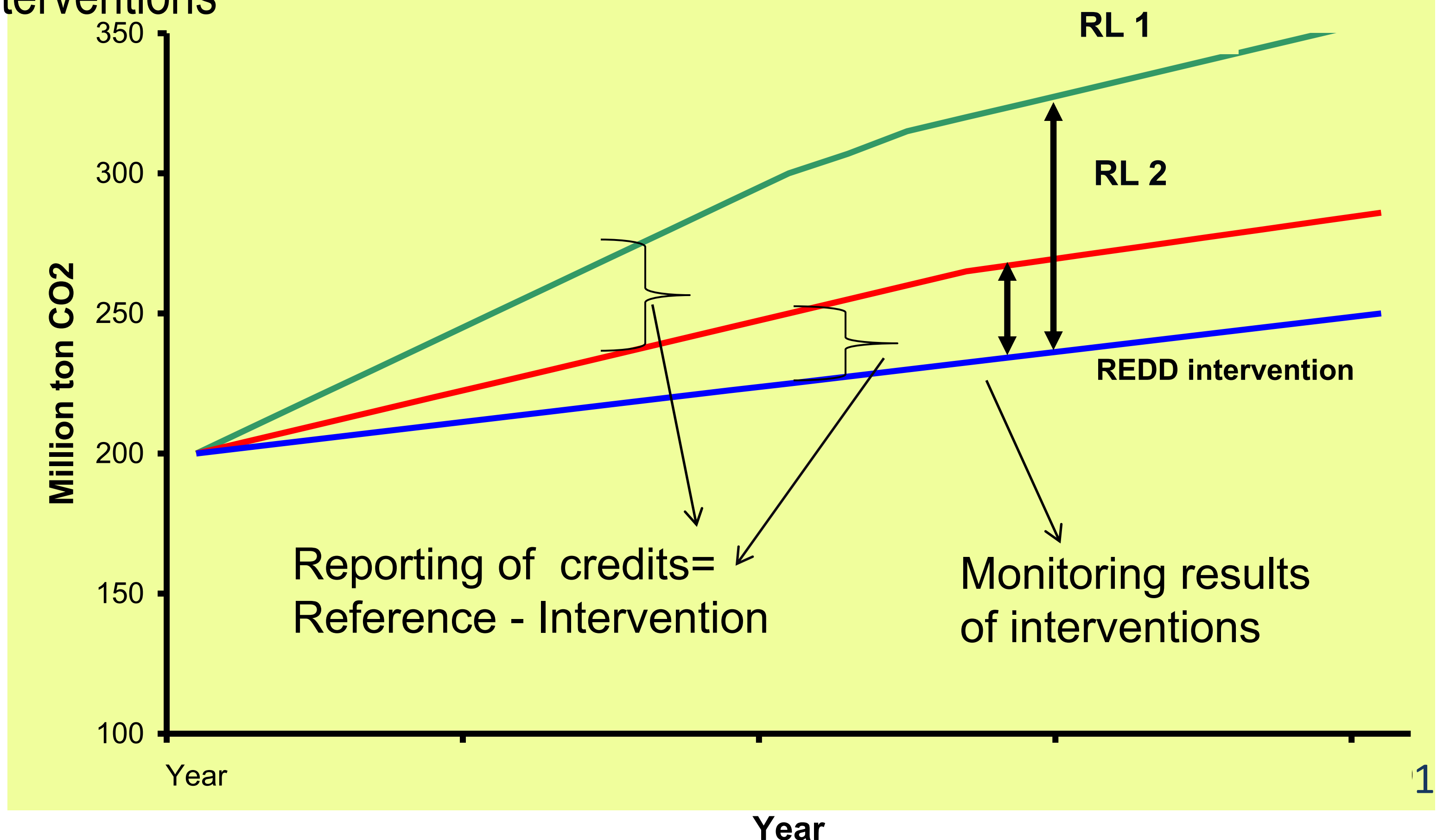
- COP 17 SBSTA agreed on modalities and guidelines for RLs:
  - Forest RLs, expressed in t CO_2e/year, are <u>benchmarks</u> for assessing each country's <u>performance</u> in implementing REDD+ related activities
  - A Party should update a forest RL periodically as appropriate, taking into account new knowledge, new trends and any modification of scope and methodologies
  - Provide transparent, complete, consistent and accurate information, including methodological information, such as a description of data sets, approaches, methods, models and assumptions, used at the time of construction of RLs
  - Identify which pools and gases are included and the reasons for omitting a pool/gas
  - The definition of forest used in constructing the RL, and if appropriate, why it differs from that used in national GHG inventories or in reporting to other international organizations

Outline of Presentation

- How to establish reference levels—key starting point for implementing a REDD+ program of activities
  - What are they
  - What steps needed
  - Guyana case study
- Development of MRV systems and linkage to RL

What are Reference Levels?

- Reference Levels (RLs) refer to business–as-usual benchmarks, taking into account historic data and adjusted for national circumstances
- Reference level (RL) serves as the benchmark for monitoring performance of interventions

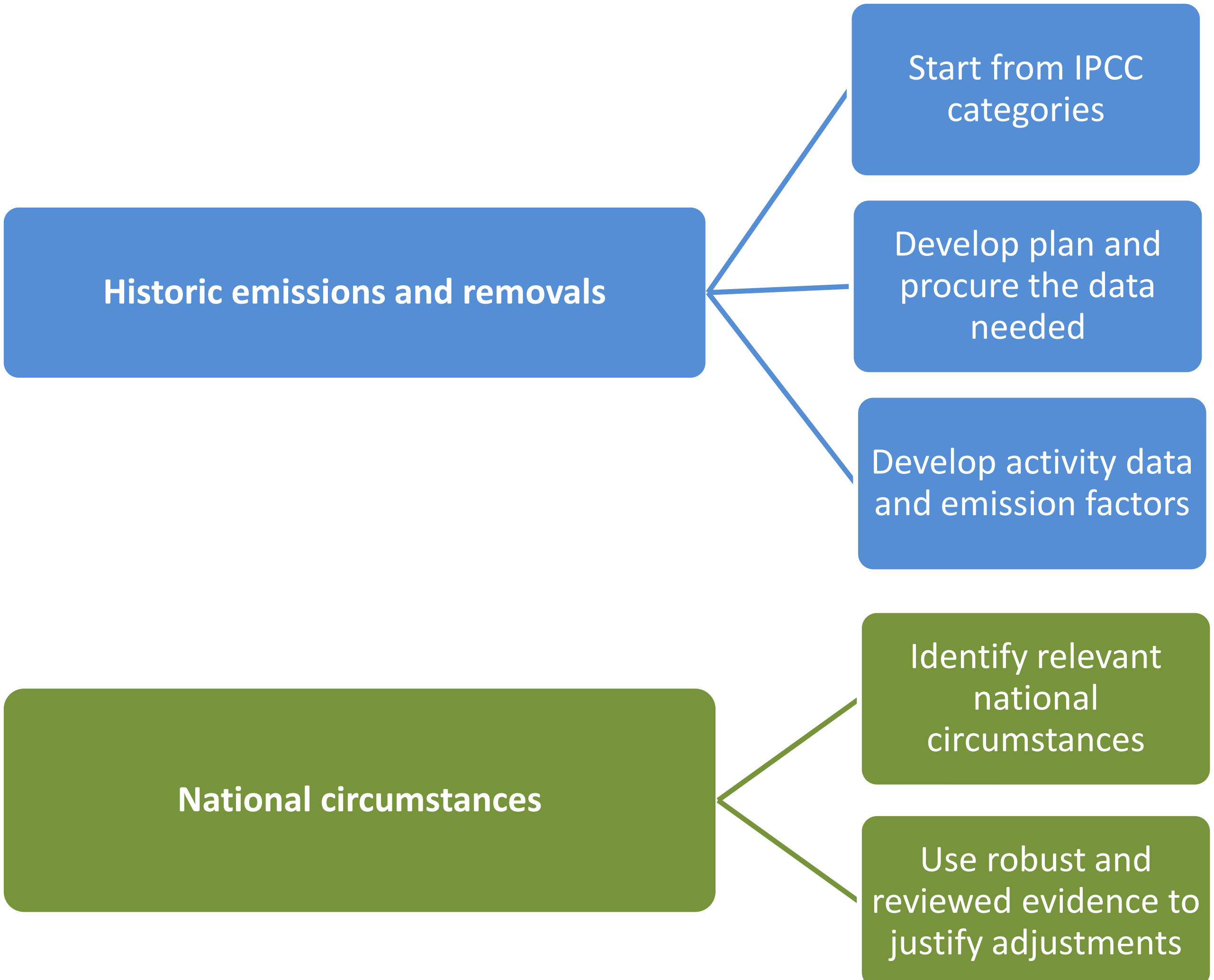


Why Reference Levels Matter

- Historic emissions provide information on the magnitude, location, and causes of emissions/removals —helps identify strategies to have the most impact
- Contribute to developing Low Emission Development Strategy by providing improved knowledge on the role of forests in national GHG inventory and potential of REDD+ activities to reduce net GHG emissions
- Establishing historic emissions provide opportunities to “learn by doing” and to design the MRV system
- Improve GHG inventory for forest sector of National Communications

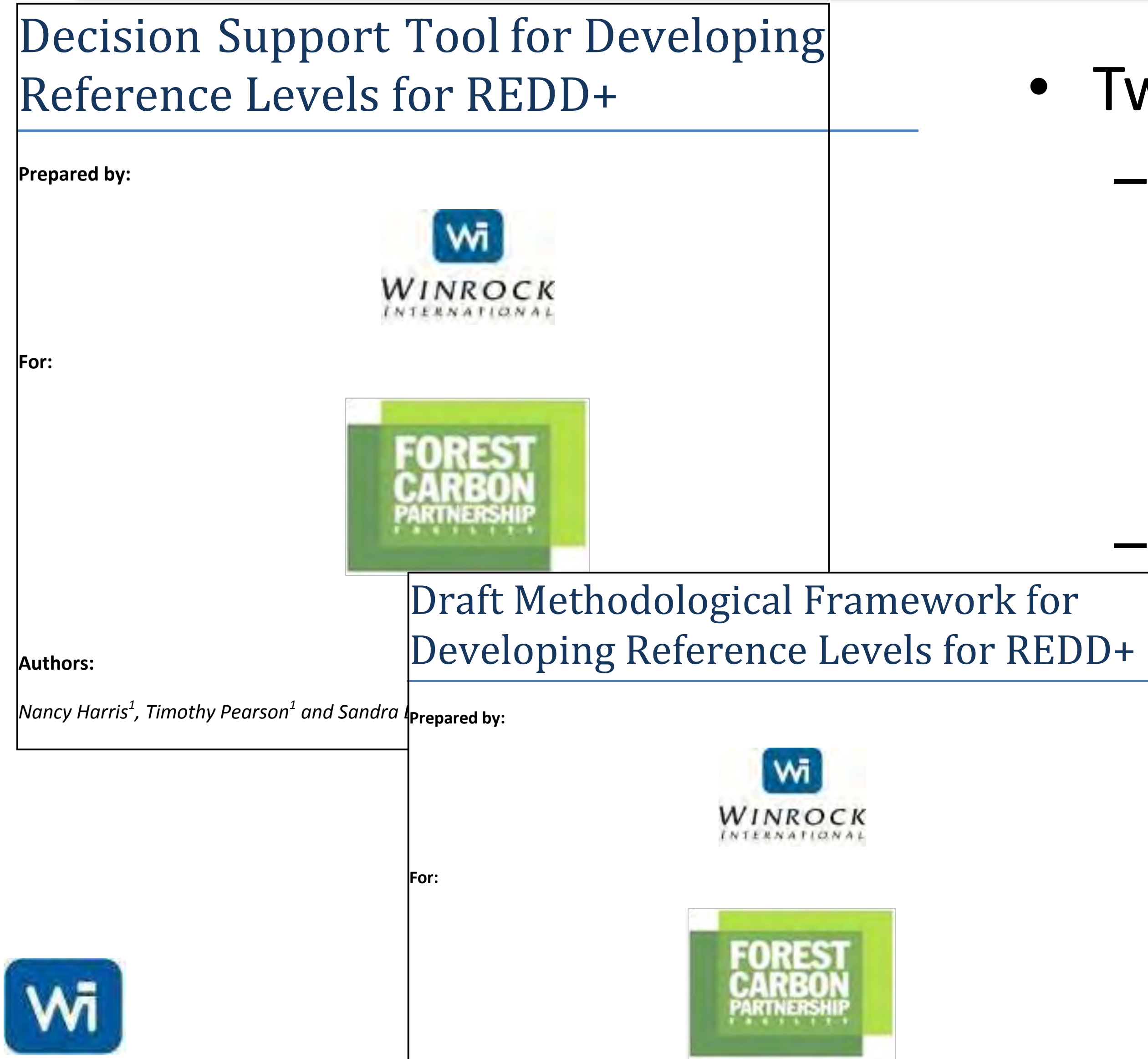
How to Develop a RL

Multi-Step Process



Three IPCC categories:
1. Forests converted to other lands
2. Forest remaining forests
3. Other lands converted to

Guidance on Developing RLs



Decision Support Tool for Developing Reference Levels for REDD+

Prepared by:

For:

Authors:

Nancy Harris[1], Timothy Pearson[1] and Sandra

Draft Methodological Framework for Developing Reference Levels for REDD+

Prepared by:

For:

- Two components:
  - **Decision Support Tools** for making key decisions that affect how the RL is developed
  - **Methodological Framework** for overall structure and details on steps involved

Component 1. Decision Support Tools

- **Key decisions needed to start the process**
- **Can weigh-up advantages and disadvantages of options**

1. Determine **Scope** of Activities

2. Finalize **Forest Definition**

3. Determine **Scale** (National or Summed Subnational)

4. Determine Which **Pools/Gases** to Include

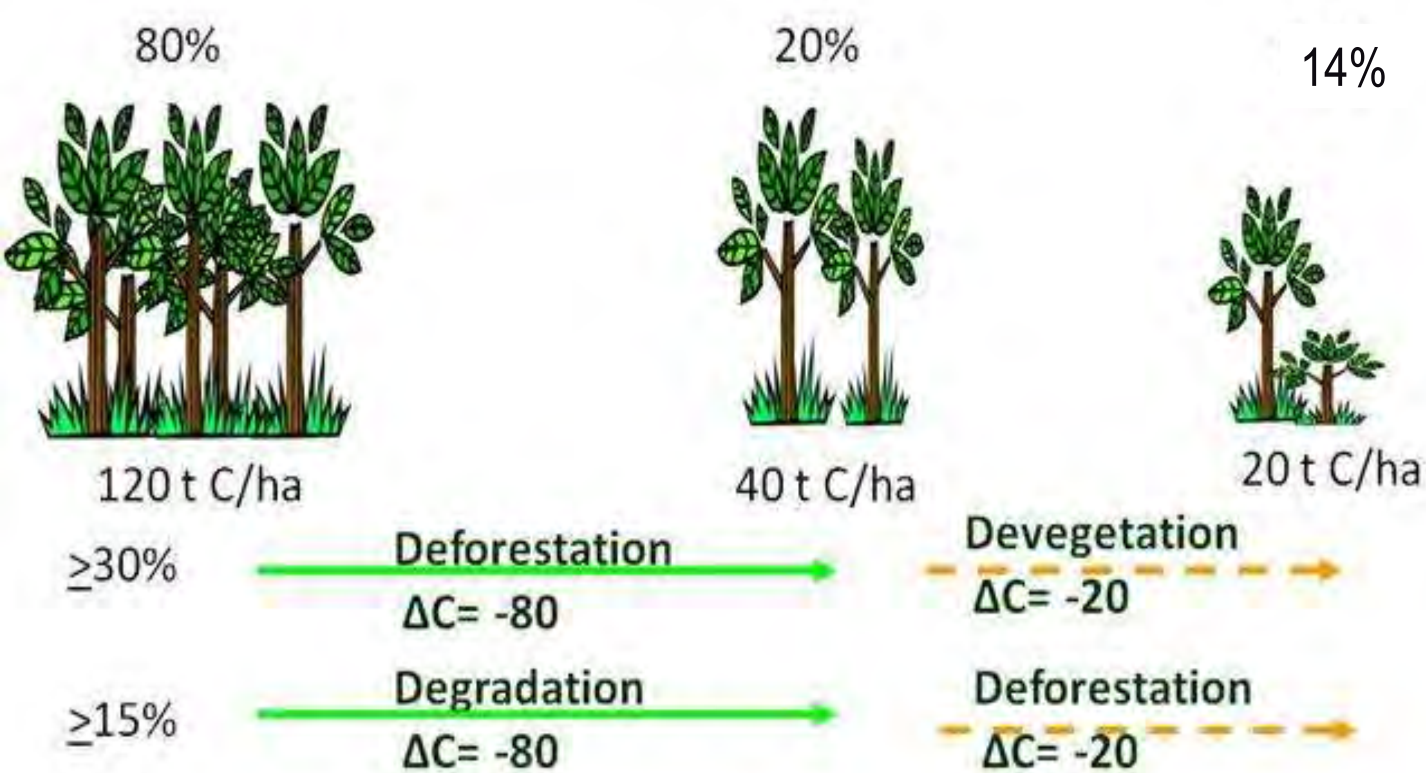
5. Link RL/MRV to a **National Forest Inventory?**

6. Adjust for **National Circumstances**?

7. Should a **Spatial Analysis** Be Included?

E.g. 1. Finalize Forest Definition

Countries must provide information on the definition of forest used in the construction of their RLs

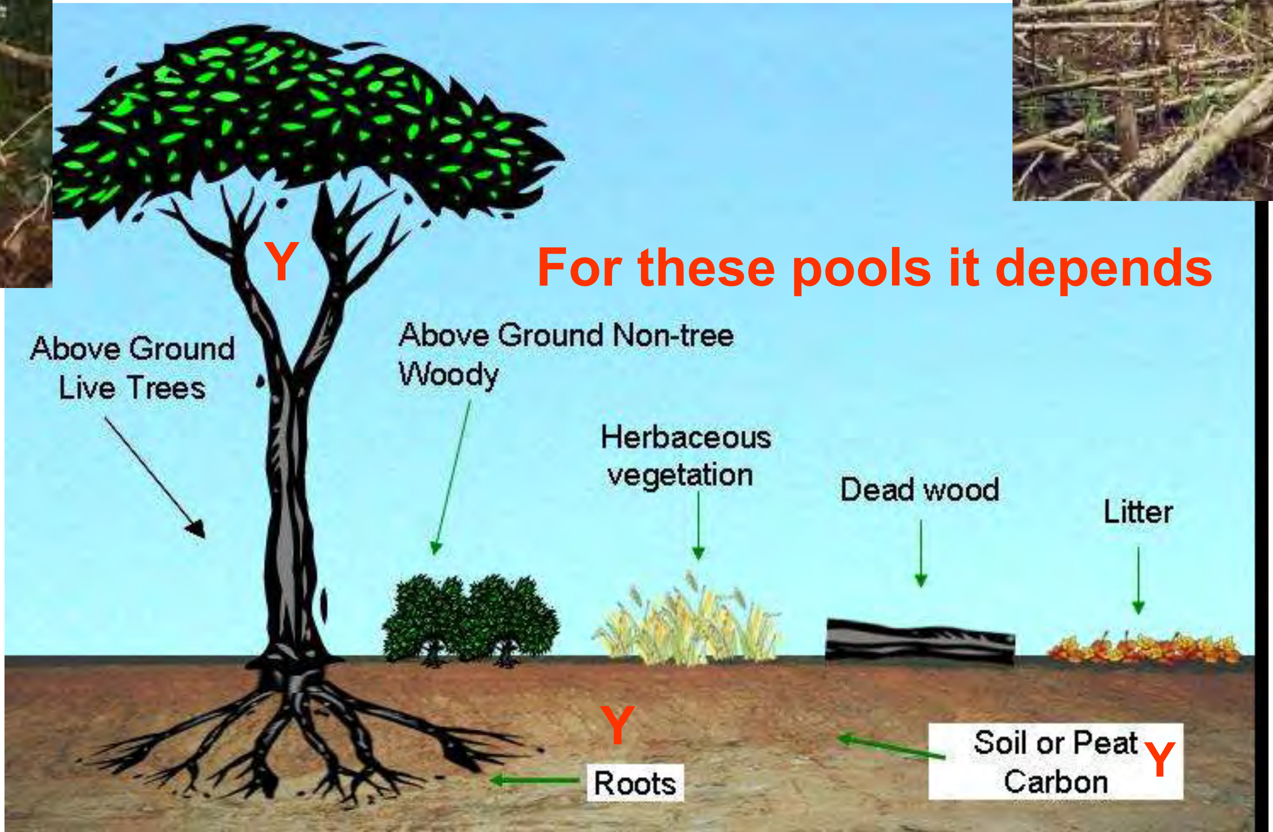


Marrakesh Accords

- Minimum crown cover or equivalent stocking level) of 10 to 30 %
- Minimum forest area: 0.05 -1 ha
- Minimum height at maturity of 2-5 m

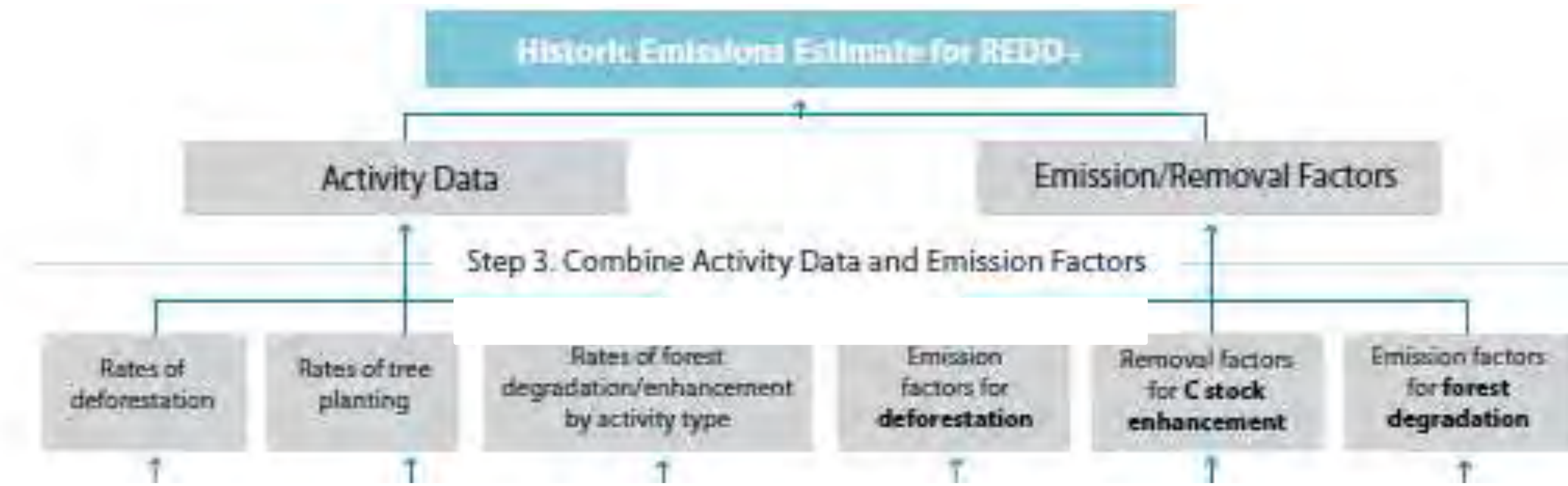
E.g. 2. Select Pools to Include

- Robust methods exist to measure all pools accurately and precisely with sufficient resources
- Not all pools need be monitored
- The more pools included the higher the costs



Data Needs for Historic Emissions

Estimate emission using the IPCC framework



Activity data (AD): obtained from change detection of remote sensing products or other sources such as timber extraction

Emission factors (EF): obtained from:

1. Stock change approach , e.g. difference in pre and post deforestation C stocks in selected pools
2. Gain-loss approach, e.g. removals in timber and gains in regrowth

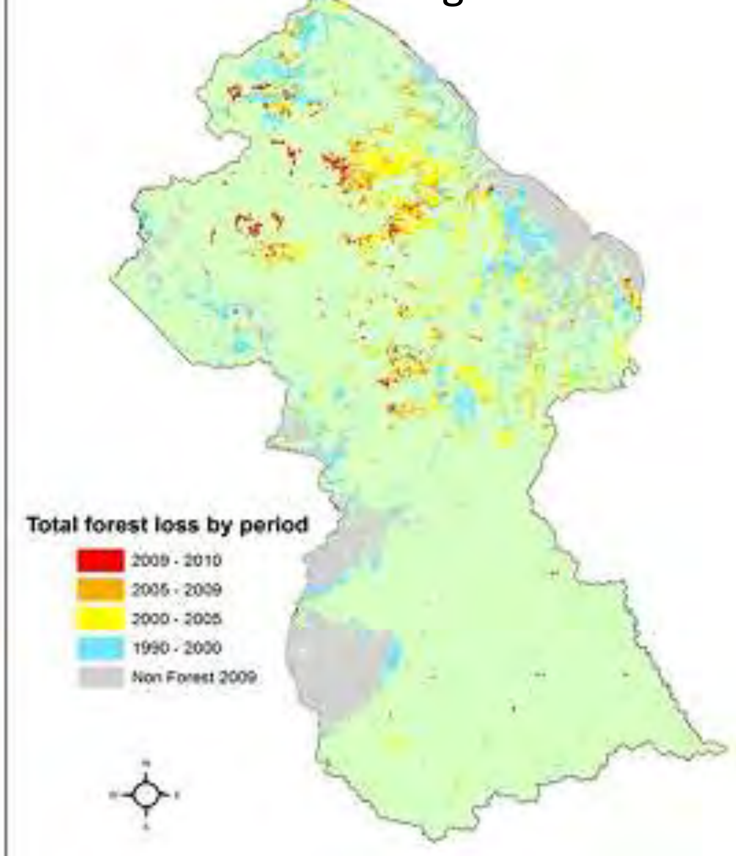
Case Study: Guyana

- New assessment of deforestation completed based on Landsat-type data, with verification, and covers the periods 1990-2000, 2001-2005, 2006-2009, 2009-2010
- Made key decisions: defined forests, national in scope, include deforestation and forest degradation, includes aboveground and below ground tree biomass, dead wood and soil pools
- Targeted precision is 90% confidence interval of ±10% of the mean
- Time period–post-2000
- Inadequate existing data on forest C stocks so implementing a system to fill gap (Forest Carbon Monitoring System-FCMS)
- Data generated from FCMS combined with past historic activity data to provide **historic emissions** (RL) and estimates of annual carbon emissions (MRV)

Main Drivers of Deforestation and Forest Degradation

- Identify main drivers as affect selection of pools and post D&D stocks
- Deforestation:
  - Mining—medium and large scale
  - Infrastructure—roads, settlements
  - Agriculture—permanent
  - Fire
- Degradation:
  - Forestry--for timber production
  - Mining —small scale
  - Shifting cultivation
  - Fire

Forest cover change 1990-2010



Key outcome of FCMS: national tables of emission factors to meet standards

- Standards for level of uncertainty (e.g. precision of ground data)
- Produce QA/QC plans for all data collection, analyses, and archiving

Stratum	Change agent/Driver – Deforestation (stock change)				
	Mining (>1 ha in size) (t CO_2e ha^{-1})	Infrastructure (t CO_2e ha^{-1})	Logging Infrastructure (t CO_2e ha^{-1})	Agriculture (t CO_2e ha^{-1})	Fire (t CO_2e ha^{-1})
Mixed forests high potential for change					
Mixed forest medium potential for change					

- Similar one developed for Degradation (gain-loss)
- Table will be filled in with EF based on ground data collection and analysis
- Factors will be used with activity data to generate estimates of historic emissions of GHG

National Stratification of Forest Lands

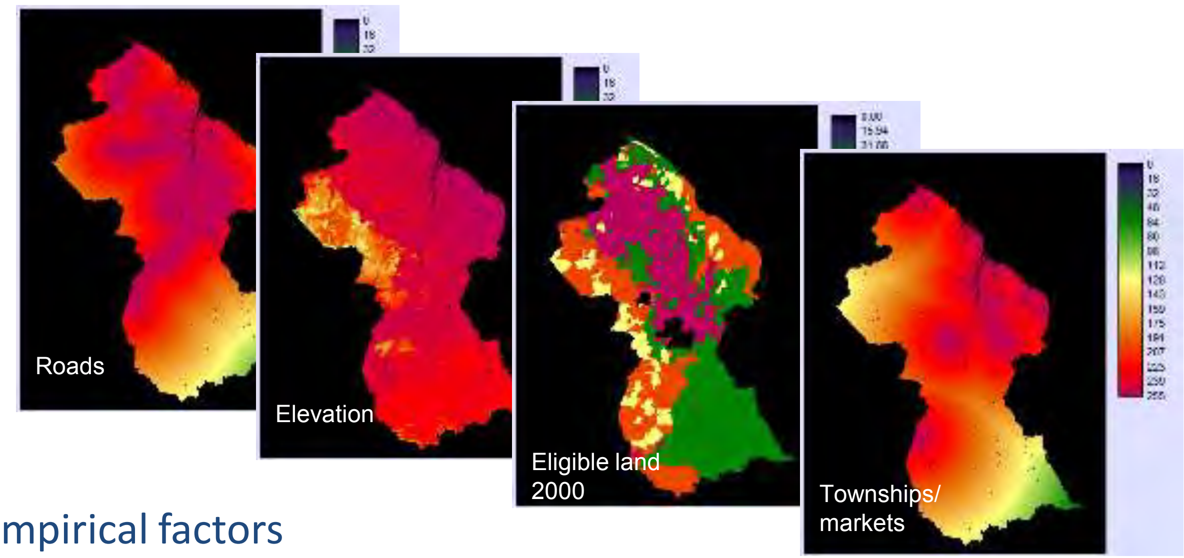
- Define biophysical and human factors that influence the distribution of carbon stocks
  - Elevation/Slope
  - Roads, rivers, towns/settlements, proximity to cleared areas
  - Logging concessions
  - Post land-use change
  - Pattern of historical deforestation
- Run spatial analysis, e.g. in GEOMOD, to stratify forests by carbon stocks, activity type (deforestation/degradation), threat of future land use change
- Define population of interest for sampling

Select and Process Factors Contributing to Deforestation

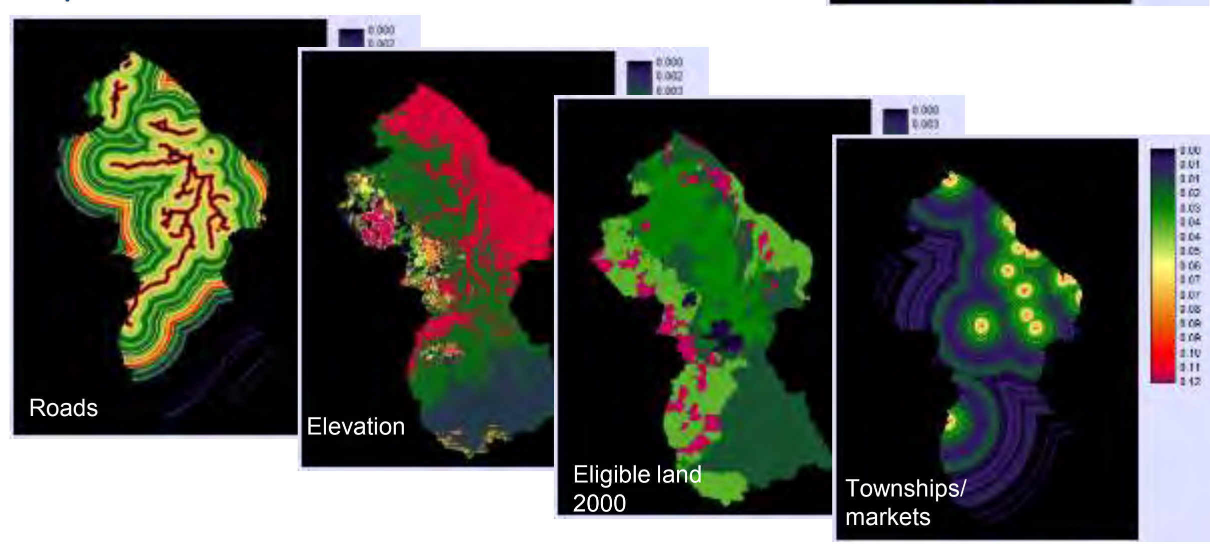
Factors existing in 2000

- Roads *(main and secondary)*
- Rivers
- Settlements
- Townships *(markets)*
- Eligible areas *(mining & forestry concessions; PA; State Forest; State land; Amerindian areas)*
- Forest species composition
- Fire incidents per forest species type
- Elevation
- Slope
- Soil dominant class

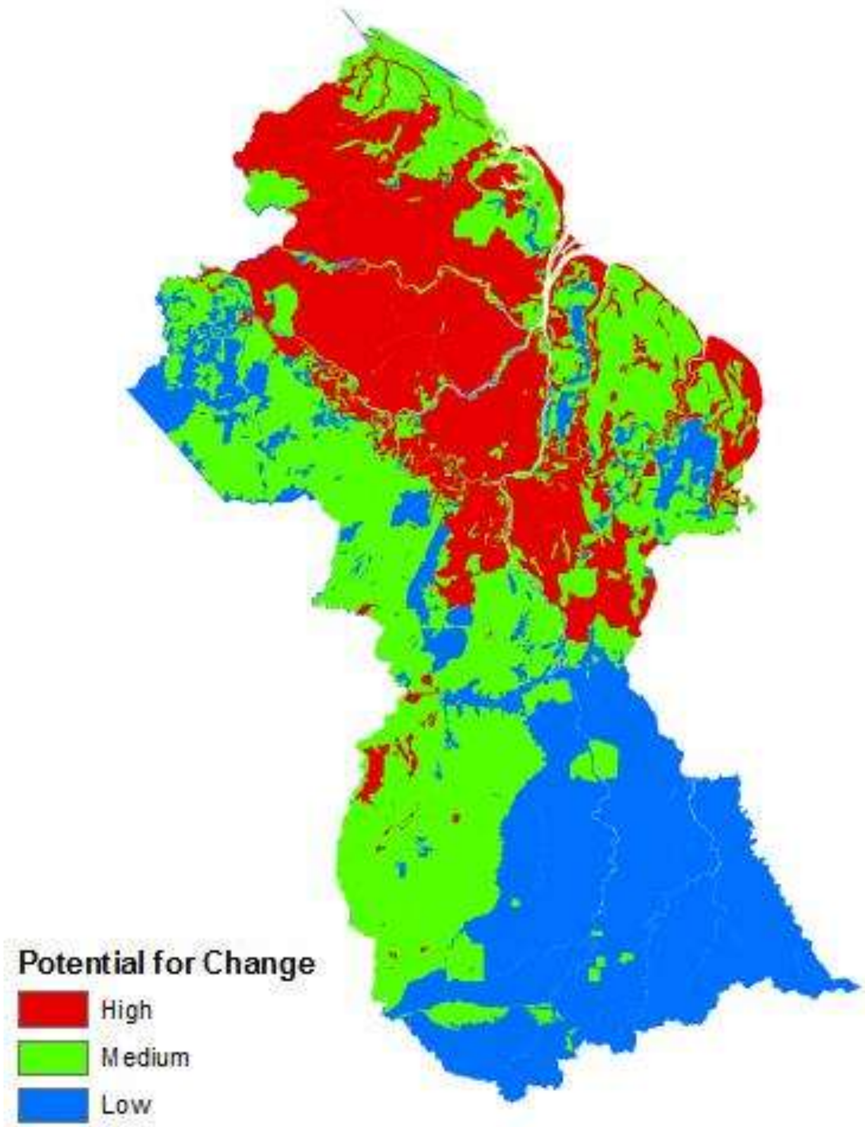
Heuristic factors



Empirical factors



Stratification by Threat for Deforestation



- GEOMOD analysis used to identify spatial patterns of change in relation to drivers and other factors and generate a “threat map”
- Stratifying by “threat” allows for estimating carbon stocks of forests where changes have occurred and likely to occur in future
- Reduces sampling effort while maintaining low uncertainty in estimates of emission factors

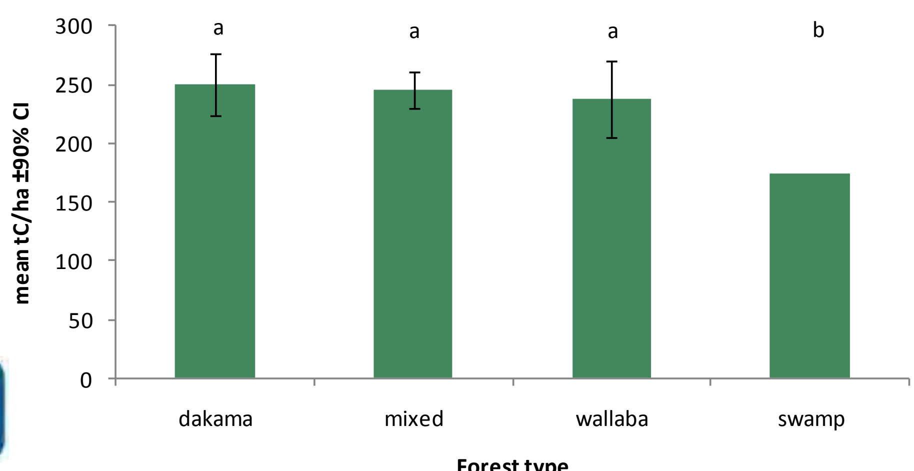
Collect preliminary field data for decisions on plot number and design

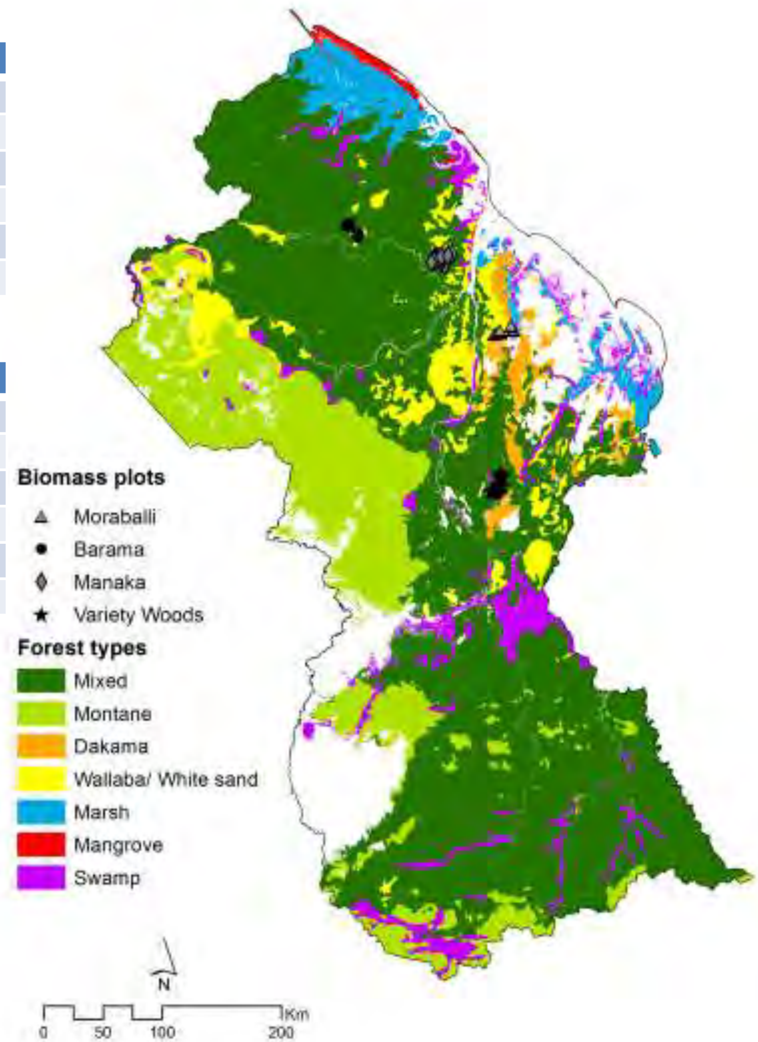
24 Single Plots—mean +/- 90% CI

Carbon Pool	Carbon Stock (t C ha^{-1})	% of Total
Aboveground tree biomass	192.4 ± 30.0	73.1
Belowground tree biomass	45.2± 7.0	17.2
Saplings*	7.0 ± 1.3	2.7
Dead wood (standing)#	1.1 ± 1.0	0.4
Dead wood (lying)#	17.3 ± 7.1	6.6
Total	263.0 ± 37.0	100

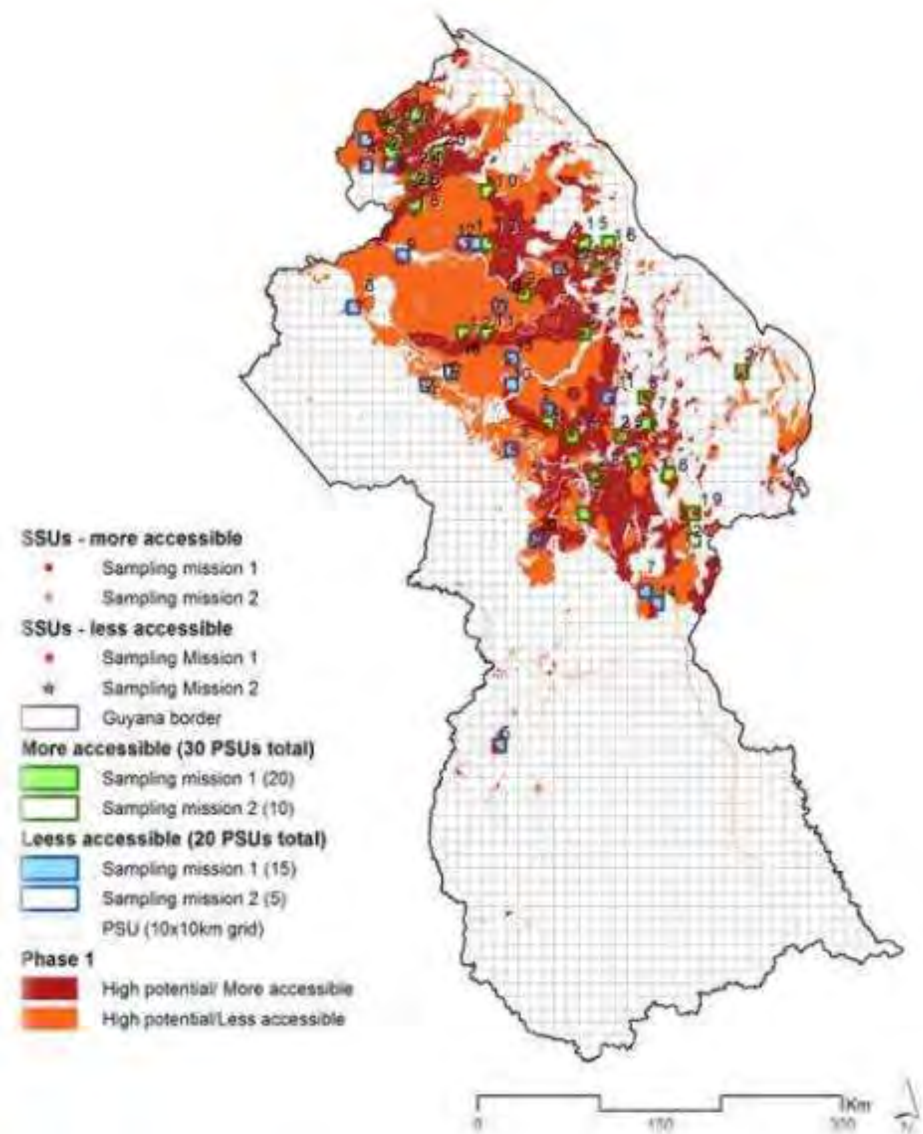
29 Cluster Plots—mean +/-90% CI

Carbon Pool	Carbon Stock (t C ha^{-1})	% of Total
Aboveground tree biomass	190.6 ± 12.9	72.4
Belowground tree biomass	44.8± 3.0	17.0
Saplings*	5.2 ± 0.6	2.0
Dead wood (standing)#	3.3 ± 1.4	1.3
Dead wood (lying)#	19.3 ± 3.1	7.3
Total	263.2 ± 16.4	100



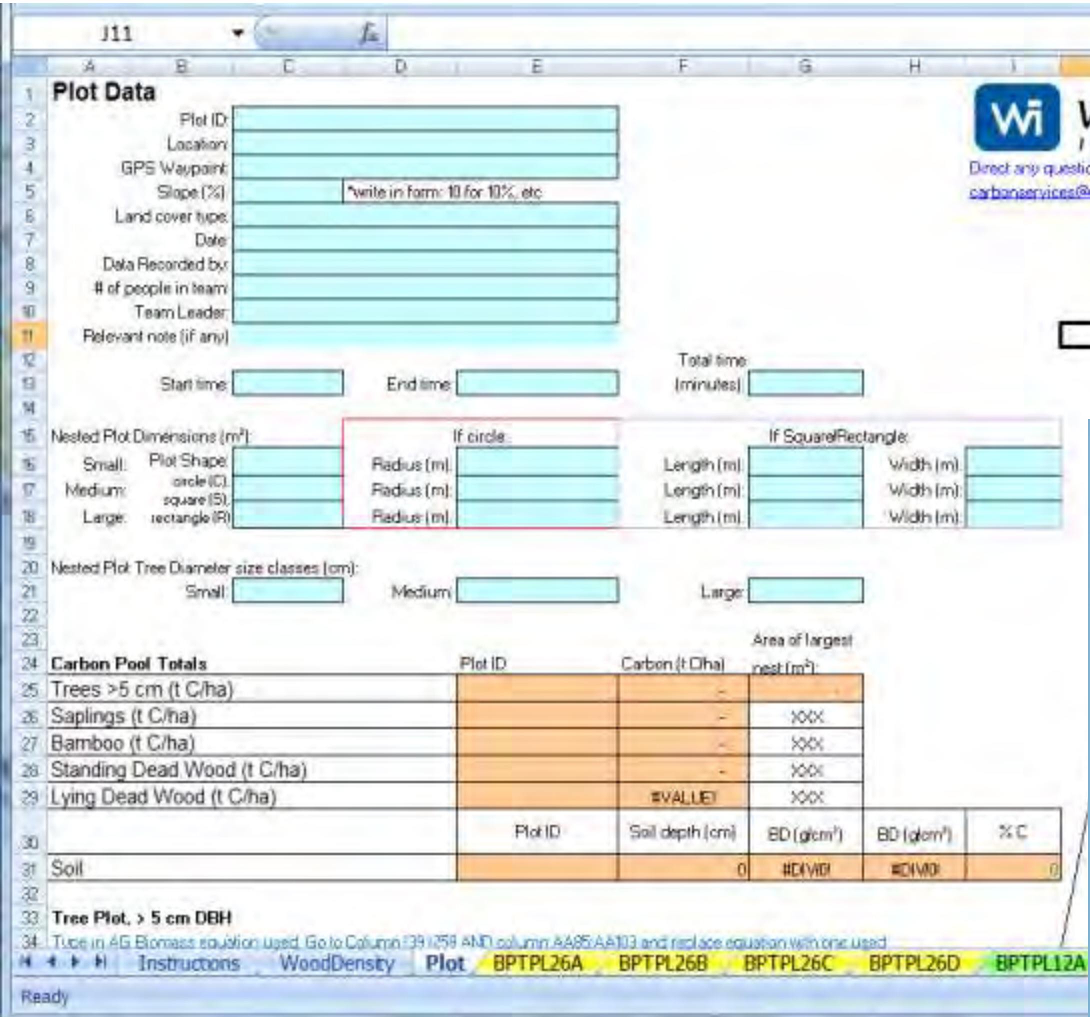


Design Sampling Plan for Generating EF for Deforestation

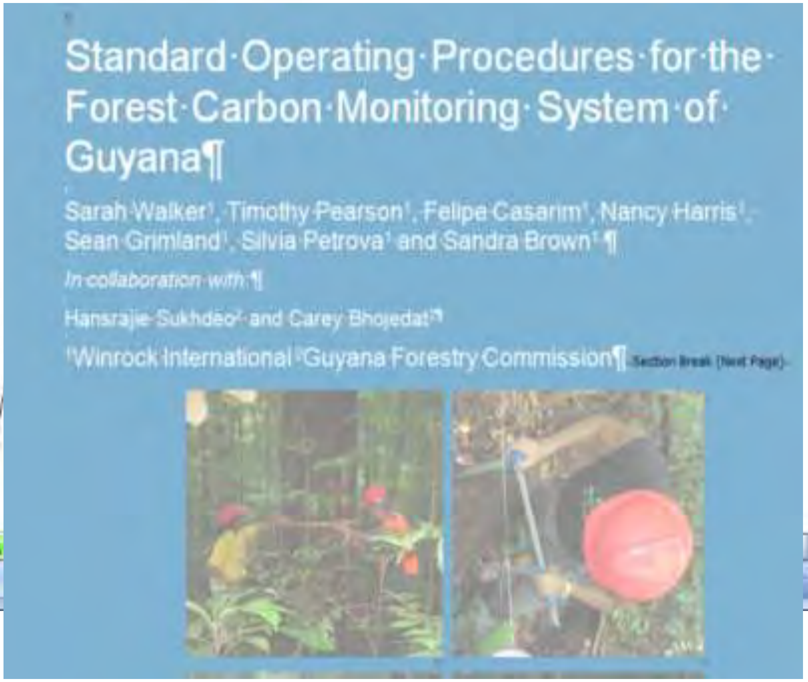


- Past deforestation has occurred in high threat area and likely to occur in future
- Stratify by more accessible and less accessible forests in sampling design for cost effectiveness
- Randomly selected number of grids in which to install plot clusters in high threat strata based on targeted precision
- <u>Repeat process</u> for medium and low threat in phased approach

QA/QC plans: Developed SOPs and tools to automate calculations for all field data



Worksheet links to data collected in use of Standard Operating Principles

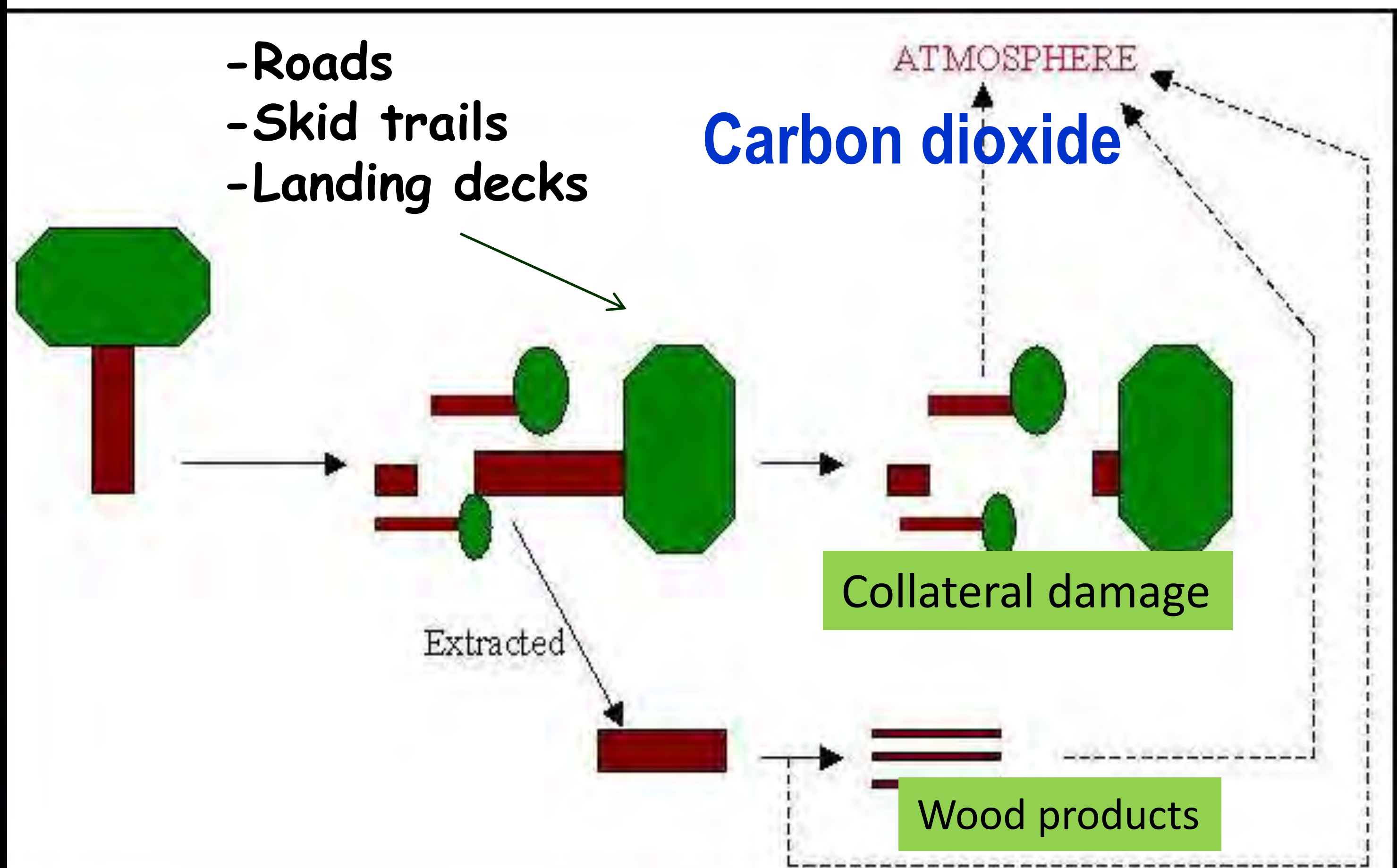


Historic Emissions from Deforestation

- Activity data from the remote sensing work
  - Landsat-type data, with verification, for 2001-2005, 2006-2009, 2009-2010
- Emission factors from stock-change approach based on completed implementation of field sampling
  - Post deforestation carbon stocks assumed to be zero
  - Change in soil C based on IPCC methodology with field sample results
- Emissions = activity data x emission factors

Methods for Developing Emissions Factors from Timber Harvesting

•Use –change detection” to estimate carbon impact per unit volume of timber extracted



Estimating Emissions from Removals in Selective Logging

C emissions, t C/yr = [vol x WD x CF x (1-LTP)] +[vol x LDF] +[vol x LIF]

Where:

Vol = volume timber extracted over bark per logging block (m3); serves as activity data

WD = wood density (t/m3)

CF = carbon fraction

LTP = proportion of extracted wood in long term products (dimensionless)

LDF = logging damage factor (t C/m3)—dead wood left behind in gap from felled tree and collateral damage

LIF = logging infrastructure factor (t C/m3)—dead wood produced by construction

E.g. Measurements Needed for Logging Damage Factor

- Take measurements in gaps on felled trees and collateral damage to estimate the losses of live biomass carbon
- Use biomass regression equations to estimate biomass carbon of felled and damaged trees

Emissions from Timber Extraction

	Extracted Volume (m3/gap)	Felled Tree Carbon (t C/gap)	Top & stump of Felled Tree (t C/m3/gap)	Incidental Damage per Vol. Extracted (t C/m3/gap)	LDF Total Carbon Damage per Vol. Extracted (t C/m3)	Total Carbon Emissions per Carbon Extracted (t C/t C)
Mean	3.91	3.74	0.57	0.34	0.95	2.67
Std.Dev	2.32	2.54	0.31	0.36	0.51	1.4
90% CI	0.35	0.38	0.05	0.05	0.08	0.2

Based on 120 logging plots in Guyana

Emissions e.g. for extraction of 10 m^3/ha over 200 ha concession:

= [200 ha * 10 *0.65*0.47*(1-0.1)] + [200*10*0.95]

=550 + 1900

=2,450 t C/yr

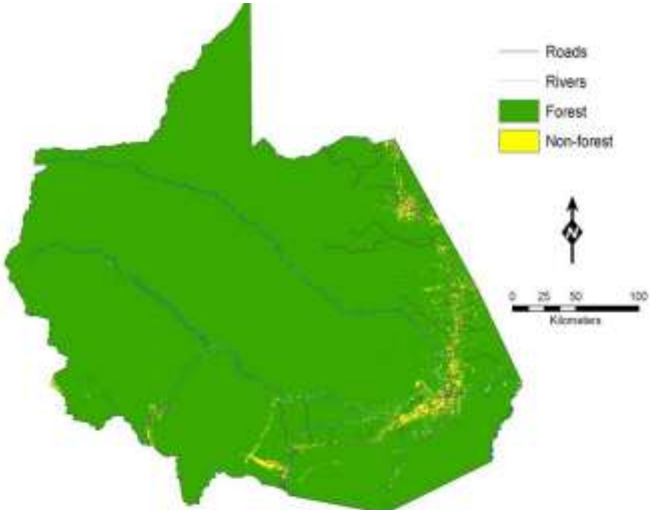
Or about 12.3 t C/ha—compared to about 260 t C for deforestation

Projecting Future Emissions

Each country must justify projections

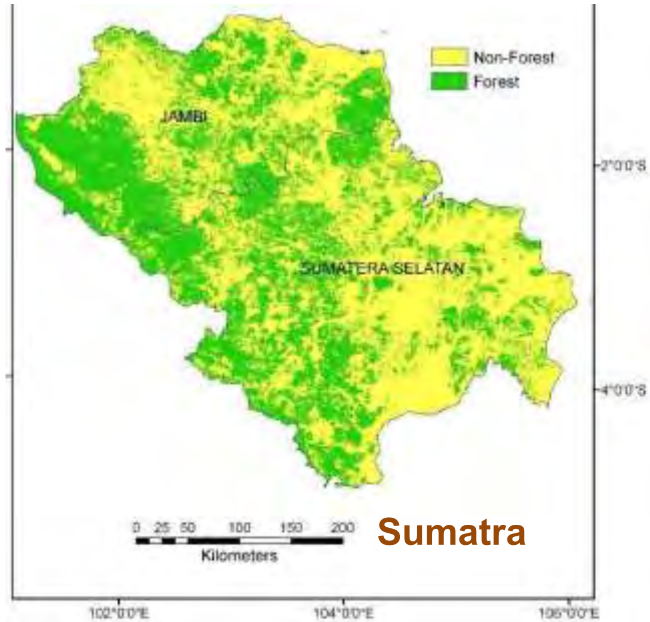
1. National circumstances—analysis by countries using variety of tools:
-development plans, including infrastructure (e.g. roads)
-opportunity costs
-markets for commodities (e.g. biofuels)
-spatial pattern and rate of past deforestation

Frontier-type pattern-forest less accessible and threat low except near roads



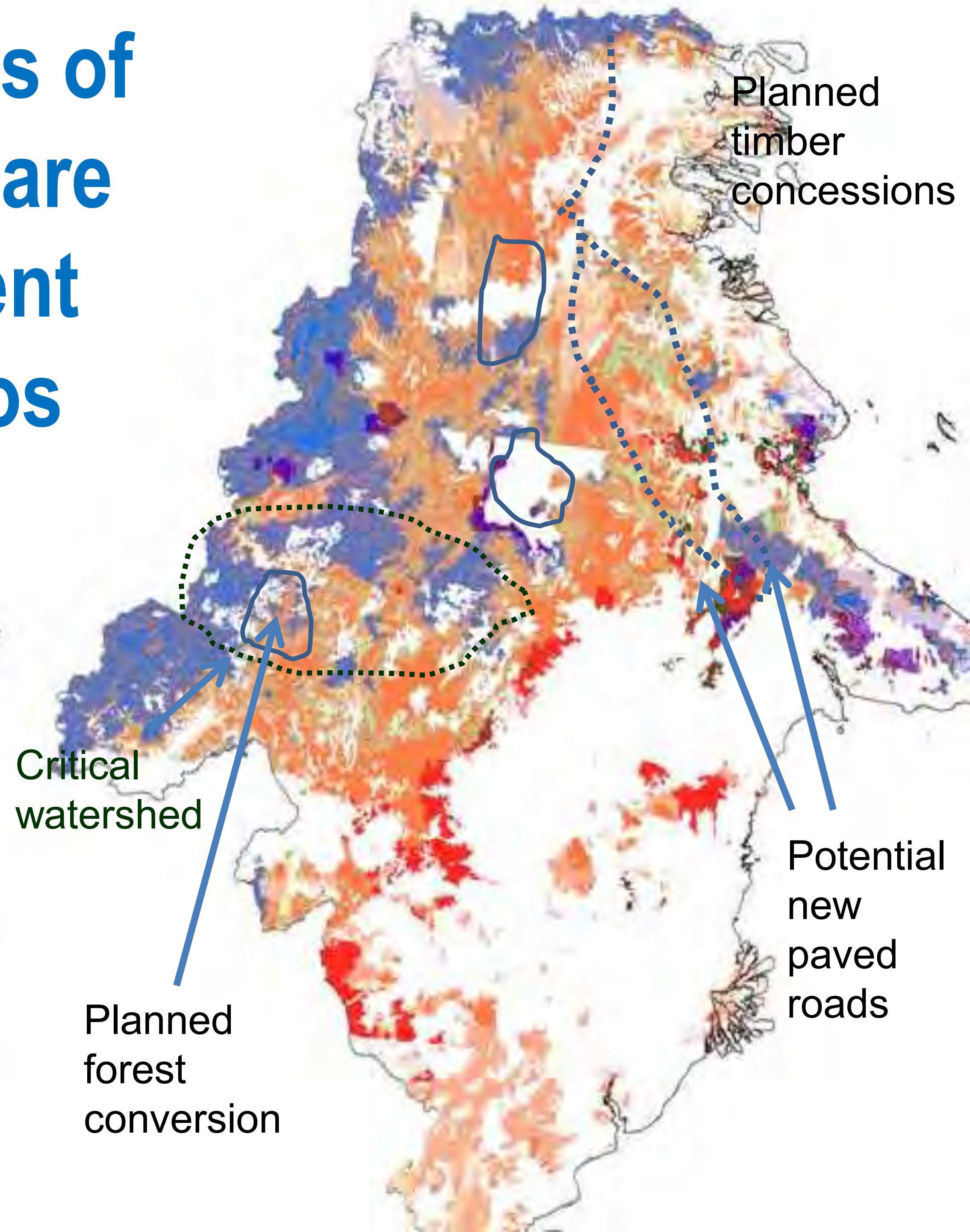
Madre de Dios, Peru

Mosaic-type pattern-forest accessible and threat likely high for all forests



Sumatra

Future projections of emissions--compare impacts of different land-use scenarios



No Data

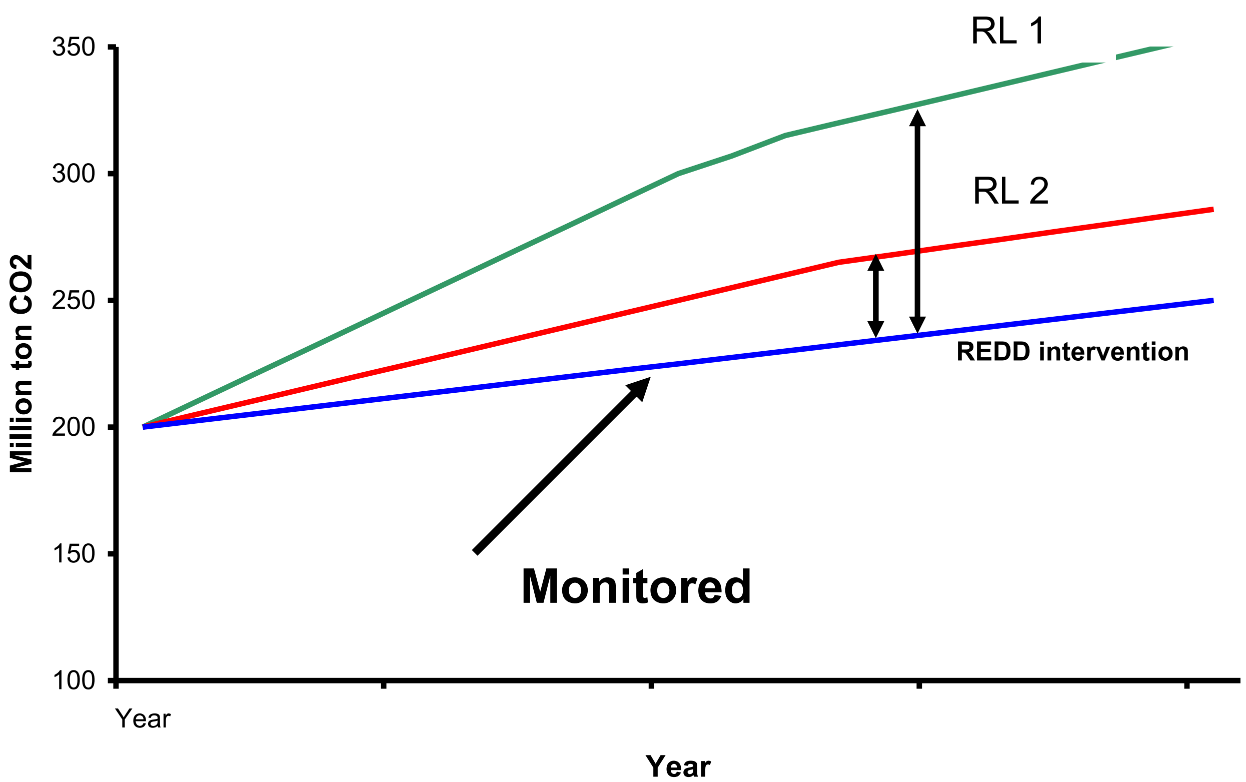
Deformation threat class /Carbon category

- Low threat /Medium carbon
- Low threat /Medium High carbon
- Low threat /High carbon
- Low threat /Very High carbon
- Moderate threat /Medium carbon
- Moderate threat /Medium High carbon
- Moderate threat /Very High carbon
- Moderate threat /High carbon
- High threat /Medium carbon
- High threat /Medium High carbon
- High threat /High carbon

From Harris et al. 2008

Monitoring Emissions and Removals with REDD+ Interventions

- Monitoring is related to the collection of the data needed to perform the calculations for estimating emission or enhancement of C stocks (and their associated uncertainties) with REDD+ interventions



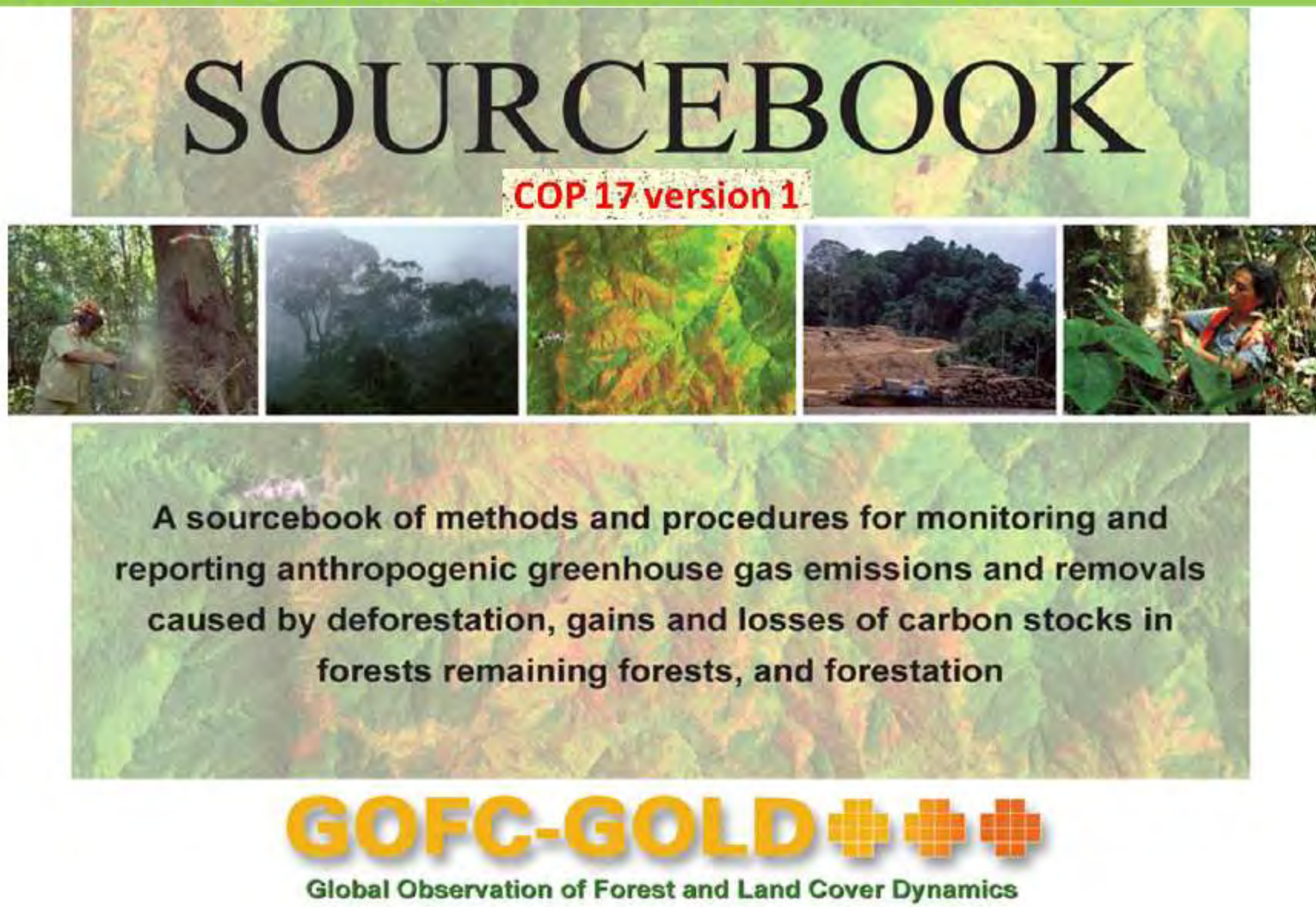
Elements of MRV plan

- Need a benchmark map of forest cover for year from which future changes will be monitored
- Include same pools as in RL
- Focus on forests under threat—population of interest is forests at threat of human-induced change; no need for a National Forest Inventory
- Need to monitor both area change and emission factors to similar levels of precision—otherwise the advantage of the area accuracy is lost

Remote Sensing Uncertainty	Carbon Stock Uncertainty	Total Uncertainty
10 %	30 %	32 %
10 %	10 %	14 %

REDD Sourcebook Provides Guidance

Provides guidance on how to collect and process data for monitoring change in area and carbon stocks



Conclusions

- UNFCCC making progress in providing modalities and methodological guidance on REDD+ RLs; modalities and guidance on MRV not yet established
- RLs are a key starting point for engaging in a REDD+ mechanism and serve as the basis for developing a strategy as well as for monitoring performance of strategic interventions
- To design and implement a cost-effective system for generating EF need to stratify forests by threat and carbon stocks
  - Can focus on forest areas where change has occurred and likely to occur in future
  - No need for a national forest inventory for EF for REDD+
- No fixed methodology for taking into account national circumstances for projections—likely difficult for high forest cover and low historic emission countries
- An MRV plan needs to be strongly linked to RL and drivers of forest cover change and to the strategy for interventions

Thank You!

- Thanks to the WI Ecosystem Services team
- Support from US AID, The World Bank, Meridian Institute, Guyana Forestry Commission, and The Nature Conservancy
- For more information see:
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