

GOFC-GOLD

Global Observation of Forest and Land Cover Dynamics



Estimation of carbon stocks

Sandra Brown
Winrock International
sbrown@winrock.org



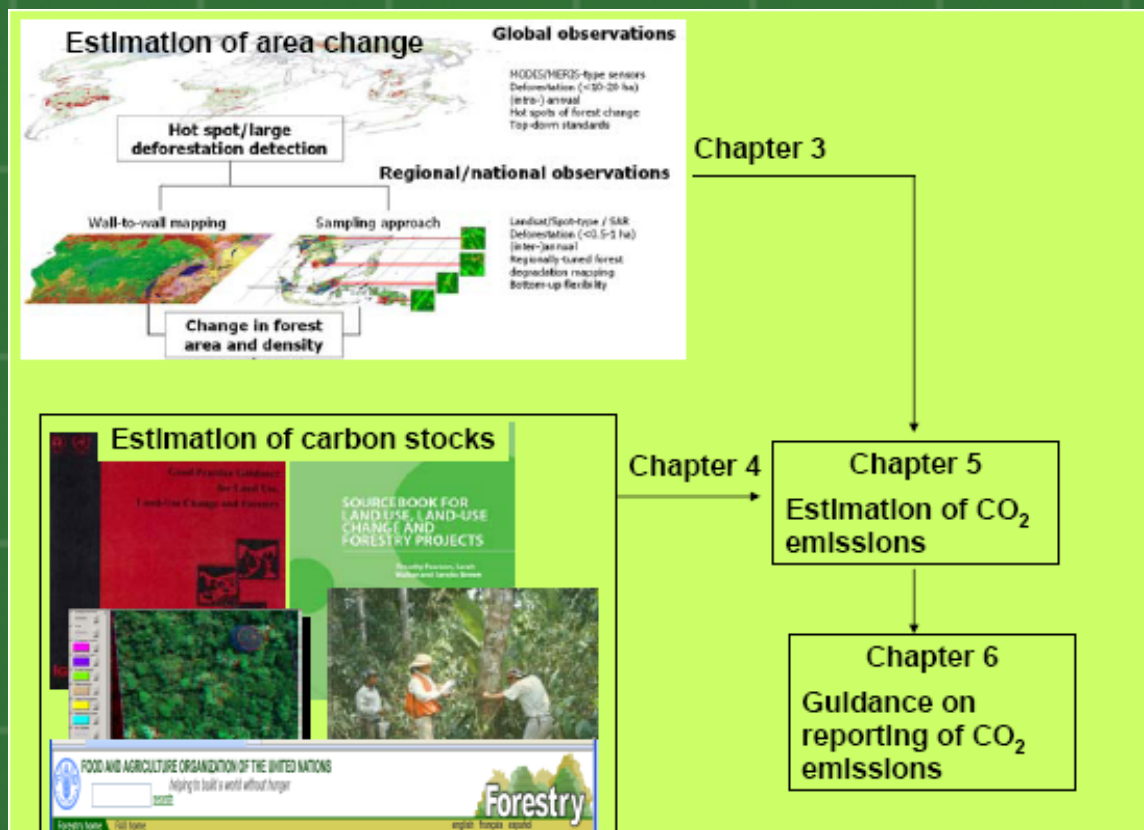
United Nations Climate Change Conference
Bali, 3 - 14 December 2007

GOFC-GOLD

Global Observation of Forest and Land Cover Dynamics



Carbon emissions =
Area deforested or degraded * change in carbon stock per area



Goals of chapter

- Not to re-invent methods for estimating forest carbon stocks
- To complement the GPG-LULUCF and AFOLU by providing, in a user-friendly way, additional explanation, clarification and enhanced methodologies for obtaining and analyzing carbon stock data for key categories
- To provide guidance on producing estimates of carbon stocks that do not overestimate the true value (conservative) and have low uncertainty



Overview of Chapter

- ✓ Which Tier Should be Used? The IPCC allows for three Tiers with increasing complexity and costs of monitoring
- ✓ Stratification by Carbon Stock—a key step to allow an accurate, cost effective and creditable linkage between the remote sensing imagery estimates of area change and estimates of carbon stocks and emissions



GOFC-GOLD

Overview of Chapter

- ✓ Estimation of Carbon Stocks of Forests Undergoing Change—steps to devise and implement
- How to assess Uncertainty resulting from the forest carbon stock estimations
- Case Studies on the entire process of implementing a carbon stock assessment for REDD



Which Tier Should be Used?

IPCC Tier	Data needs/examples of appropriate biomass data
Tier 1 (little guidance needed)	Default mean annual increment (MAI for degradation) and/or forest biomass stock (for deforestation) for broad continental forest types— includes 6 classes for each continental area to encompass differences in elevation and general climatic zone; default values given for all vegetation-based pools
Tier 2	MAI and/or forest biomass values from existing forest inventories and/or ecological studies. Default values provided for all non-tree pools Newly-collected forest biomass data.
Tier 3	Repeated measurements of trees from permanent plots and/or calibrated process models. Can use default data for other pools stratified by in-country regions and forest type, or estimates from process models

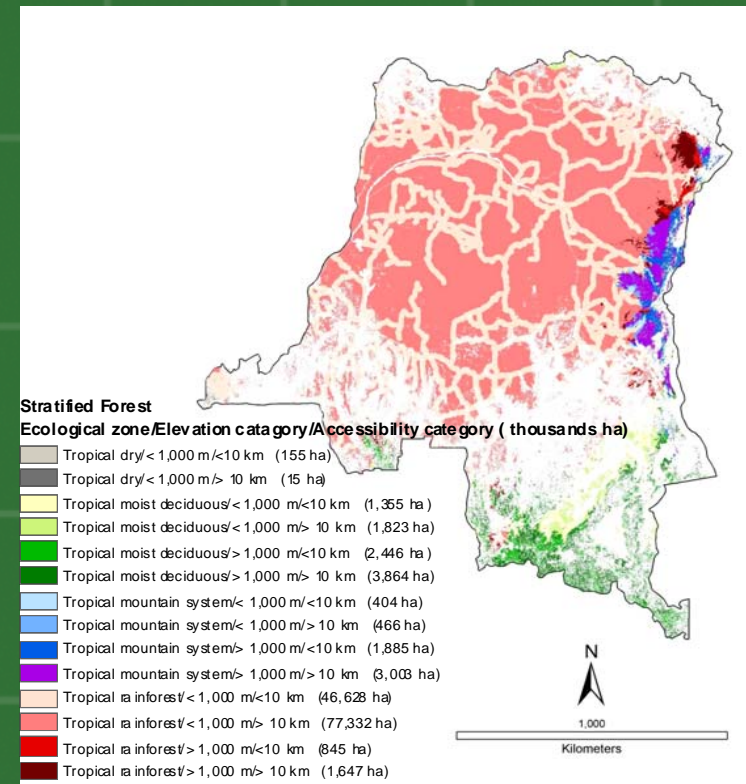
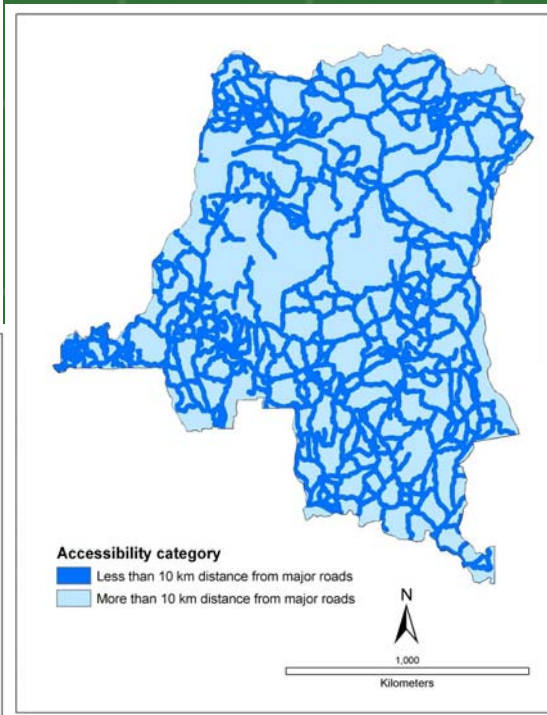
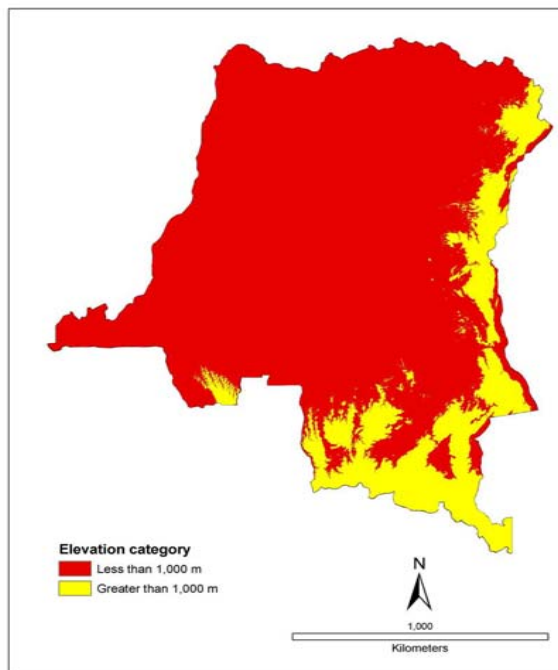
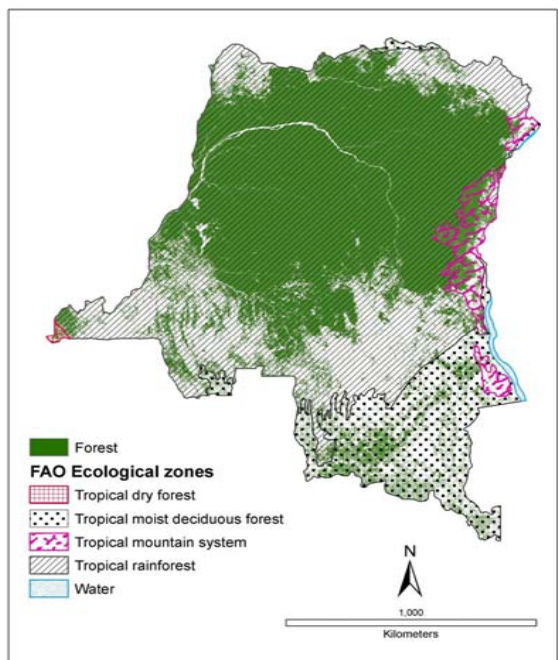
Stratification by Carbon Stock

- Stratifying an forest area by its carbon stocks rather than by forest vegetation can reduce uncertainty and costs
- Carbon stocks of forests vary by different forest types and ecoregions depending on:
 - physical factors—e.g. precipitation regime, temperature, soil type, topography
 - biological factors—e.g. tree species composition, stand age, stand density
 - anthropogenic factors—e.g. disturbance history, logging intensity, accessibility (roads, population centers)



GOFC-GOLD

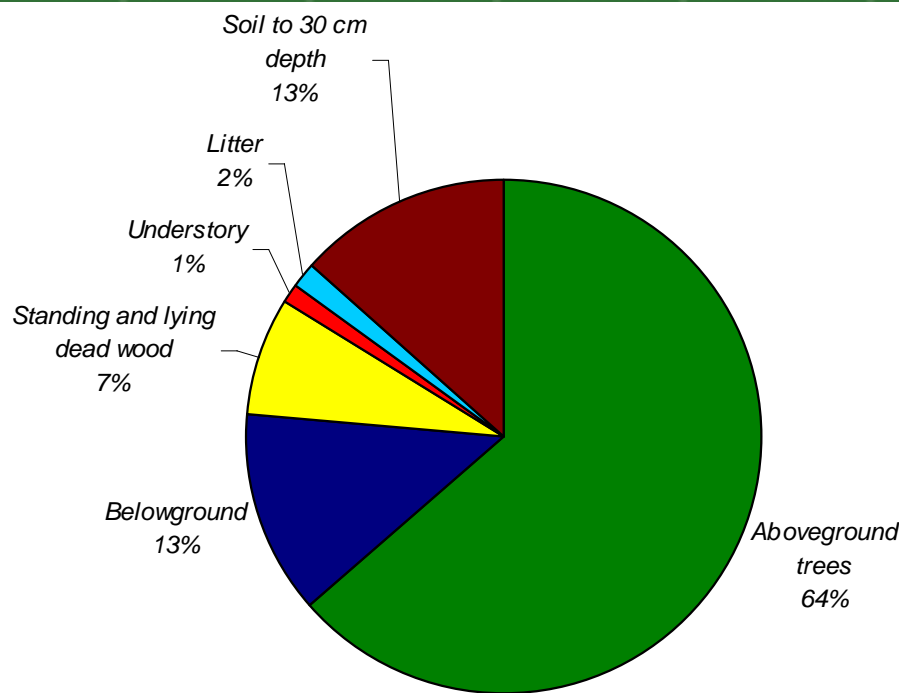
Example of how to stratify country's forests for carbon estimation



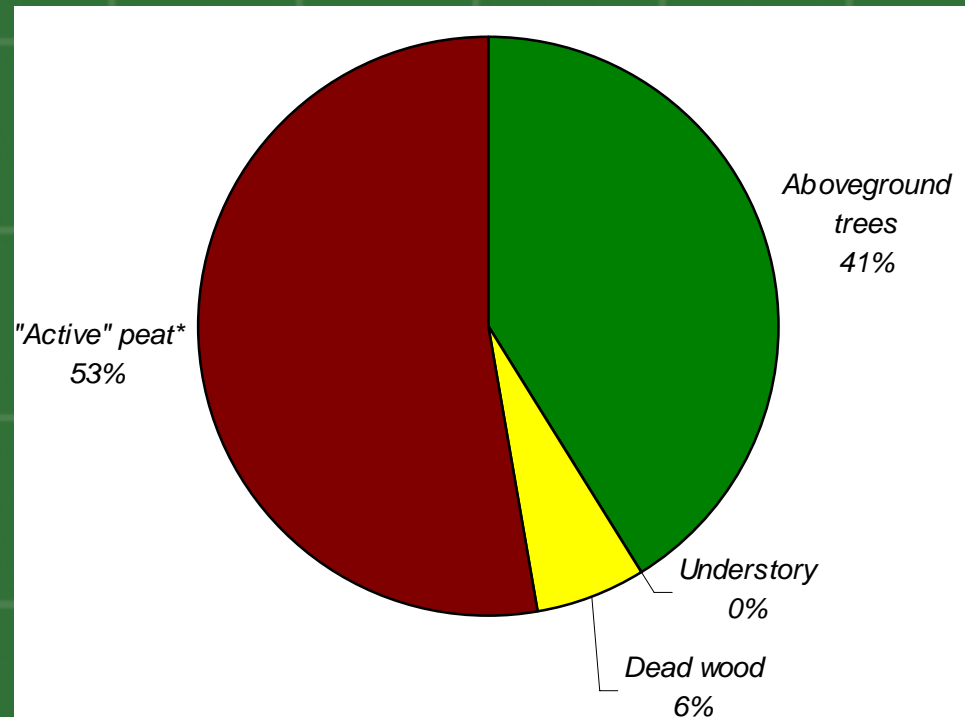
GOFC-GOLD

Estimation of Carbon Stocks

- Which pools—key categories



Lowland forest in Bolivia



Peatswamp forest in Indonesia



GOFC-GOLD

General approaches to improving estimates of carbon stocks

- 1 STEP 1: Identify strata where assessment of carbon stocks is needed
 - Not all forest strata are likely to undergo change (identified by stratification step)
- 2 STEP 2: Assess existing data quality
 - e.g.—less than 10 years old, derived from multiple plots, sampled from good coverage of the strata, all species and minimum diameter at least 25-30 cm included if using forest inventory data
 - Provides detailed guidance on how to convert forest inventory data to carbon stock estimates
- STEP 3: Collect missing data
 - Based on decisions about which strata at risk of deforestation or degradation in the future but do not have estimates of carbon stock



Create a national “look-up” table

- A cost-effective method may be to create a “national look-up table” and periodically updated and used through time to detail the pre-deforestation or degradation stocks –Tier 2 approach

Stratum	Above-ground Tree	Below-ground Tree	Dead Wood	Non-Tree	Total
Units in t C/ha					
Lowland Forest	110	23	18	3	154
Montane Forest	91	17	17	5	130
Open Woodland	48	10	6	8	72
Degraded Lowland Forest	70	15	18	4	107
Degraded Montane Forest	58	11	16	7	92
Degraded Woodland	28	6	6	6	46
Shifting Cultivation	20	5	5	7	37
Permanent Agriculture	0	0	0	4	4

Soil carbon changes

- IPCC provides guidance using 3 Tiers for soil carbon changes
- We present opportunities to improve on Tier 1 to move to Tier 2 if soil is a key category

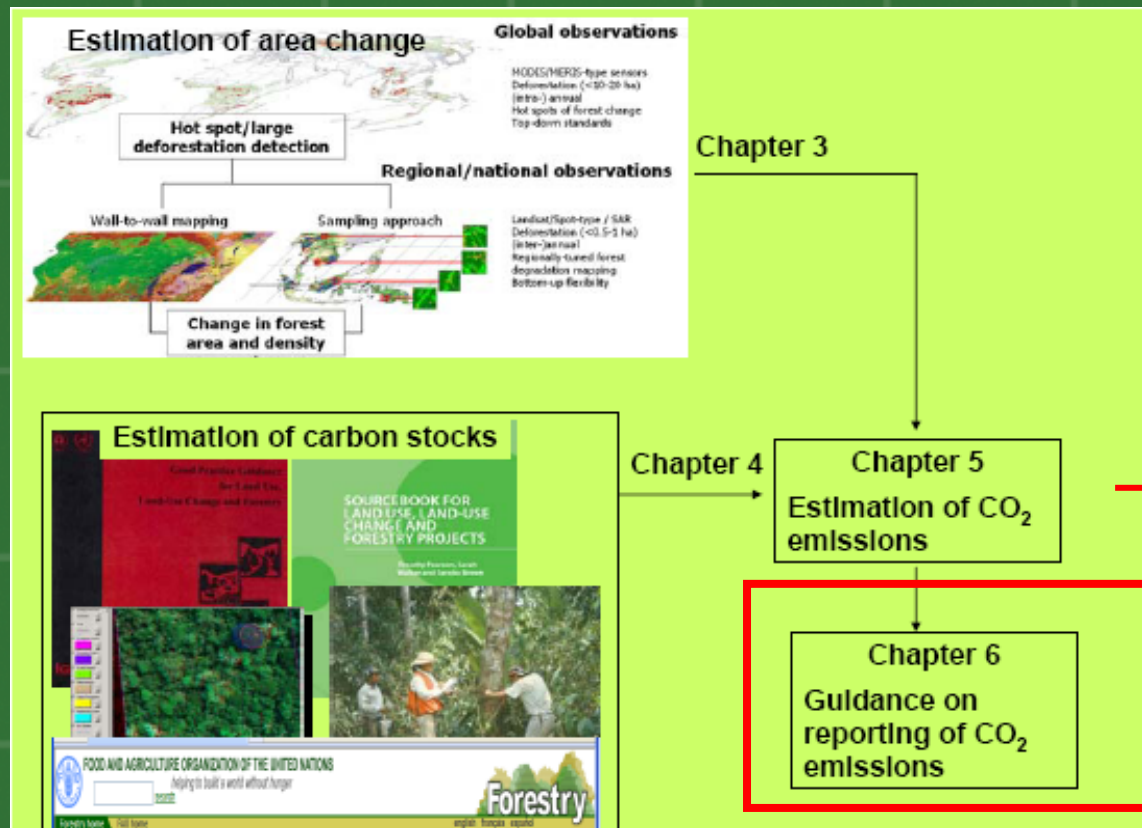
Soil carbon pool	Tier 1	Tier 2	Tier 3
Mineral soil organic carbon	Default reference C stocks and stock change factors from IPCC	Country-specific data on reference C stocks & stock change factors	Validated model or direct measures of stock change through monitoring networks
Organic soil carbon	Default emission factor from IPCC	Country-specific data on emission factors	Validated model or direct measures of stock change

GOFC-GOLD

Global Observation of Forest and Land Cover Dynamics



**Carbon emissions =
Area deforested or degraded * change in carbon stock per area**



**Next
presentation**