



National Forest Inventory of Bhutan



Thursday, October 17, 2013

Department of Forests and Park Services
Ministry of Agriculture and Forests



Objective of National Forest Inventory



To provide up-to-date data and information on forest and its resources in Bhutan



National level data



Objective of the process of NFI



- To strengthen the institutional capacity of the department so that it is capable of carrying out national forest inventory PERIODICALLY(eg every ten years) through
 - * capacity building> Human resources
 - * documentation of process, technical guidelines for ensuring comparable data for monitoring
 - * establishing/strengthening infrastructures like laboratory facilities, database management system , remote sensing and GIS lab



Modus Operandi

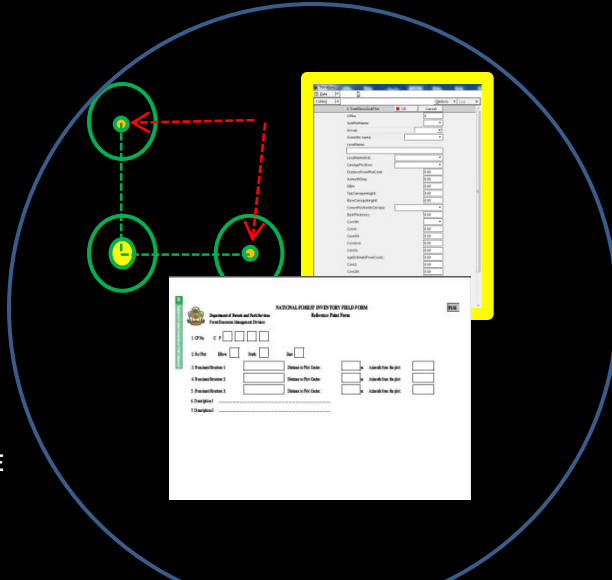
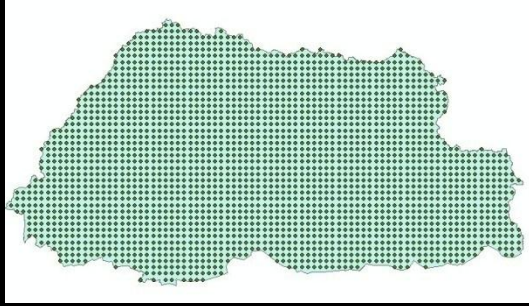
Phase I: Preparatory Phase

- Development of inventory design and methodologies.
- Defining the data parameters.
- Field manuals
- Defining field implementation modality
- Procurement of field equipments and gears
- Mobilizing Field crew
- Capacity Building
- Setting up National Information Management System

Phase II: Enumeration Phase

- Field work /data collection
- Analysis of data
- Publication of State of Forests report and other relevant reports

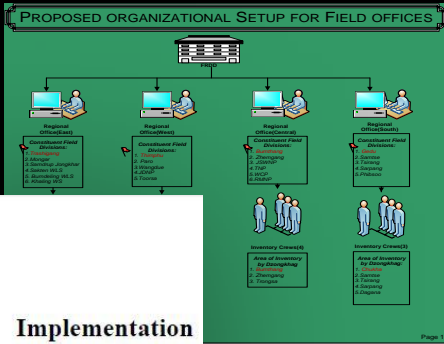
STATUS....



Field manuals

Design, data collection methodology and data parameters

4km by 4km systematic grid, 2424 Cluster plot at 15 % MoE



Mobilizing field crew and training



Field equipments and field gear

Field Implementation Modality for National Forest Inventory



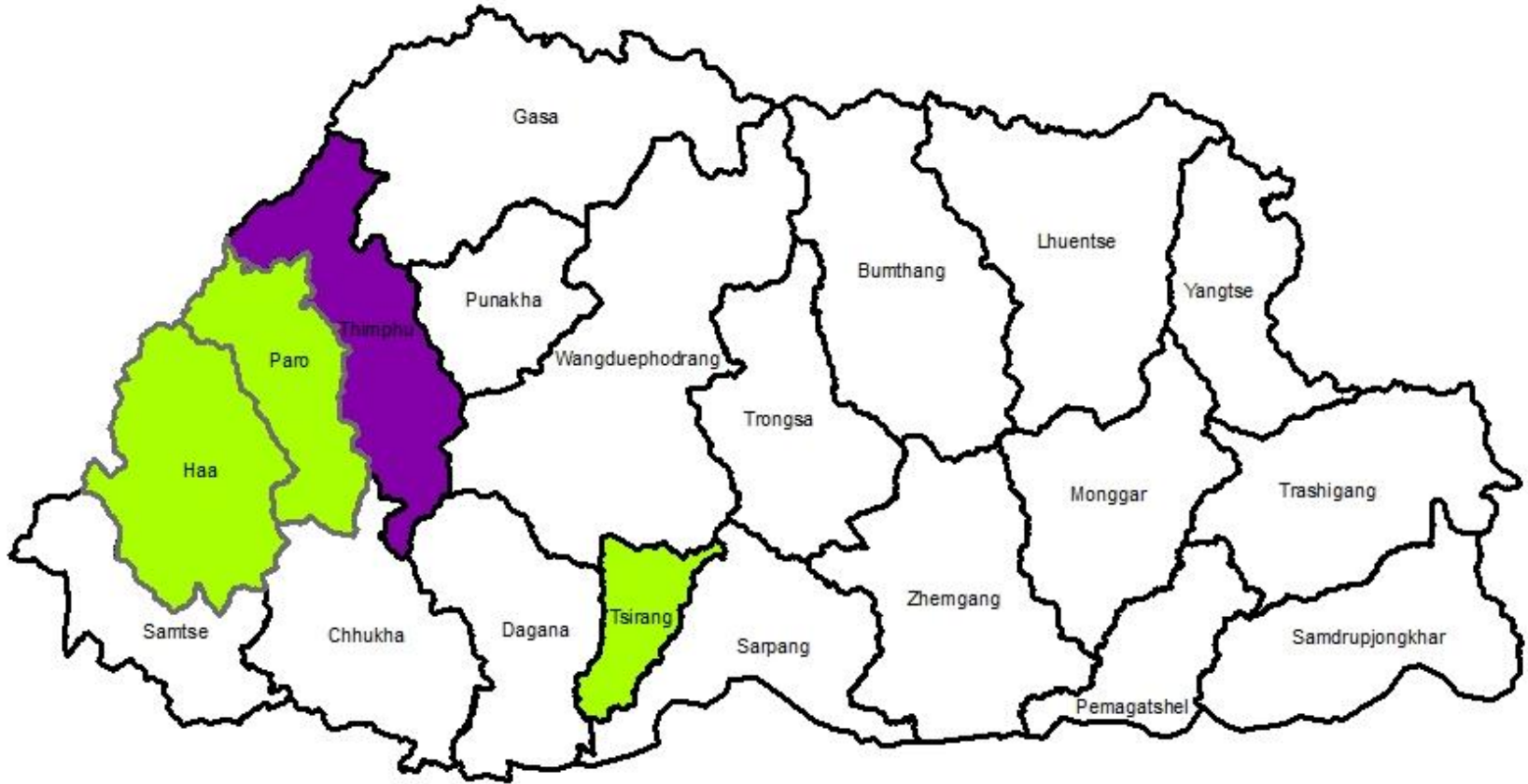
Field Implementation modality adopted

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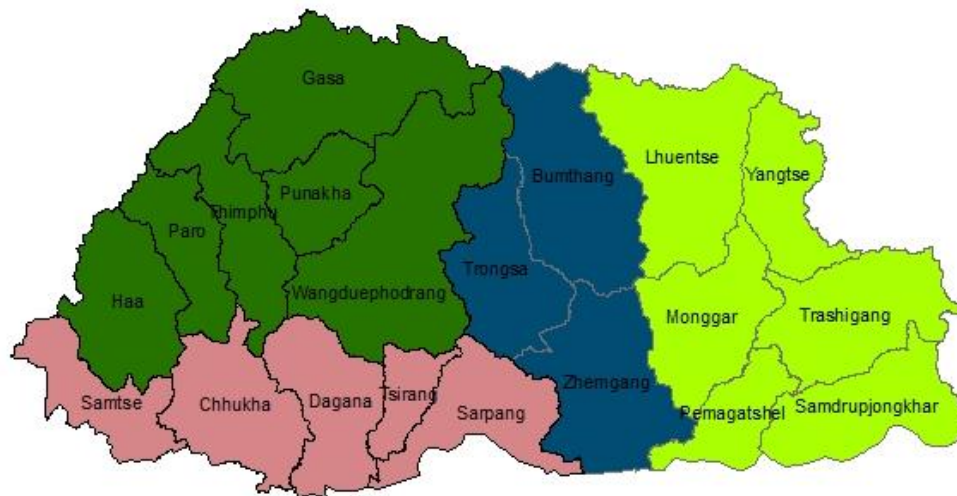


Status...Enumeration Phase



Implementation modality for NFI

FOUR REGIONS OF NFI



Legend

-  Inventory_southern_region
-  Inventory_western_region
-  Inventory_eastern_region
-  Inventory_central_region

Twelve Inventory Crews , comprising of five foresters each trained(60 field crews in total)

Field work to be carried out region wise.

Time frame of two years

Cost of field work only: 52 million ngultrum

NAVIGATION AND DATA COLLECTION

- Navigation to Elbow plot using the GPS
- Data collection is also on Trimble Juno as it has electronic data capabilities
- Paper field forms will be used if the GPS should fail in the field
- Data cleaning process starts right in the field
- Data transfer is easier and exportable



TerraSync

Data

Collect

Options Log

1 TreeElbowSubPlot

OK Cancel

CPNo: 0

SubPlotName:

Group:

Scientific name:

LocalName:

LocalName(list):

CanopyPosition:

DistanceFromPlotCent: 0.00

AzimuthDeg: 0.00

DBH: 0.00

TopCanopyHeight: 0.00

BaseCanopyHeight: 0.00

CrownPositonInCanopy:

BarkThickness: 0.00

CoreYN:

Core1: 0.00

Core1N: 0.00

Core1nn: 0.00

Core1L: 0.00

AgeEstimateFromCore1: 0.00

Core2: 0.00

Core2N: 0.00

Core2nn: 0.00

Core2L: 0.00

AgeEstimateFromCore2: 0.00

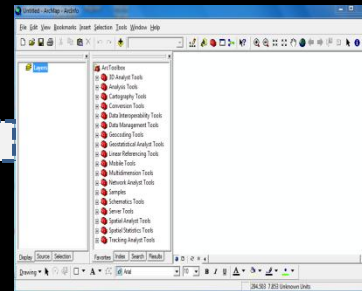
AgeEstimate: 0.00

10YearsIncrement: 0

Data Flow and processing



Save as
ssf files



CP No	Latitude	Longitude
CP238	26° 52' 24.133" N	92° 2' 13.717" E
CP237	26° 52' 24.076" N	92° 2' 13.780" E
CP233	26° 52' 34.096" N	92° 2' 13.780" E
CP274	26° 52' 34.033" N	92° 2' 13.800" E
CP278	26° 52' 33.937" N	92° 2' 13.800" E
CP230	26° 54' 44.957" N	92° 2' 13.800" E
CP281	26° 54' 43.866" N	92° 2' 13.777" E
CP282	26° 54' 43.866" N	92° 2' 13.759" E
CP283	26° 54' 43.757" N	92° 2' 13.759" E
CP215	26° 56' 53.860" N	92° 4' 38.860" E
CP216	26° 56' 53.860" N	92° 7' 3.874" E
CP217	26° 56' 53.717" N	92° 8' 28.088" E
CP218	26° 56' 53.534" N	92° 11' 53.862" E
CP247	26° 56' 3.840" N	92° 4' 38.840" E
CP248	26° 56' 3.919" N	92° 4' 1.009" E
CP249	26° 56' 3.977" N	92° 9' 29.076" E
CP255	26° 56' 3.468" N	92° 11' 54.030" E
CP187	27° 1' 13.879" N	92° 4' 38.038" E
CP188	27° 1' 13.778" N	92° 7' 1.148" E
CP189	27° 1' 13.627" N	92° 9' 29.252" E



Process
with R-
program

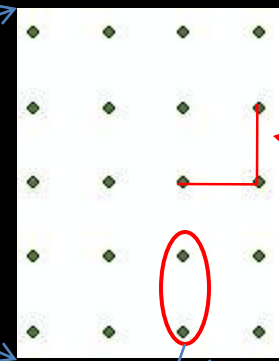
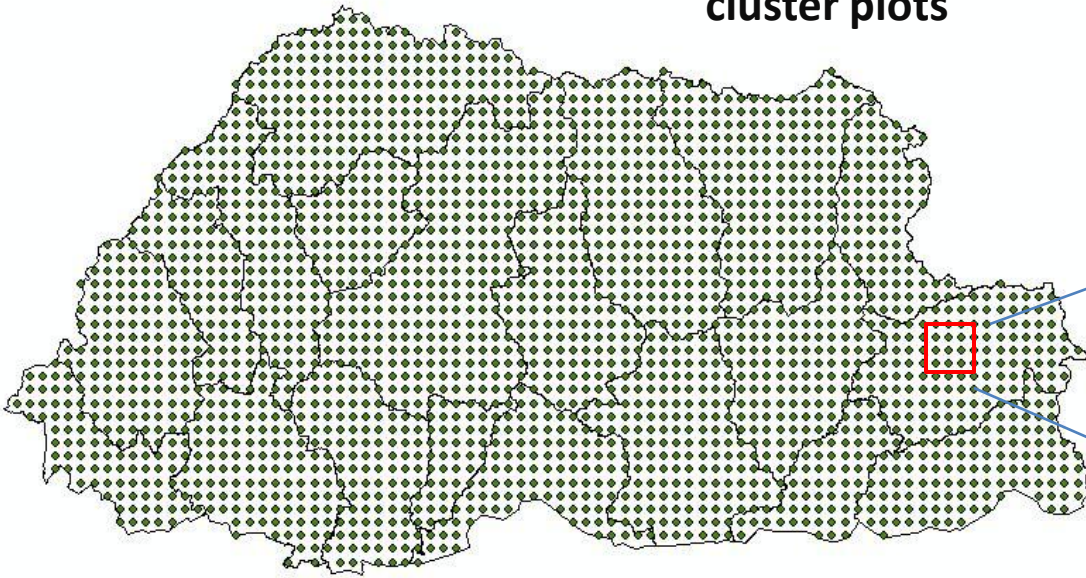
Export .shp files into
text files

Open the .shp data
files in ARCMAP

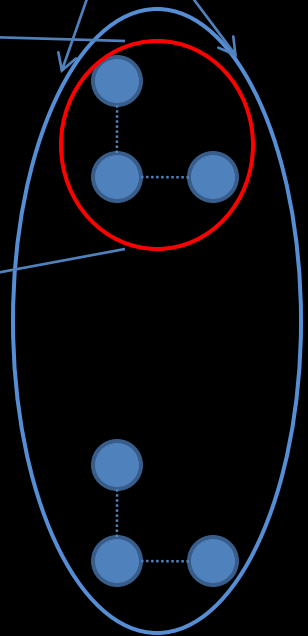
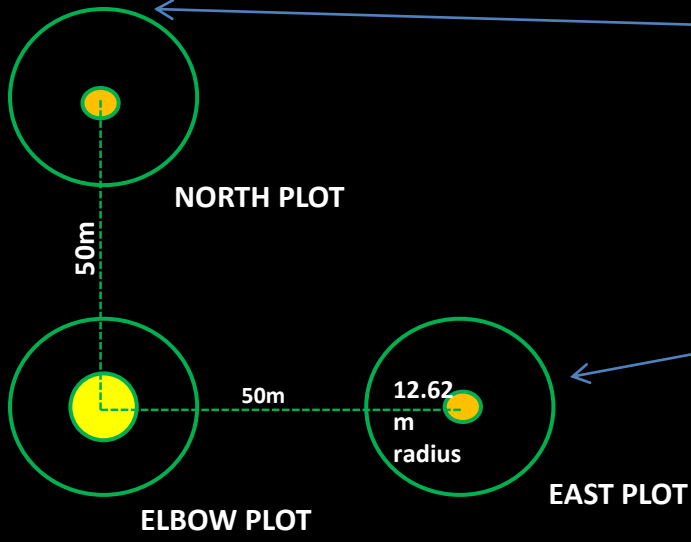


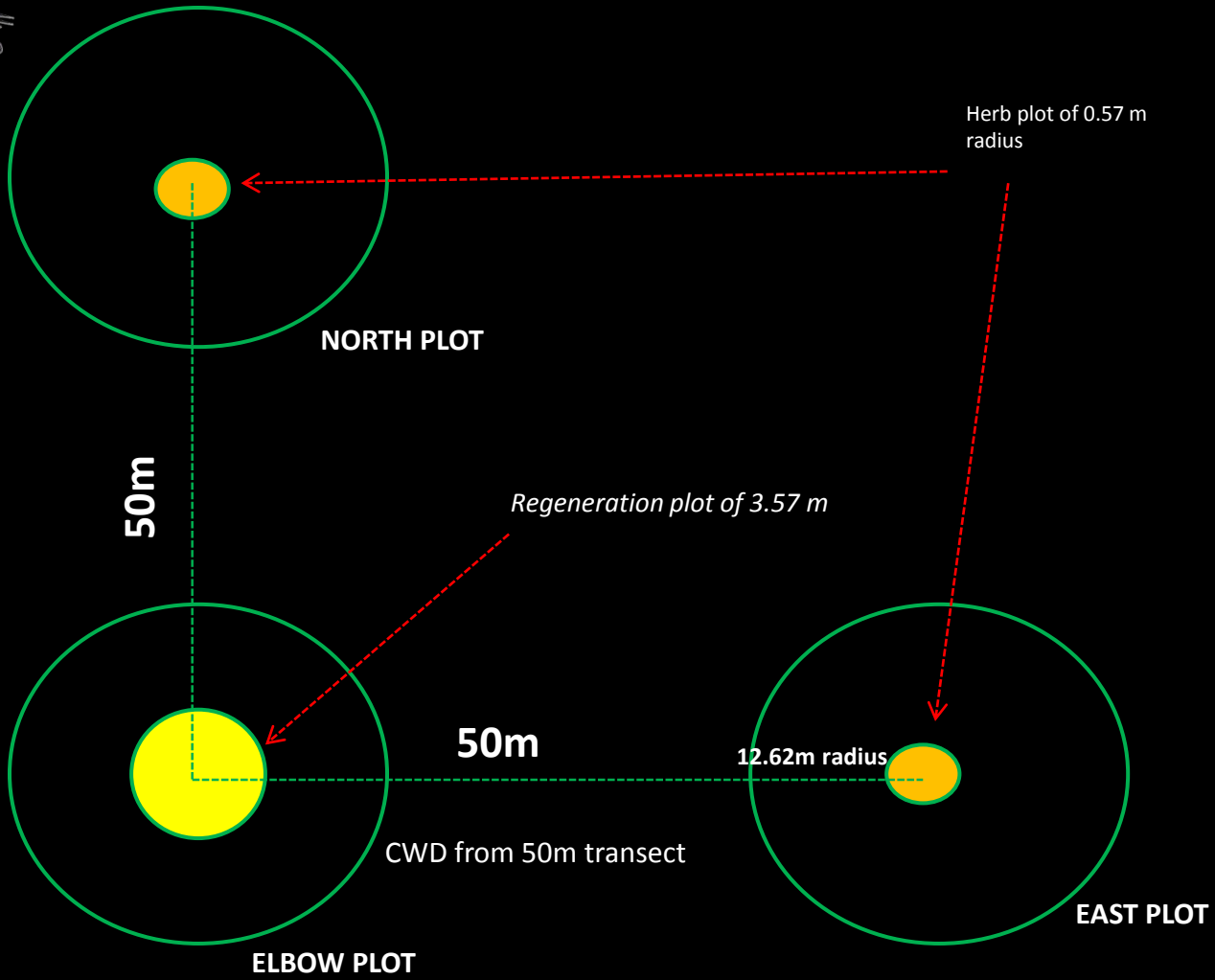
INVENTORY DESIGN

Total of 2424 cluster plots



4km by 4km







Summary of data parameters



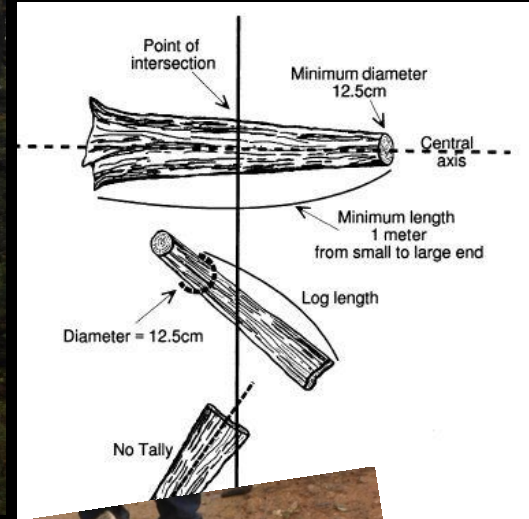
Plot description	CPNo, topographic position, Aspect, slope, stand height, canopy cover percent, land ownership, Land cover type, veg composition, forest type, stand structure, understory, NWFP species and cover percent, disturbance(forest fire, grazing, mining,timber extraction, transmission line and garbage), forest health(pests and diseases), litter depth, stoniness,soil drainage, texture, water bodies, natural trail(y/n), visitor evidence
Trees(all three plots,within 12.62 m) -above 10cm DBH	Species,dbh,ht,bark thickness, increment,GPS position, azimuth
Sapling(all three plots, within 12.62 m) -5cm to 10cm DBH	Species, no. of sapling, height
Regeneration(only ELBOW plot,within3.57 m) -below 5cm	Species, no of established by species, no of un-established by species, no of recruits by species
Herbs(only North and East plot, within 0.57 m)	Species, no of individuals,cover percent
Shrub	Species, no of individuals, cover percent, layer height
Coarse Woody Debris(along the 50m transect, down and dead tree bole, branches and other woody pieces)	Species, dia at small and large end, dia at intersection,CWD length
Wildlife data(bird, mammal, reptiles)	Species,evidence type, gender, group size



Carbon assessment

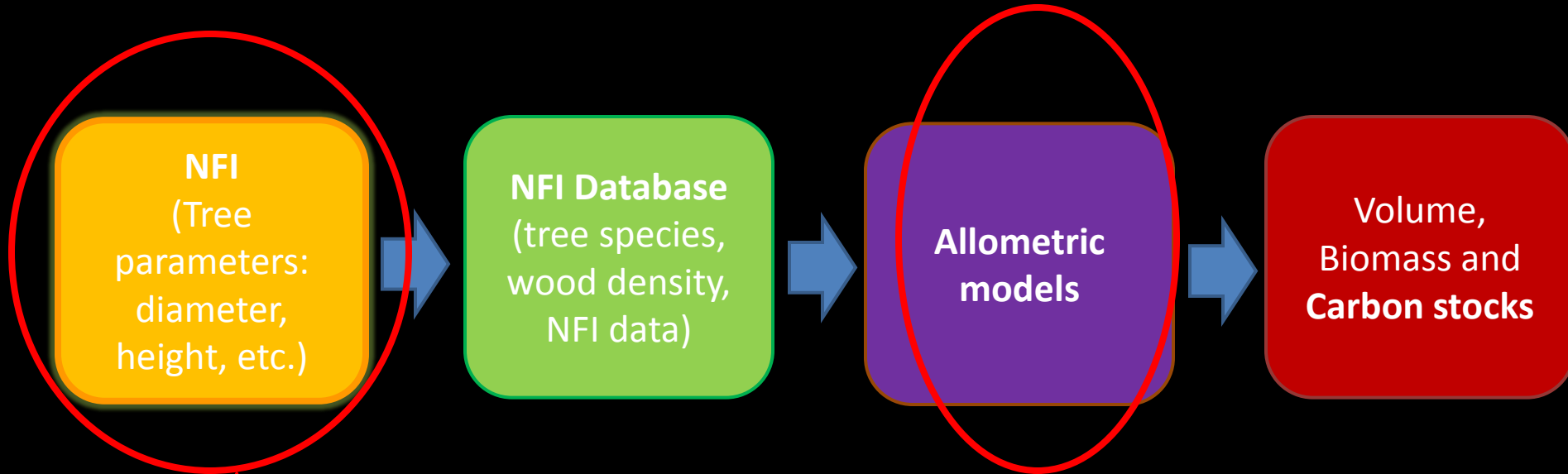
Targeted forest carbon pools :

1. Above ground carbon pools: Trees, Herbs , Shrub
 2. Dead Organic matter: Dead wood matter, Litter
 3. Soil: Mineral and organic
- *For future:-Bamboos! And Below ground biomass*





Carbon in trees



✓ Will be fulfilled by NFI

- No biomass allometric equation
- Randomized branch sampling technique adopted in August, 2011
- Implementation modality adopted
- Need to carry out the field work



Carbon assessment in other targeted pools

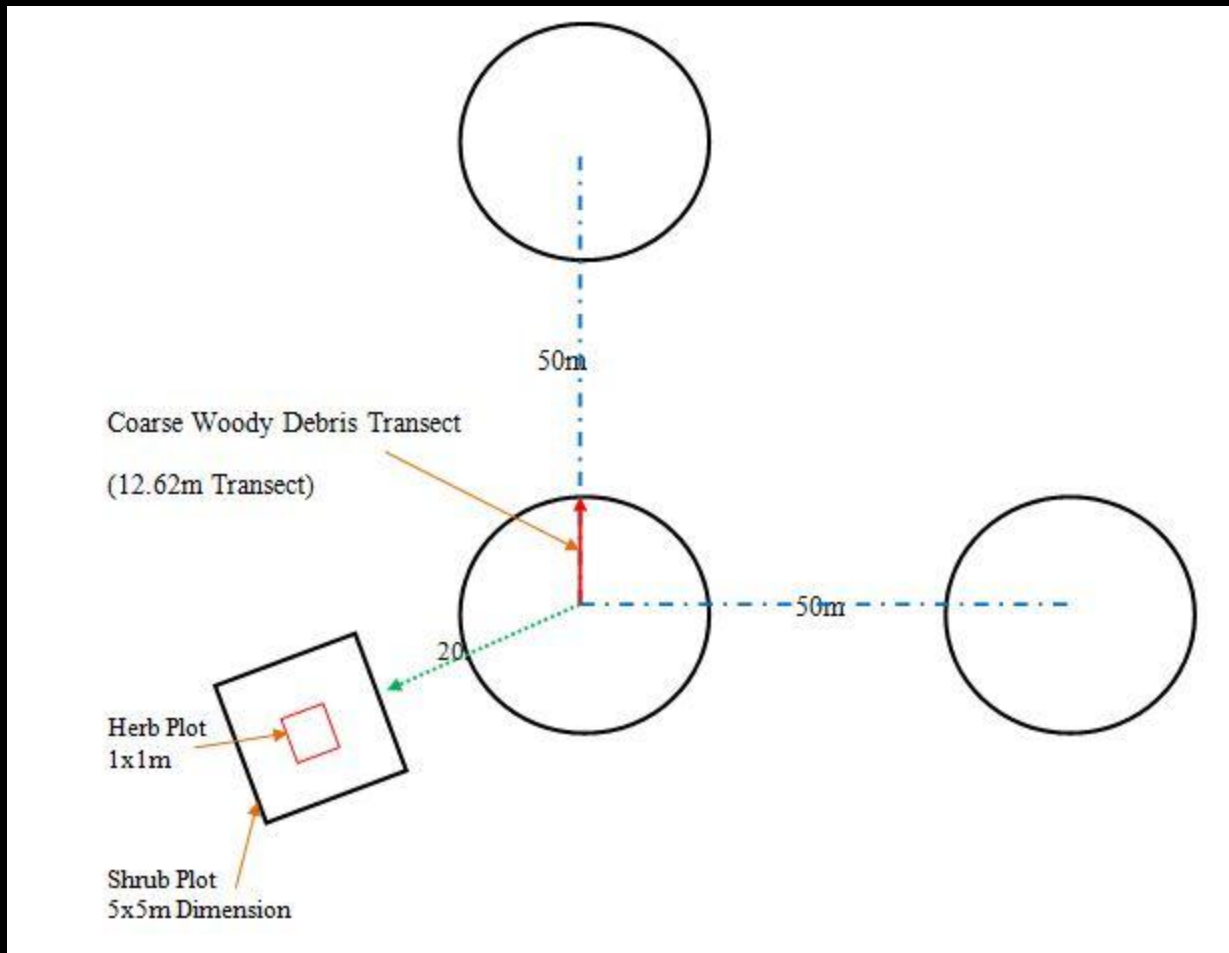
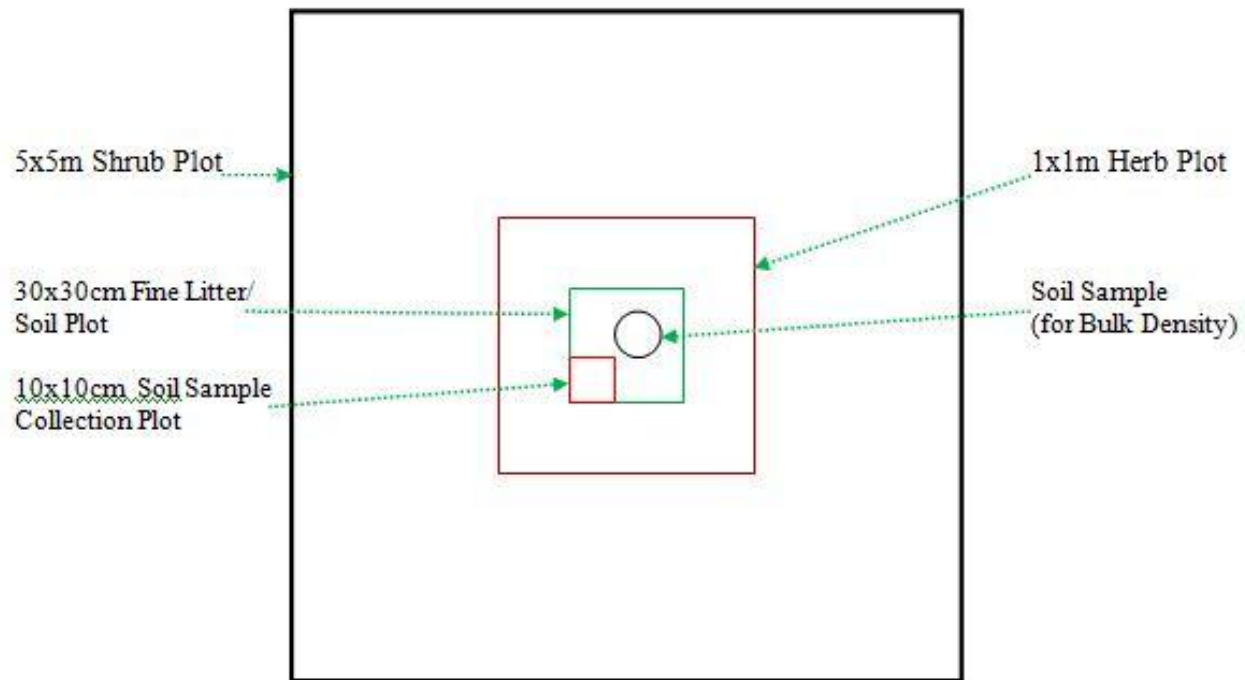




Figure 2: Details of Shrub/Herbs and Soil Plot





NFI Plot

North Plot

50m
(Distance between two plots)

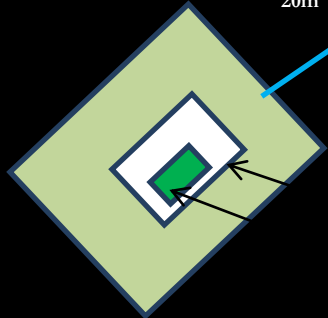
Fine Woody Debris
4m transects at the outer end of Elbow

Elbow Plot

East Plot

50m (Distance between two plots)

20m



5mx5m- Shrub Plot

1mx1m-Herb Plot

20cmx20cm-Soil Plot

Carbon Plot

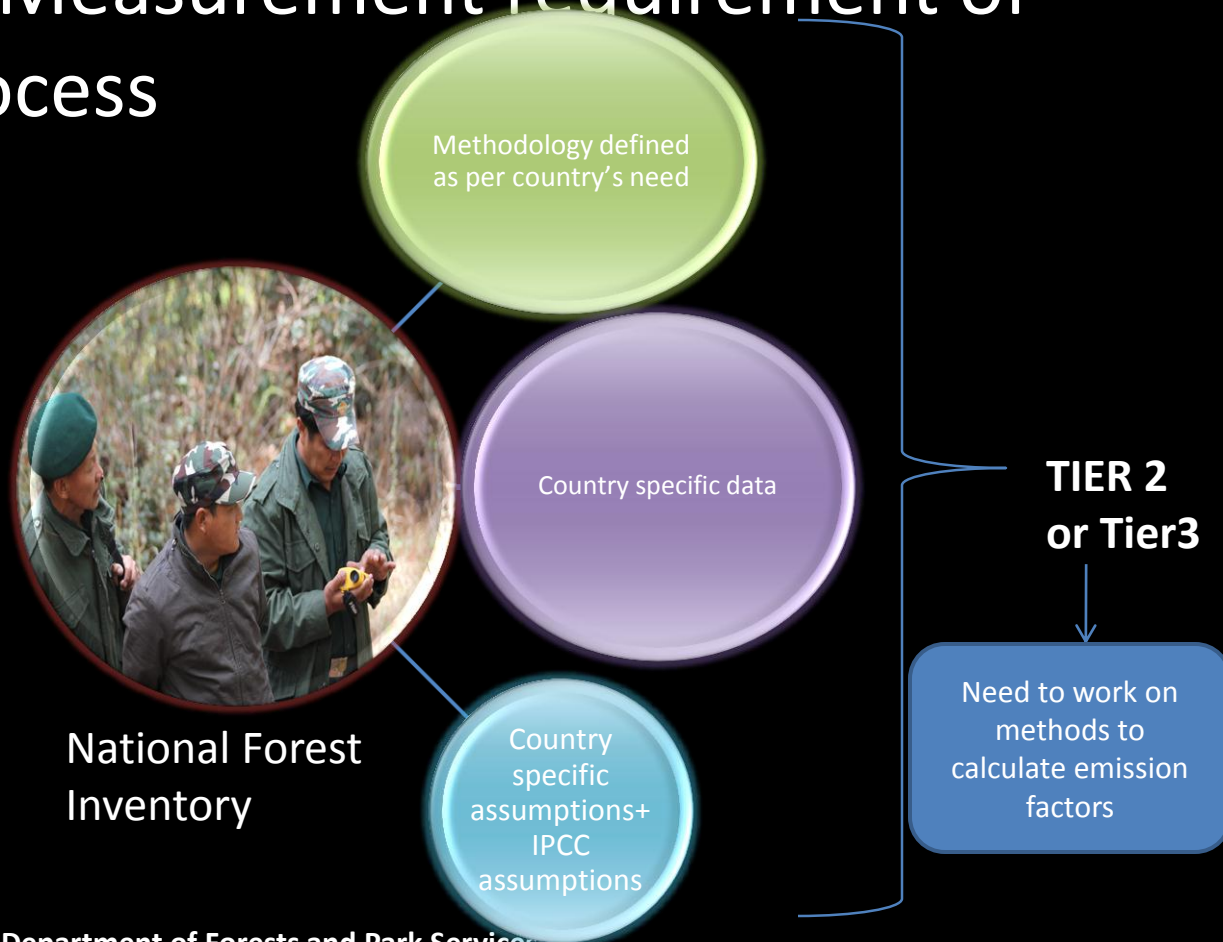
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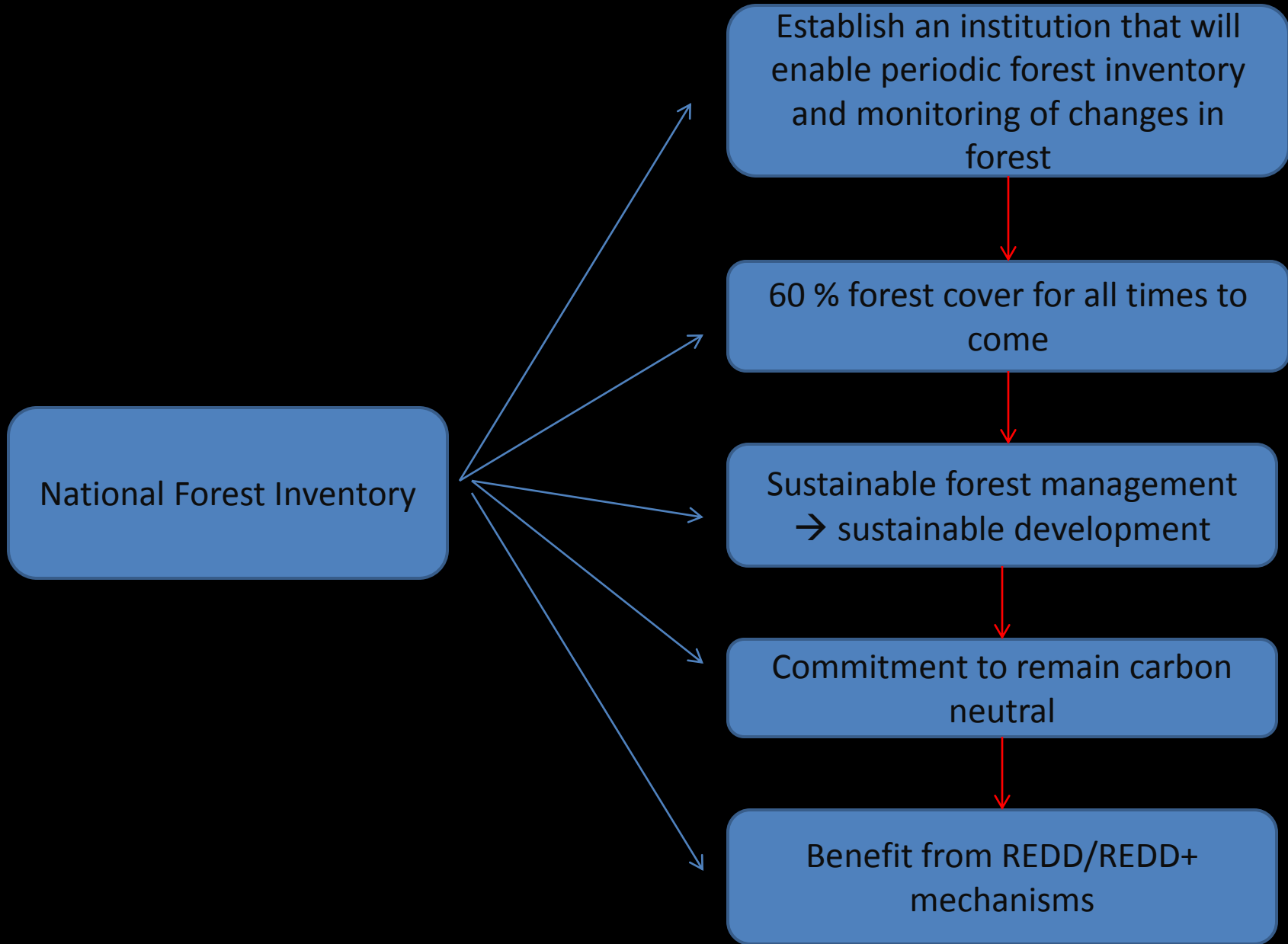
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NFI and REDD+

- NFI fulfills the Measurement requirement of REDD MRV process







Updates

Activity	Status
Biomass Allometric equation development for 50 important species	Seeking funding support for carrying out destructive sampling
Adopted methodology for assessment of above ground carbon in shrubs, herbs, litter and soil Bamboo?	Method tested Endorsed by the ministry. Crews Trained Few equipments needs to be purchased
Pre-assessment tool To develop the Database Management system	Customized for Bhutan Working with FAO to integrate NFI data system with OPEN-FORIS Collect
Continuous process of capacity building of the NFI crew	In-country training being given, Seeking funding support for NFI crews to be exposed to other methodologies

An aerial photograph of a lush green forest. A dirt path winds through the trees, and a small waterfall is visible on the right side. The text 'CHALLENGES???' is overlaid in the center.

CHALLENGES???









GREEN
UNIFORMS
SCARF
WHITE
CONTAINER

GREEN
UNIFORMS
WATCH
BLACK
PACK

GREEN
UNIFORMS
RIFLE
GREEN
BOTTLE
FLIPPERS

STRIPED
SHIRT
SHORTS

GREEN
UNIFORMS
BOWL

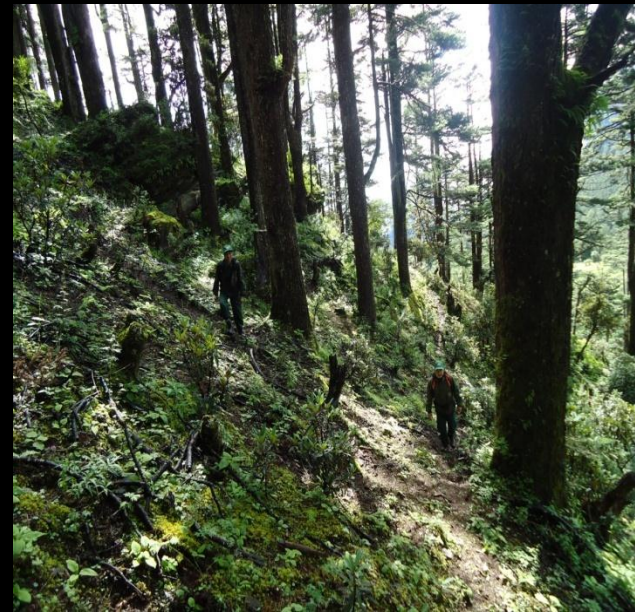
EVER





Challenges

- Financial constraints
- Inadequate technical capacity
- Sustained motivation!





Thank you for your kind
attention.