AGRICONSULTING SpA - Italy

Measurement, Reporting and Verification of REDD+ activities in NEPAL

MRV Project

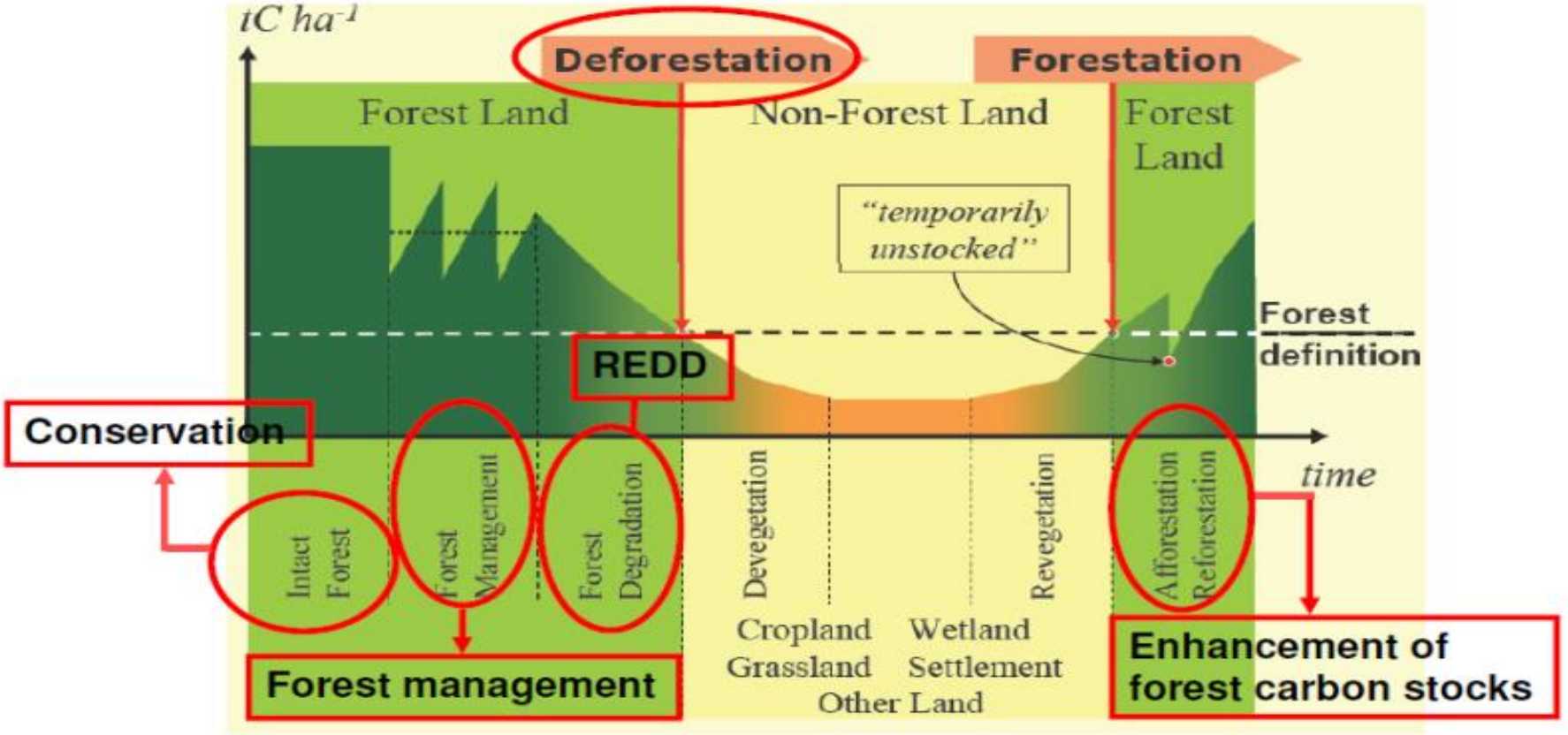
Proposed methodologies and implementation

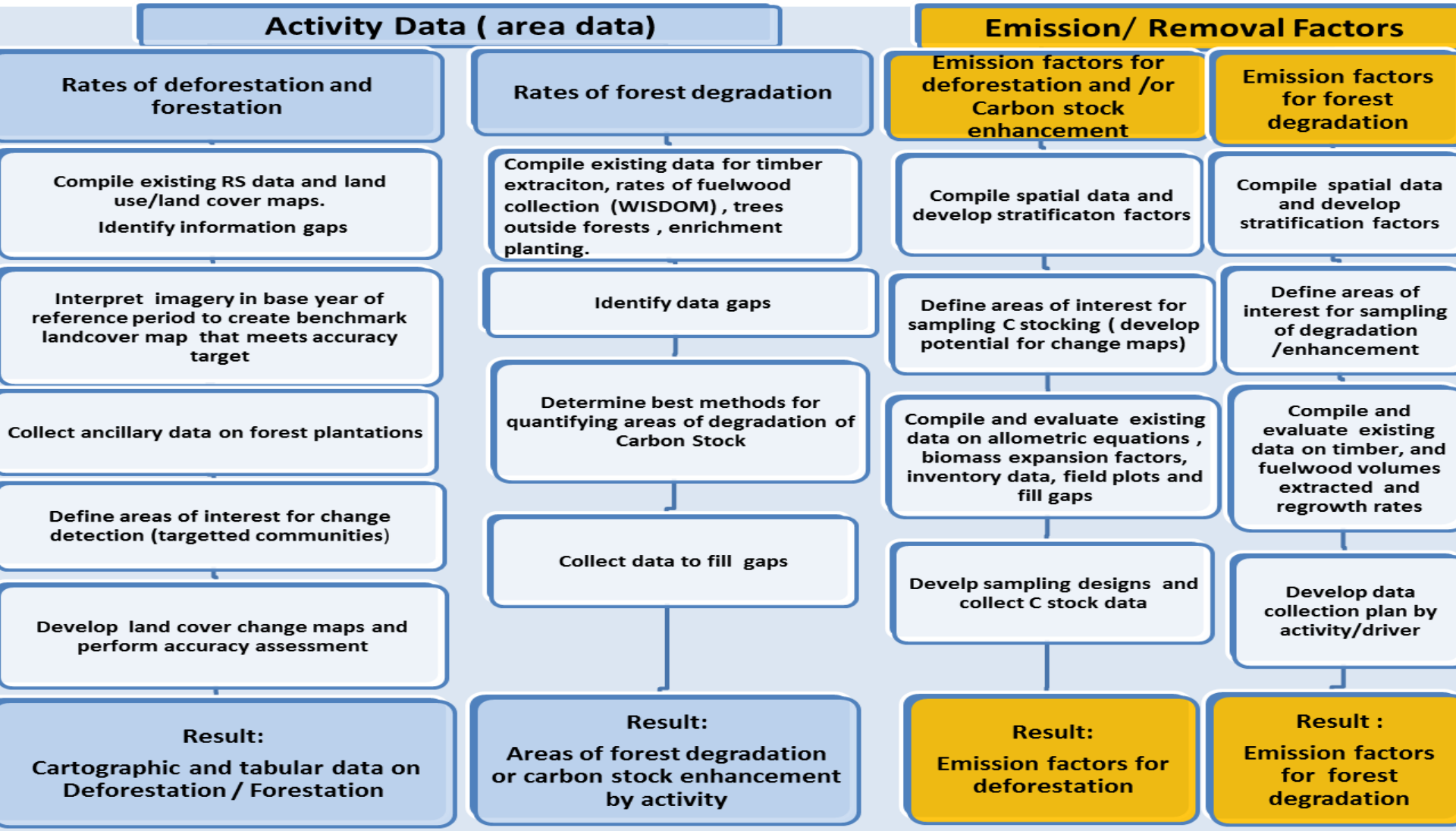
October 2013

The processes related to carbon stock shrinking and enhancement to be included in the REDD+ approach and MRV System are briefly outlined here

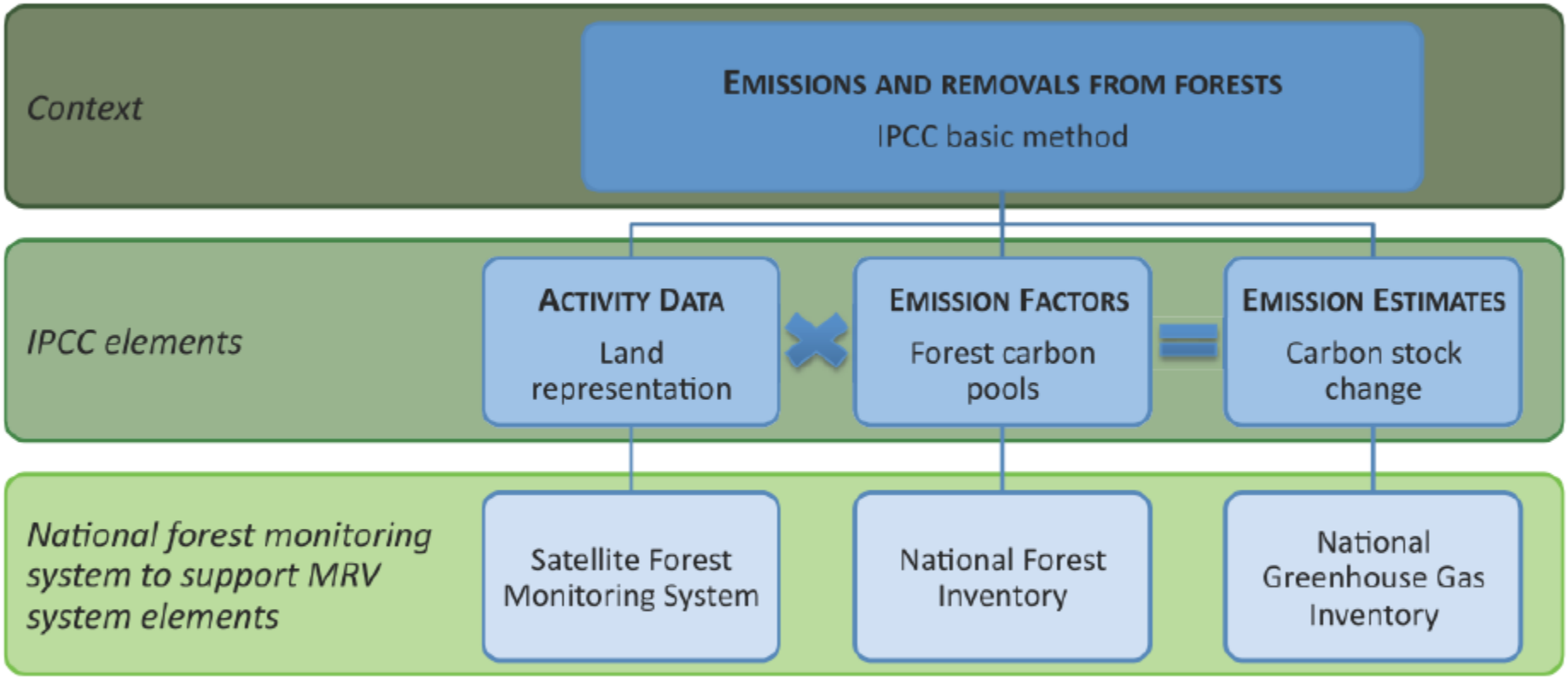
READINESS → "REDDiness"

REDD-plus using IPCC definitions




Activity Data (area data)
Emission/ Removal Factors
Rates of deforestation and forestation
Rates of forest degradation
Emission factors for deforestation and /or Carbon stock enhancement
Emission factors for forest degradation
Compile existing RS data and land use/land cover maps.
Identify information gaps
Compile existing data for timber extraciton, rates of fuelwood collection (WISDOM) , trees outside forests , enrichment planting.
Compile spatial data and develop stratificaton factors
Compile spatial data and develop stratification factors
Interpret imagery in base year of reference period to create benchmark landcover map that meets accuracy target
Identify data gaps
Define areas of interest for sampling C stocking (develop potential for change maps)
Define areas of interest for sampling of degradation /enhancement
Collect ancillary data on forest plantations
Determine best methods for quantifying areas of degradation of Carbon Stock
Compile and evaluate existing data on allometric equations , biomass expansion factors, inventory data, field plots and fill gaps
Compile and evaluate existing data on timber, and fuelwood volumes extracted and regrowth rates
Define areas of interest for change detection (targetted communities)
Collect data to fill gaps
Develp sampling designs and collect C stock data
Develop data collection plan by activity/driver
Develop land cover change maps and perform accuracy assessment
Result:
Cartographic and tabular data on Deforestation / Forestation
Result:
Areas of forest degradation or carbon stock enhancement by activity
Result:
Emission factors for deforestation
Result :
Emission factors for forest degradation

M-easurement

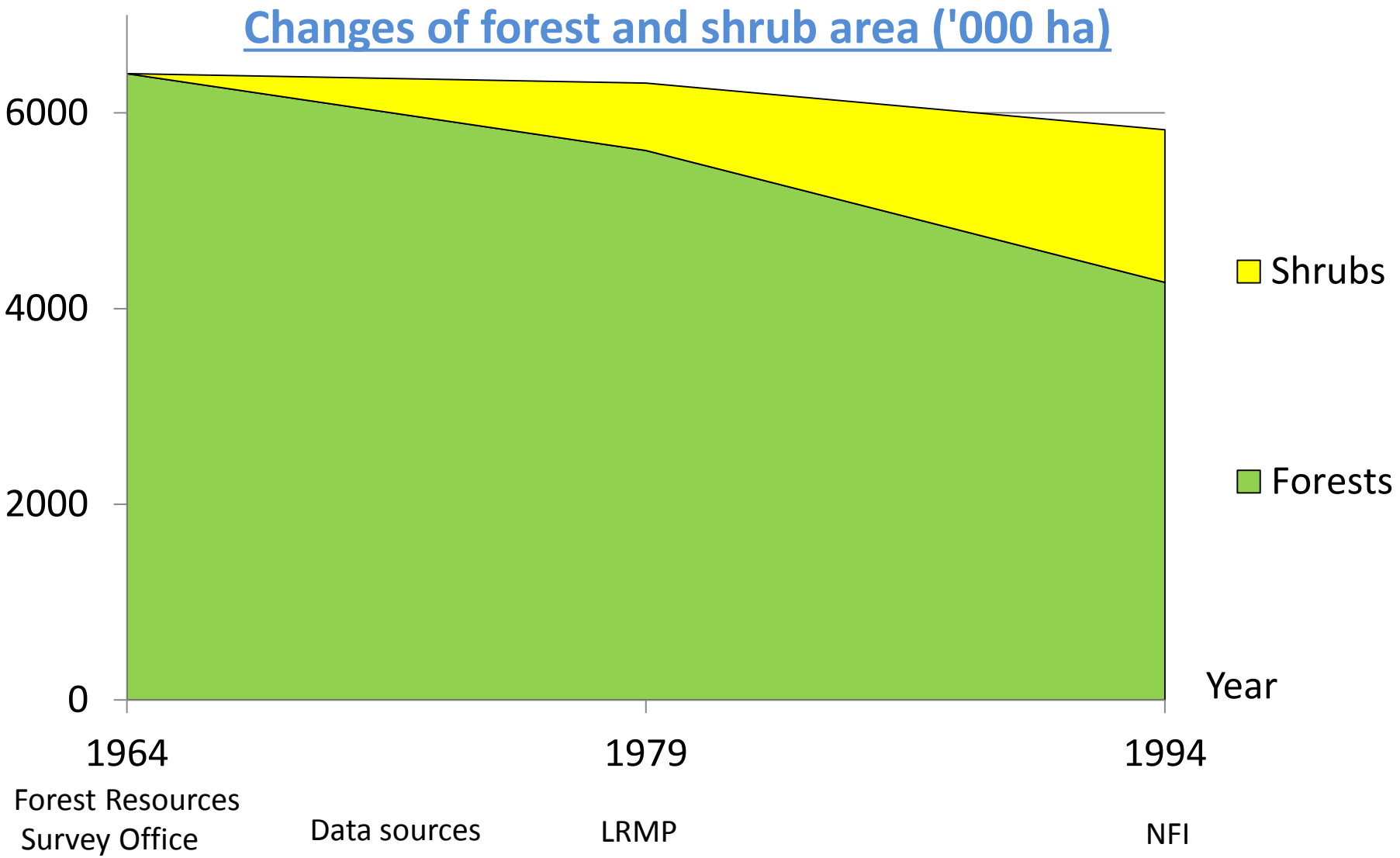


Activity data: approach 3 (spatially explicit land use conversion)

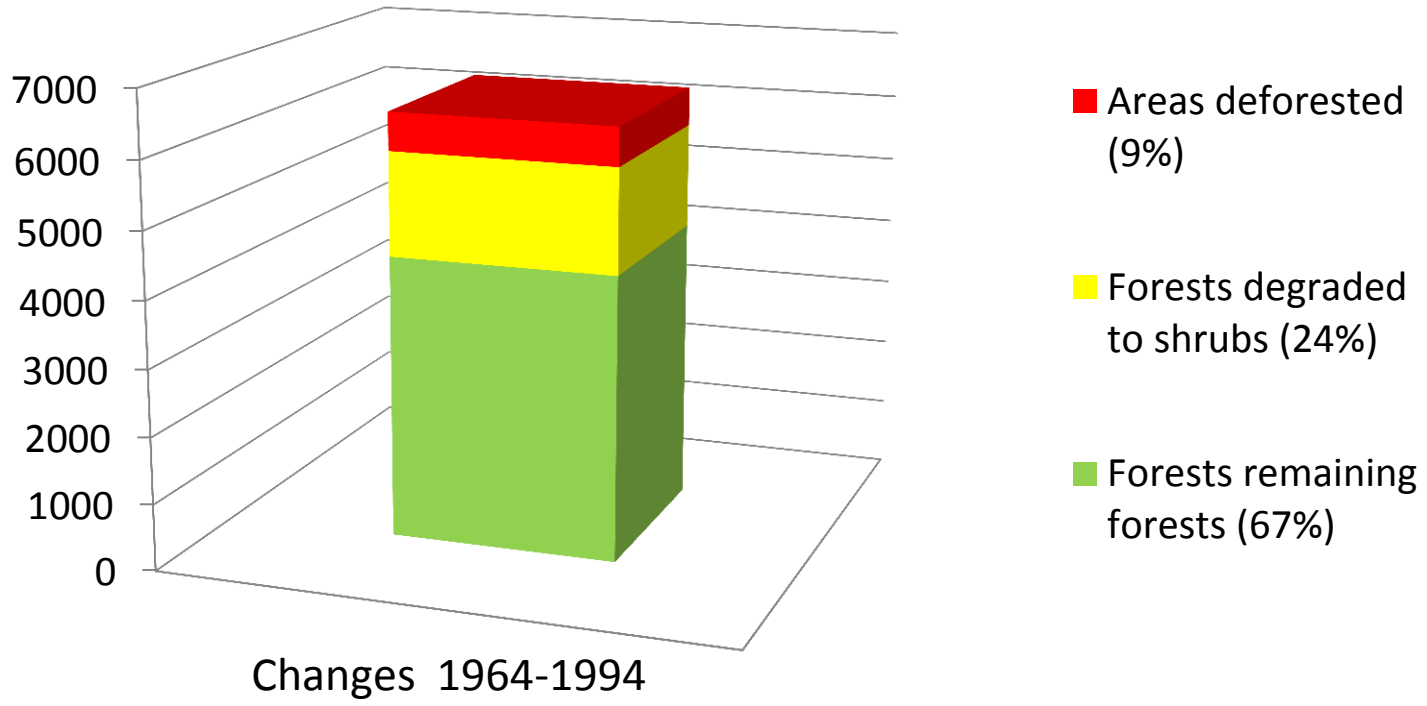
Emission factors: tier 2 (EF for each stratum, toward tier 3...)

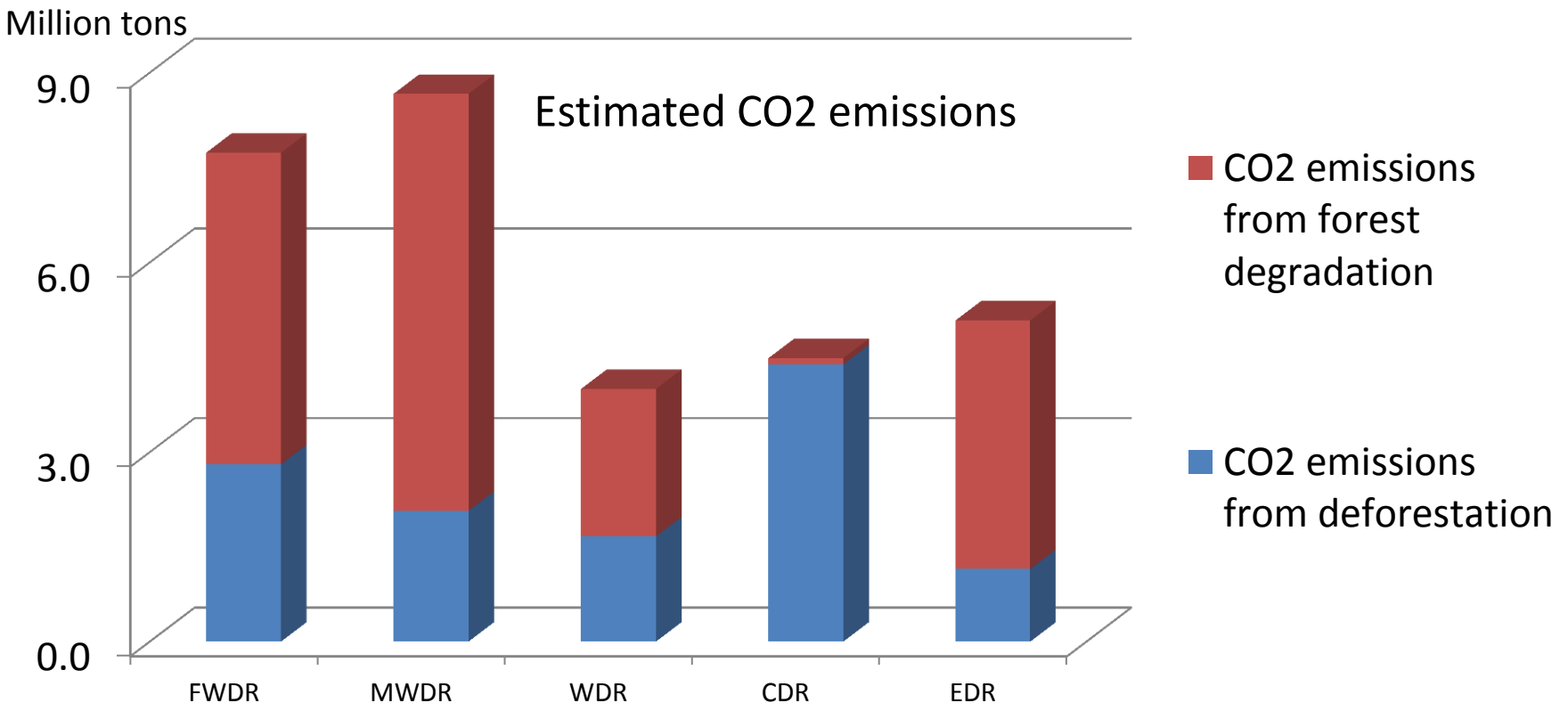
MRV implementation at National level

1. Understanding historical references



Type of change	Area (thousands of hectares)	Percentage of 1964 forest area
Forests remaining forests	4268	66.7%
Forests degraded to shrubs	1560	24.4%
Areas deforested	574	9.0%





From the graph above it seems that, with the exception of Central Development Region, the CO2 emission due to deforestation is less than the CO2 emissions due to forest degradation. The overall country estimations are illustrated in the next graph. However it must be remarked that the figures given here are just preliminary estimates, mainly intended for describing the methodological approach and will have to be consistently revised with new and more accurate data and calculations.

MRV implementation at National level

2. Expected updated Information from REL for a proper implementation of MRV

The existing information on land cover time series in Nepal is conspicuous, however there is a general lack of consistency regarding methods, classifications, spatial cover and metadata. For this reasons the role of the REL Project is essential for generating consistent time series to be later used by the MRV System.

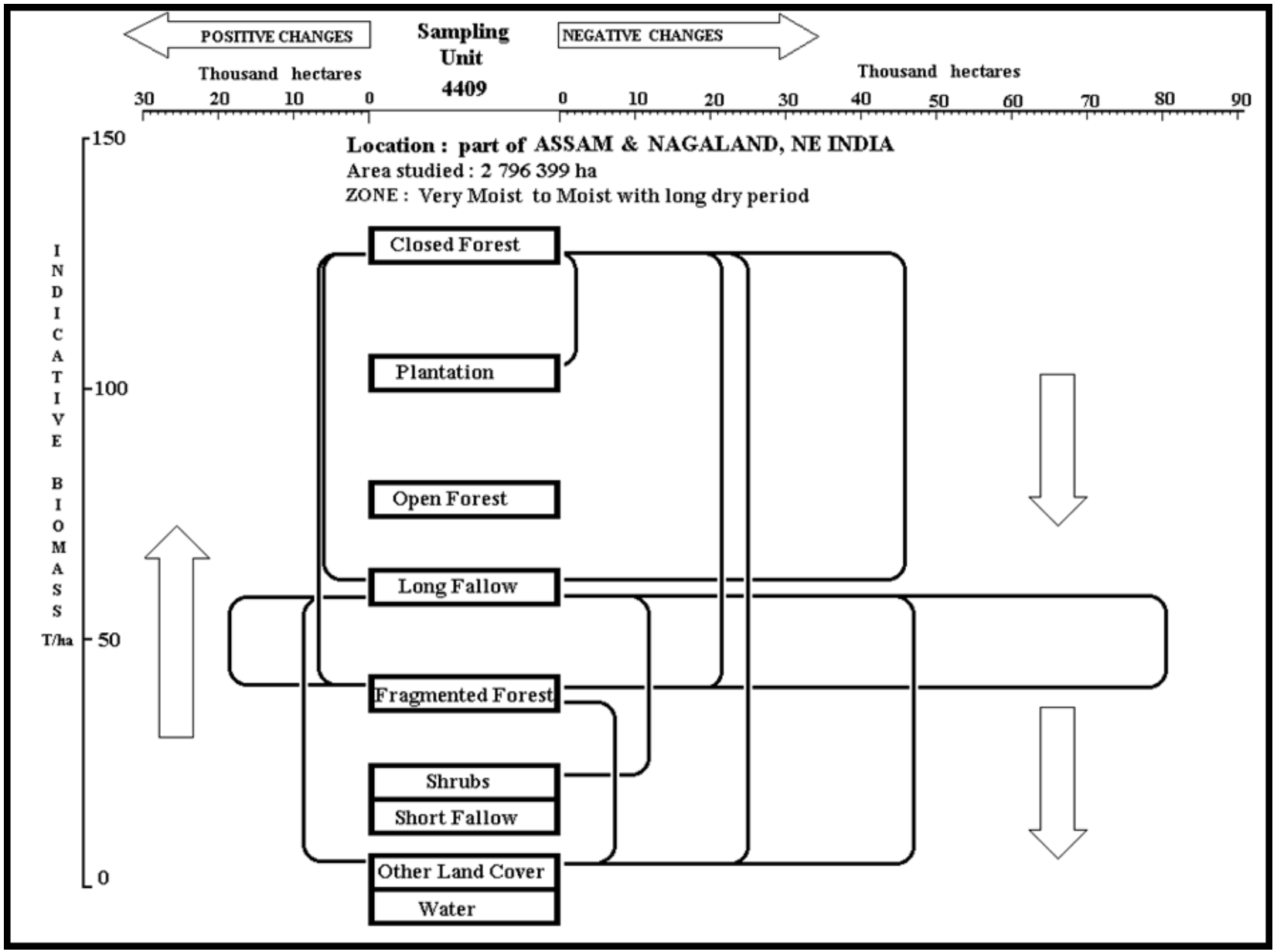
REL must undertake time series change analysis and create change matrix to be used for creating Activity Data for the target REDD+ related activities, including:

- **Deforestation**
- **Forest degradation**
- **Forest enhancement**

Minimum requirements of land cover categories to be included in the Reference Emission Level Scenario

Vegetation type	Floristic composition	Crown density
Forests		
	Broadleaved	Closed
	Broadleaved	Open
	Coniferous	Closed
	Coniferous	Open
	Mixed	Closed
	Mixed	Open
Other wooded land		
Shrubs	All types	All types
Shifting cultivation , Trees outside forest	All types if applicable	

Example of a Transition Matrix depicting land cover change



Once the REL is established providing:

- ❑ Historical and present emission levels from deforestation and forest degradation
(It is understood that REL Project will use year 2010 as reference year)

- ❑ The Business as Usual scenario projected for the period 2010-2013

Then the Measurement component of the MRV will monitor deforestation and forest degradation implementing:

- ❑ A wall to wall new land cover mapping for the new target year, using medium resolution satellite imageries. We propose to complete the land cover mapping on a two years cycle. (Activity data)

- ❑ The establishment of field Permanent Sample Plots for volume and biomass estimation (Emission factors). The Carbon pools to be measured must be identical to those defined by REL.

The PSP will also provide environmental variables on forest conditions to monitor biodiversity

The cycle for re-measuring the PSP will be determined according to human and financial resources available. A 2-3 year cycle is envisaged

In order to maximize the efficiency of the field work a stratified approach will be adopted

Stratification by carbon stocks

Stratification refers to the division of any heterogeneous landscape into distinct sub-sections (or strata) based on some common grouping factor. In this case, the grouping factor is the stock of carbon in the vegetation.

Stratification is the critical step that will allow the association of a given area of deforestation and degradation with an appropriate carbon stock for the calculation of emissions.

Because ground sampling is usually required to determine appropriate carbon estimates to apply to specific areas of deforestation or degradation, stratifying an area by its carbon stocks can **increase accuracy and precision and reduce costs**.

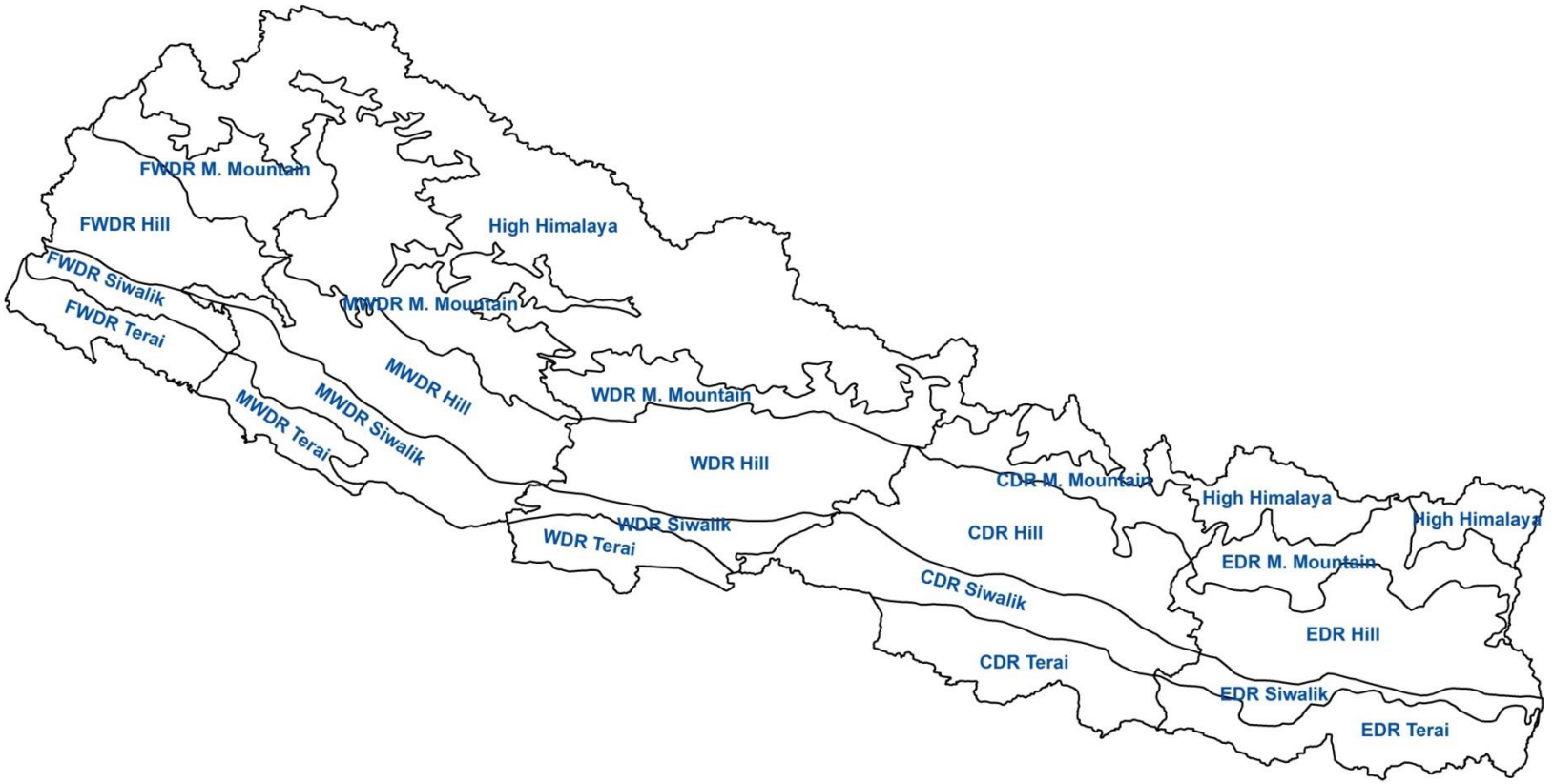
In the case of Nepal we propose to use a stratification based on the combination of

- Physiographic Region; and
- Development Regions

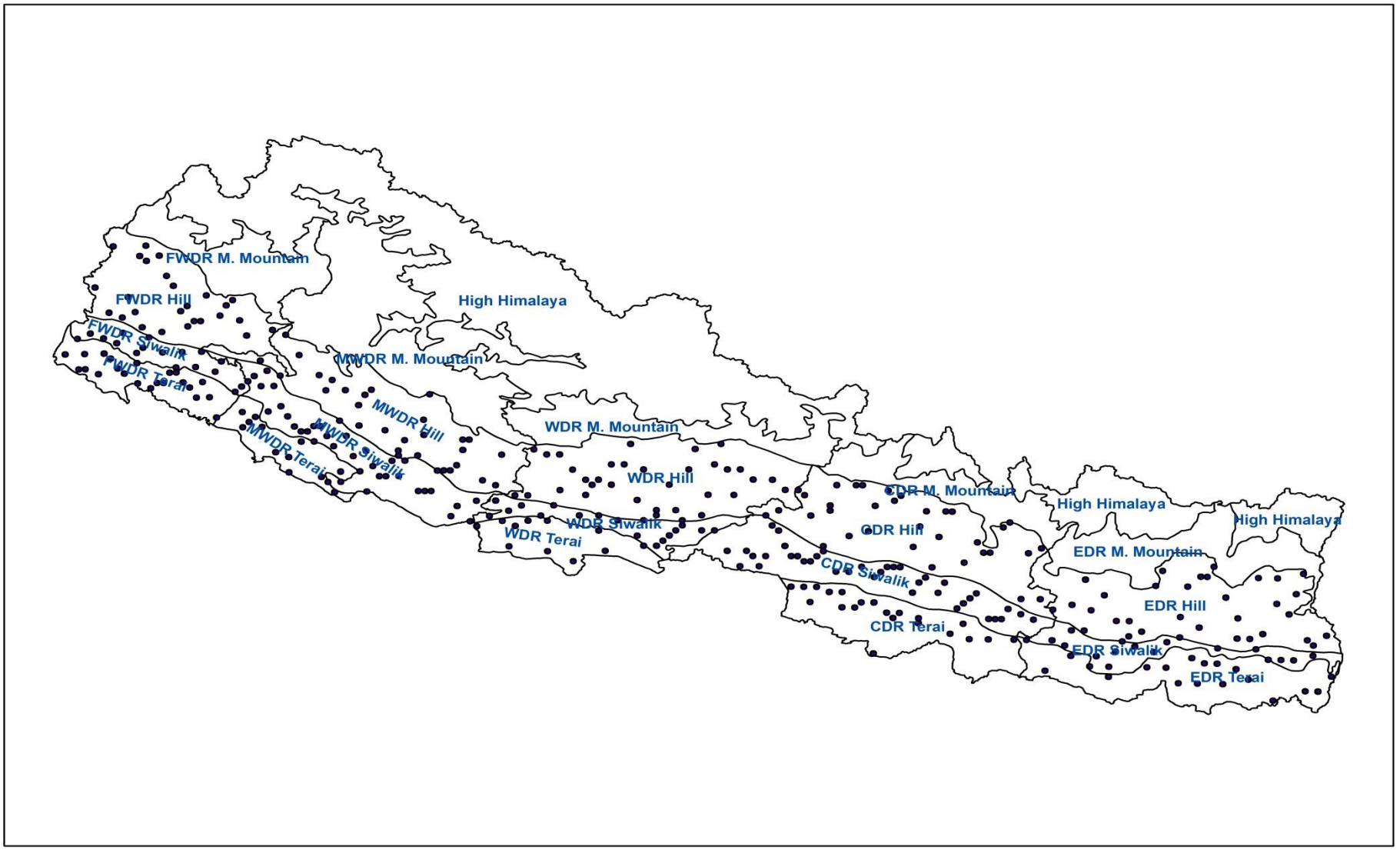
The distinction of physiographic regions is quite obvious since they account for the altitudinal gradient of Nepal, associated with different ecosystems and forest types and different level of carbon stocks

The further distinction of Development Regions may account for some rainfall gradient ranging from West to East, and also for some differences in the socio-economic development which may reflect in a different approach in the use of land and forest resources (e.g. subsistence vs. commercial uses)

Stratification criteria: Physiography and Development Regions



FRA Nepal distribution of Permanent Sample Plots



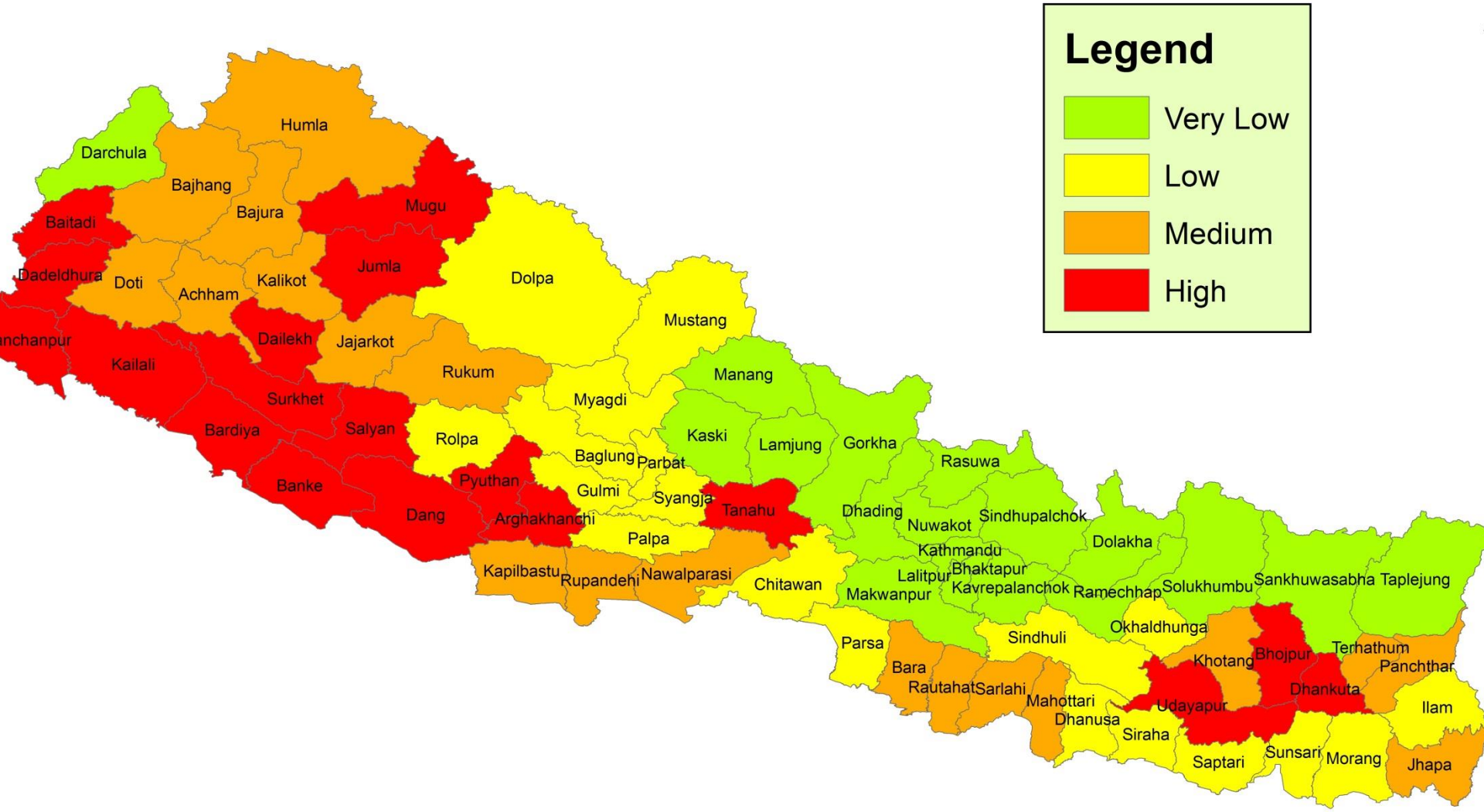
Stratification based on deforestation and forest degradation risk

Besides physiographic zones and development regions one additional criterion that might be used for improving the stratification are the deforestation and forest degradation risks.

Using the historical reference levels produced by REL it will be possible to identify areas where major changes have occurred. Additional information of areas where there is a high pressure on forest resources can be provided by the WISDOM model. These areas where changes are more likely to take place should be sampled with a higher intensity than forest areas which appear to be stable both in terms of area and carbon stocks.

An example of the historical deforestation at District level is presented in the next slide where the forest change was analyzed comparing LRMP map of 1979, and a preliminary forest map developed by the MRV Project, using a combination of preliminary FRA data and the ICIMOD land cover map of 2010, calibrated using FAO/ESA Global land cover

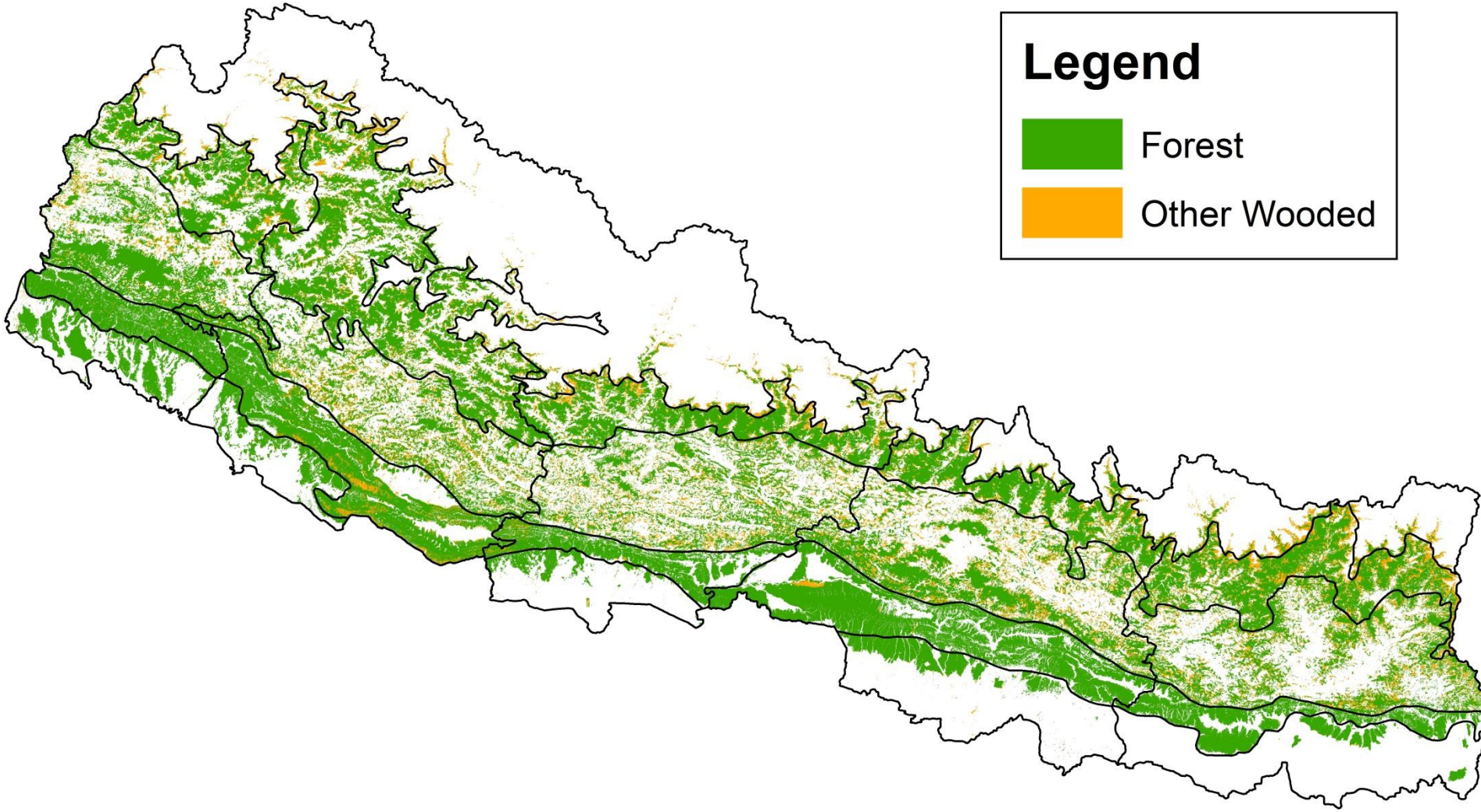
Estimated historical deforestation rates1979 - 2010



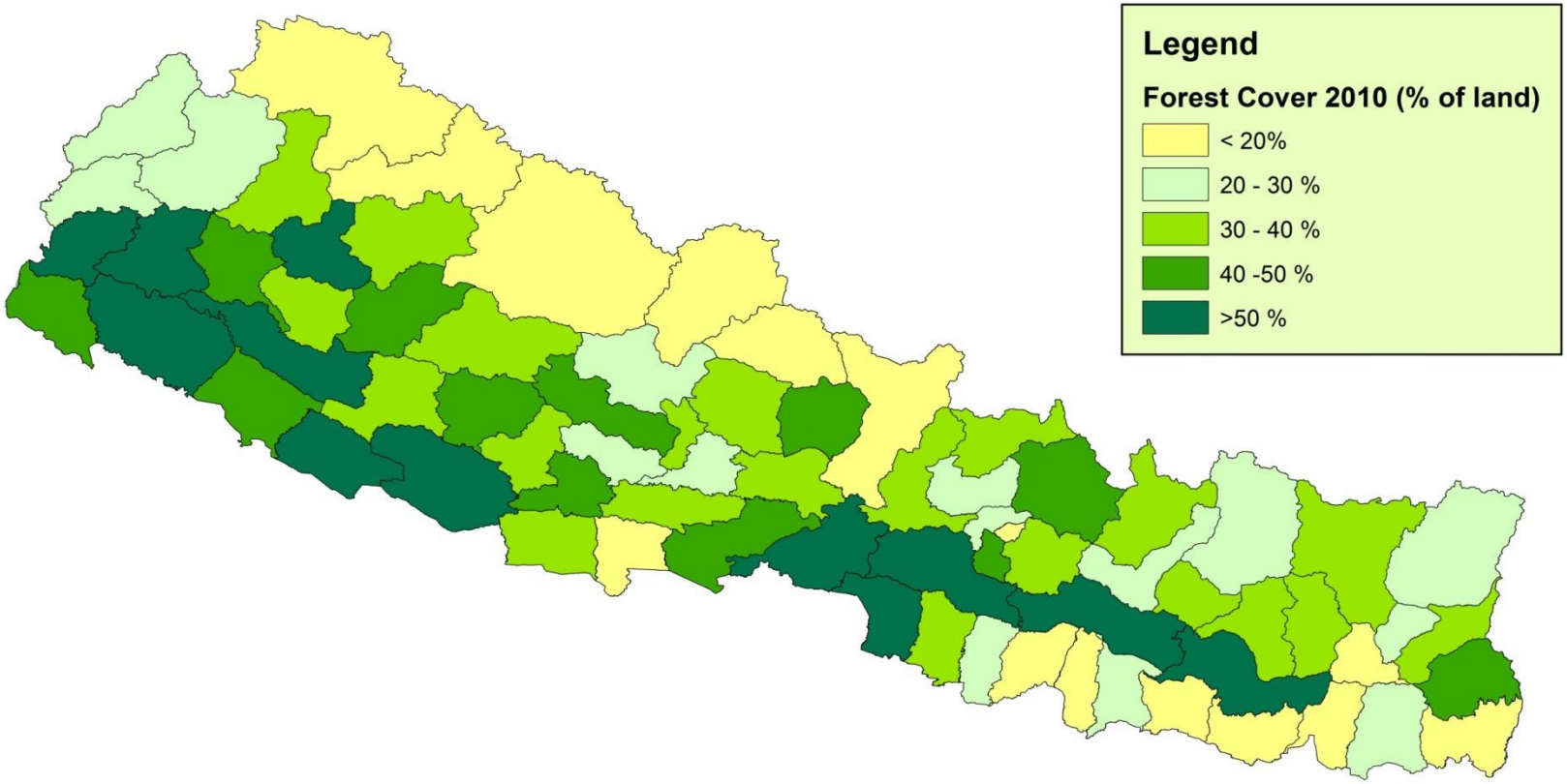
1:3,500,000

Soutce: Elaboration of MRV Project

MRV - Preliminary Forest Map



Estimated Forest Cover 2010 (% of land), by District



1:3,500,000

Source MRV Project elaboration, 2013

Modeling and forecasting deforestation and forest degradation

- Scenarios of future deforestation and degradation can be constructed based on understanding of which drivers are important and how they might occur in the future.
- Scenario-building must also account for biophysical features that determine where deforestation/degradation occurs.
- Drivers associated with degradation can suggest which policies might be effective in reducing degradation.

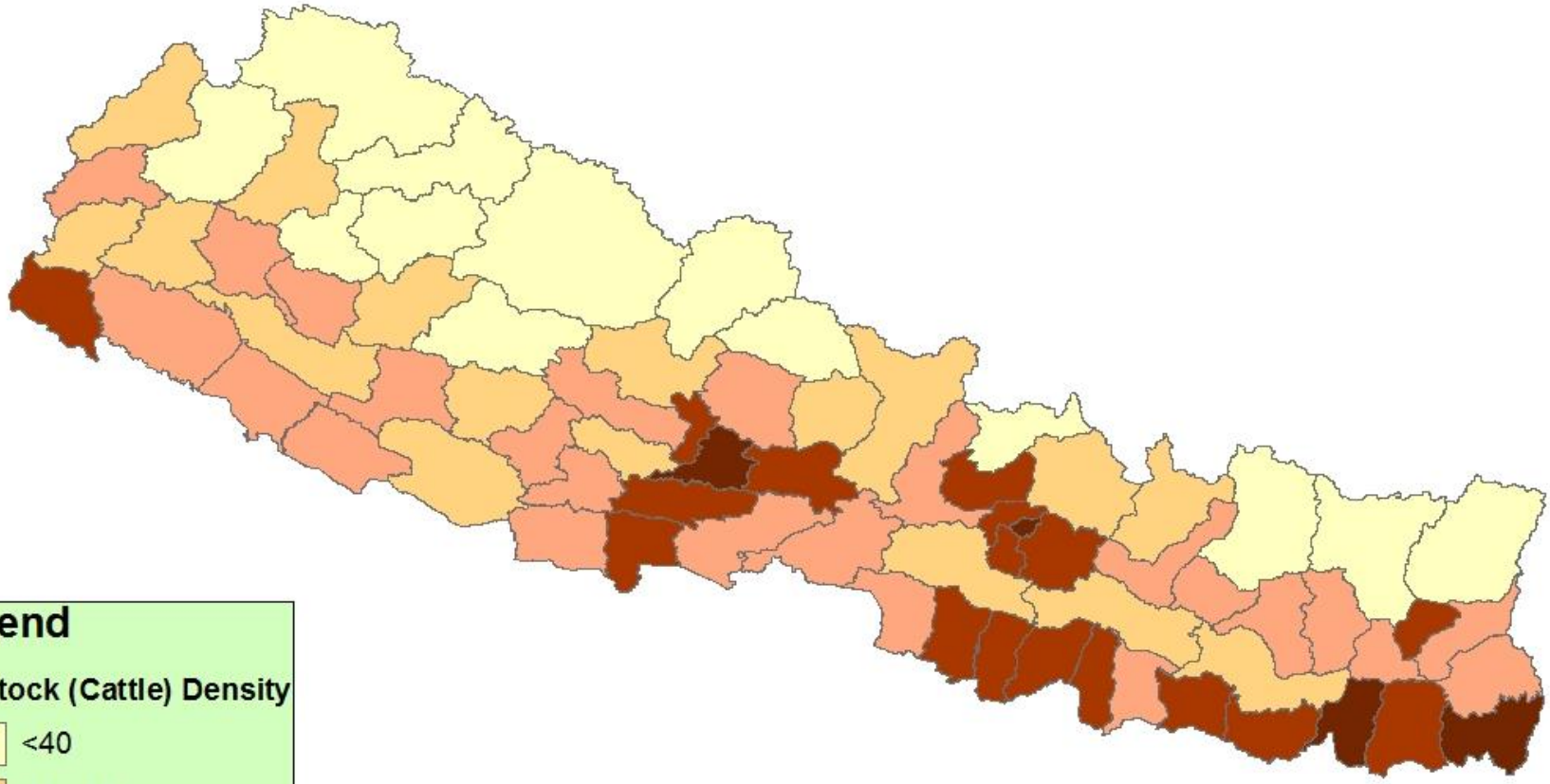
In the case of MRV the modeling approach will be used for

- Elaborate the Business as Usual scenario, on successive occasion, replacing the linear trend approach
- Understanding the dynamics of the wood resources, including their associated drivers and to derive adequate policy measure to reduce GHG emissions

In light of the experience existing within the MRV Team the following modeling approaches are proposed:

- Application of the Forest Area Change Model (Scotti, R., Marzoli, W.A., Singh, K.D. FAO, 1994) for deforestation forecasting.
- The WISDOM Model (Drigo R., Masera O., Trossero, M., FAO Unasylva, 2002) for forest degradation due to fuelwood consumption.
- Additional modeling and proxy approach for forest fires, overgrazing and illegal timber harvesting, to be developed.

Livestock (Cattle) Density



N

Legend

Livestock (Cattle) Density

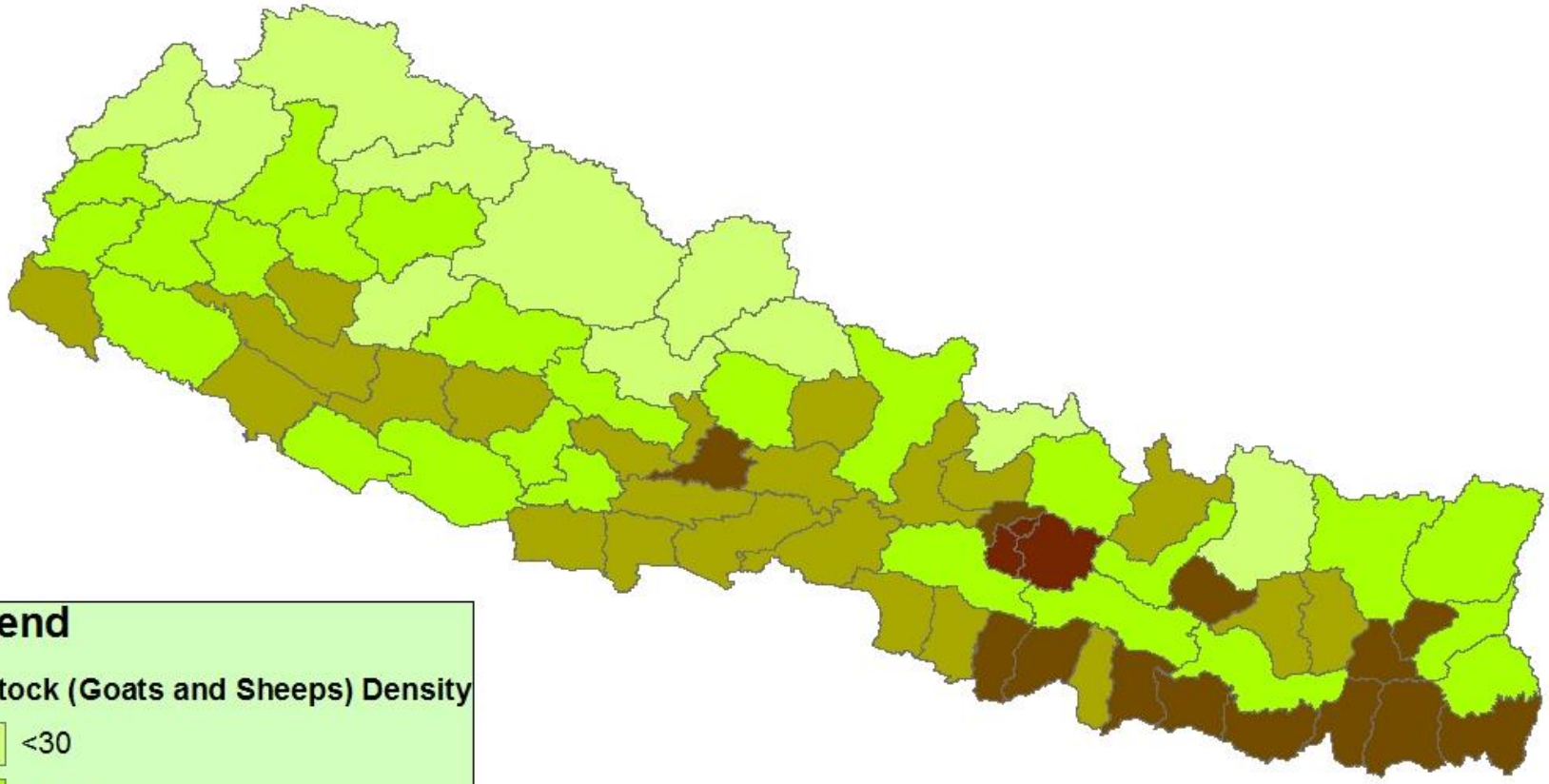
- <40
- 40 - 80
- 80 - 120
- 120 - 200
- >200

Source :
Central Bureau of Statistics 2004-2005

0 62,5 125 250 375 Km

1:3.500.000

Livestock (Goats and Sheeps) Density



N

Legend

Livestock (Goats and Sheeps) Density

- <30
- 30- 60
- 60 - 100
- 100 - 140
- >140

Source :
Central Bureau of Statistics 2004-2005

0 62,5 125 250 375 Km

1:3.500.000

R-eporting and V-erification

Reporting: collating and presenting the information on GHG emissions/removals in a (REDD+) standard and documented format

Verification: dissemination of data, metadata, (replicable) methodologies, results and documentation

MRV implementation at Sub-National level

- Nepal's national REDD+ strategy needs to build on many community based forest management (CoFM) mechanisms being practiced since over three decades now.
- Over one third of Nepal's forests are under one or the other CoFM regime
- Nepal's R-PP has already justified the need of a hybrid (nested) approach which will enable the country to go for early participation in REDD+ at sub-national/local level while engaging in continuous improvement of its MRV institution and capacity for MRV system strengthening.
- A nested approach is a flexible mechanism. It allows countries to start REDD+ efforts through sub-national activities and gradually move to a national approach, or for the coexistence of the two approaches in a system where REDD credits are generated by projects and governments, thus maximizing the potential of both approaches.
- In our vision, data collected will be transferred to sub-/national MRV system in a transparent manner, and the participating CoFM communities will be compensated based on an appropriate crediting system established under the REDD+ strategy. An appropriate mechanism for ensuring environmental and social safeguards will be implemented side by side which will consider both environmental conservation, and distribution of carbon and non-carbon benefits ensuring forest dependent interest groups/communities impacted due to REDD+ are benefitted in an equitable manner.

Actors of MRV at community level

The development of an MRV system at CFUG level is a challenging issue, both from the technical and the socio-economic view point. The proposed approach will rely on the following major actors, namely

- The MRV Section established at national level;
- District Forest Officers and rangers;
- Community Forest Users Group members.
- The role of NGOs and civil society should also be taken into adequate consideration.

Proposed methodological approach at community level

Schematically, the implementation of MRV at CFUG level includes the following steps

Preparation phase

Step 1: Preparation phase

Measurement of activity data

Step 2: Delineation of project boundaries

Step 3: Land use and land cover mapping

Step 4: Stratification of the project area

Measurement of emission factors and GHG emissions

Step 5: Preparation for the field work and capacity building of local communities

Step 6: Pilot inventory for variance estimation

Step 7: Inventory design and field work

Step 8: Quality assurance and quality control

Step 9: Data processing and estimation of emission factors and GHG emissions

Reporting

Step 10: Analysis of trends

Step 11: Detection of leakage

Step 12: Estimation of net carbon emissions

Verification, Payment of Carbon Credits and Follow-up

Step 13: Verification

Step 14: Payments of carbon credits

Step 15: Follow-up

CFUGs approach: Preparation and measurement of activity data

MRV Phases	Step	Responsible body	Output / Product
Preparation	Step 1: Preparation phase	CFUGs / REDD Cell / MRV Section	A formal agreement between CFUGs and the REDD cell / MRV on the establishment of REDD+ activities in given communities.
Measurement of activity data	Step 2: Delineation of project boundaries	CFUGs / DFOs / MRV Section	A digital map with the boundaries of the project area.
	Step 3: Land use and land cover mapping	MRV Section/CFUGs/Local forest officers	The baseline LULC map, and the changes that occurred in recent the past, prior to the project initiation.
	Step 4: Stratification of the project area	MRV Section / CFUGs / Local forest officers	Project area stratification map

CFUGs approach: Measurement of emission factors

Measurement of emission factors	Step 5: Preparation for the field work and capacity building of local communities.	Local forests authorities / NGOs	Local communities are trained for field work.
	Step 6: Pilot inventory for variance estimation	MRV Section / CFUGs / local forest officers	Field sampling design established
	Step 7: Field work	CFUGs, local forest authorities	Field inventory executed
	Step 8: Quality assurance and quality control	Local forest authorities	Validated field data
	Step 9: Data processing and estimation of emission factors and GHG emission	MRV Section	Estimation of GHG emissions (REL)

CFUGs approach: Reporting

Reporting	Step 10: Analysis of trends	MRV Section	Trends in carbon emission balance established
	Step 11: Detection of leakage	MRV Section and local forest officers	Quantification of leakage
	Step 12: Estimation of net (deducting leakage) carbon emissions	MRV Section	Net carbon emission balance established
	Step 13:Collating and presenting the information on GHG emissions/removals.	MRV Section	A report in a REDD+ standard and documented format.

CFUGs approach: Verification, Payments of carbon credits and Follow-up

Verification	**Step 14: Verification**	**Independent authority**	**Certified net carbon emissions**
Payments of carbon credits	Step 15: Payments of carbon credits	MRV Section and designated REDD+ authorities	Carbon transactions in place
Follow-up	Step 16: Follow-up	MRV Section / REDD Cell	Sustainable REDD mechanisms are in place

MRV Project: Next Steps

- Consolidate the existing information, including setting up institutional arrangements for data sharing among Projects/Institutions;
- Definition of a common protocol with REL for Remote Sensing imageries interpretation and mapping of land cover and land cover changes in a consistent manner;
- Carry out a case study on the implementation of the MRV at Forest Community level;
- Define the stratification criteria for national field sampling;
- Define the methodological approach for modeling deforestation and forest degradation;
- Formalize the data model and structure of the MRV System;
- Define MRV hardware and software requirements;
- Define capacity building needs;

Measurement, Reporting and Verification of REDD+ activities in NEPAL

Thank you