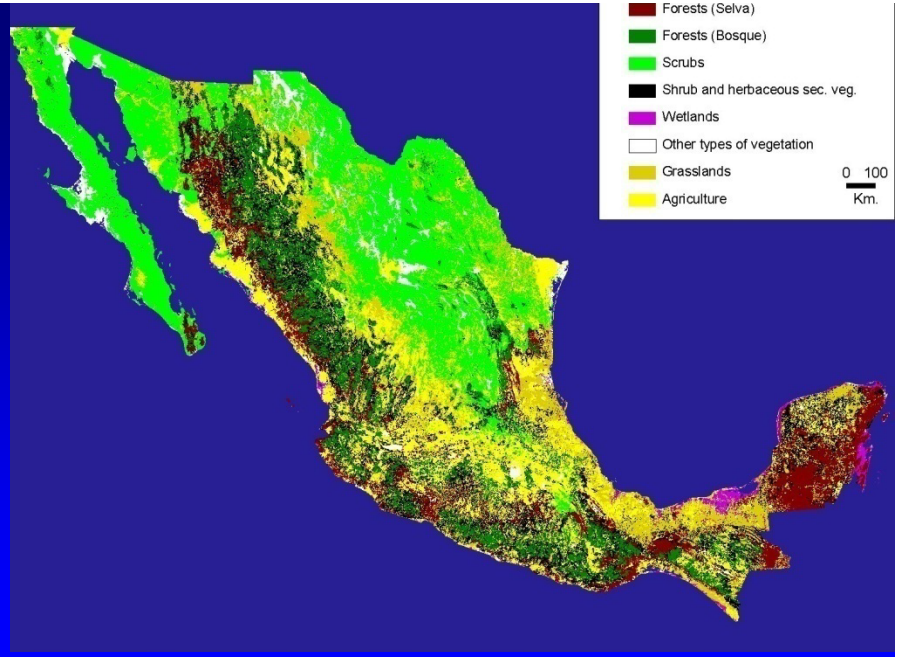

Reducing Emissions from Deforestation and Degradation: Example of a regional reference scenario and advances of a national approach in Mexico

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Key questions to be addressed for REDD

- How much forest clearing would occur without any measure?
- Where will deforestation most likely occur in the future?
- How much carbon will be emitted from forest conversion?
- How to calculate carbon benefits from REDD.

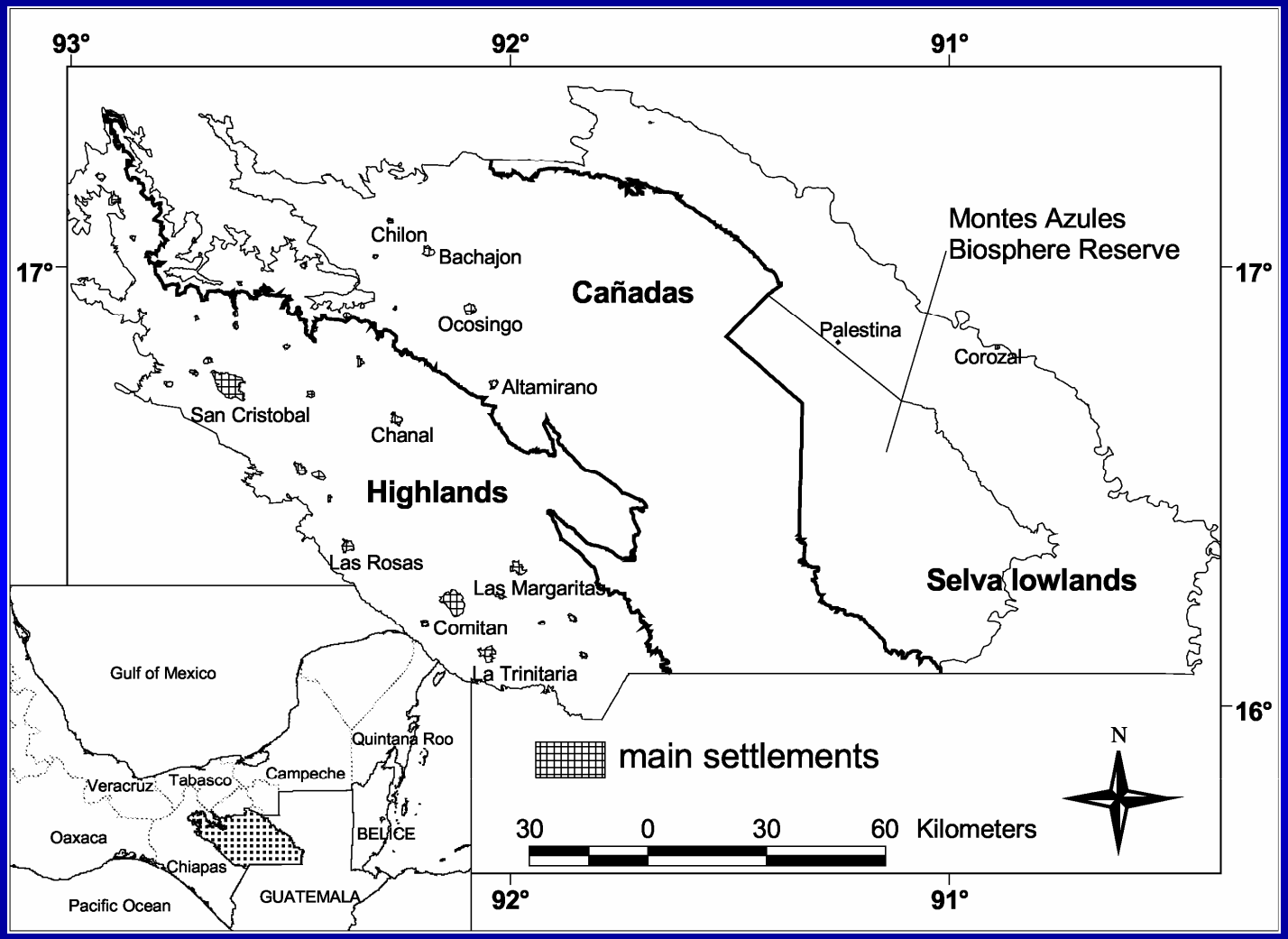
Data available

- Land-use map of the 1970s
- Satellite imagery of 1996-1997
- Biomass density measurements of 68 plots in various land-use classes
- Geo-referenced population census of 1990s and 2000
- Road-map
- Slope derived from digitized topographic maps scale 1:50,000

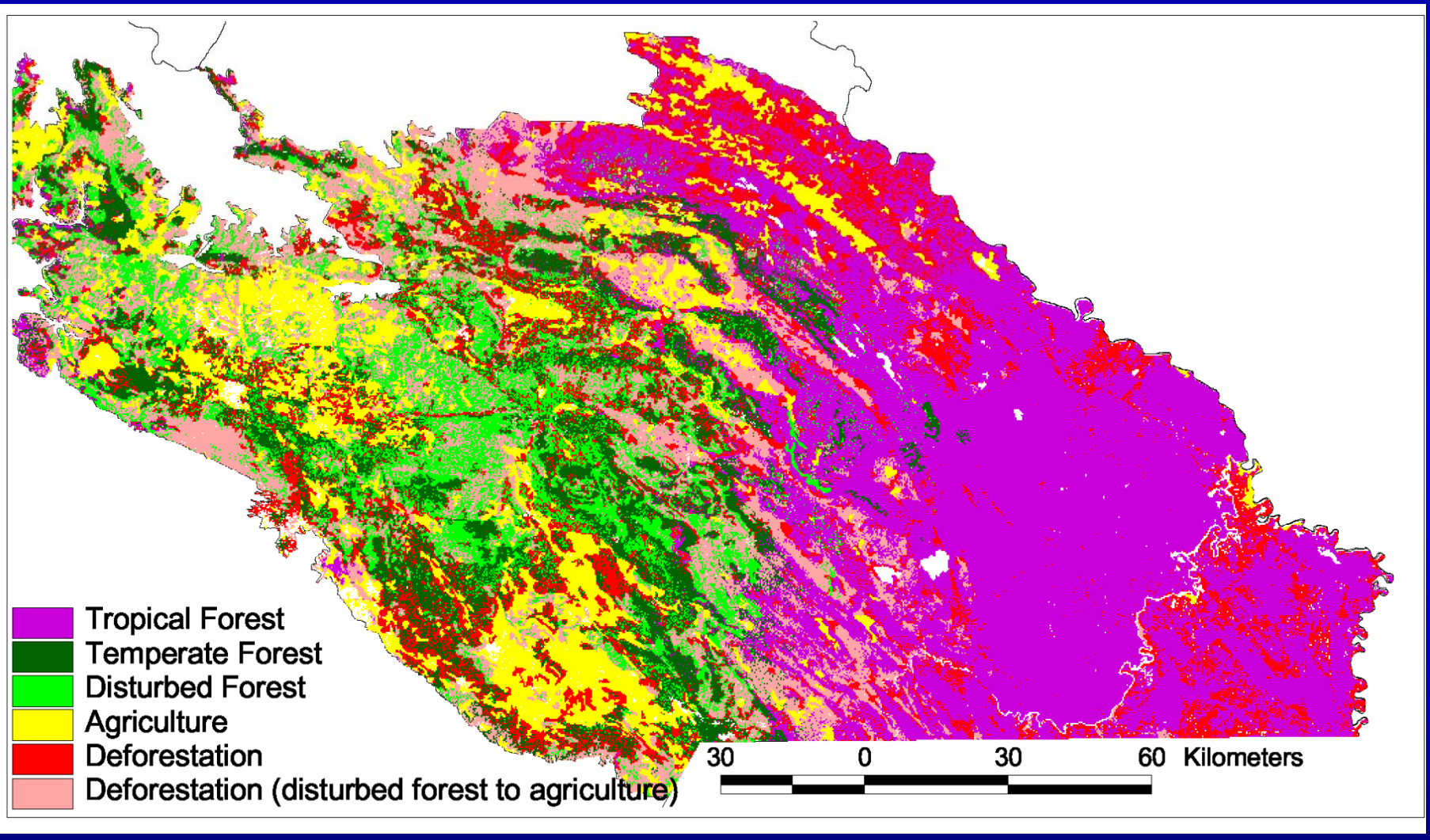
First steps to construct Deforestation risk map:

- Identify areas that were deforested between 1970 and 1997 (availability of land-cover maps).
- Correlate observed change to two types of possible causal factors:
  - ´predisposing' factors that determine the susceptibility of a particular area of forest to change (slope, distance to agriculture and roads, land tenure) and
  - 'driving' factors representing the pressure for change (population density, poverty).
- The correlated factors were combined in risk matrices, which show the proportion of vulnerable carbon stocks lost in areas with defined social, economic and environmental characteristics.
- two matrices were constructed, using population density as the single most important driving factor and distance from roads and distance from agriculture as the two alternatives for the predisposing factors of deforestation

Castillo et al 2007


93°
92°
91°
17°
16°
Chilon
Bachajon
Cañadas
Ocosingo
Montes Azules
Biosphere Reserve
Palestina
Corozal
Altamirano
San Cristobal
Chanal
Highlands
Las Rosas
Las Margaritas
Selva lowlands
Comitan
La Trinitaria
Gulf of Mexico
Quintana Roo
Campeche
Veracruz
Tabasco
Oaxaca
Chiapas
BELICE
GUATEMALA
Pacific Ocean
main settlements
30 0 30 60 Kilometers
N

Deforestation observed between comparing 1970s LU map and satellite imagery of 1996-1997



Deforestation in relation to correlated predisposing and pressure factors

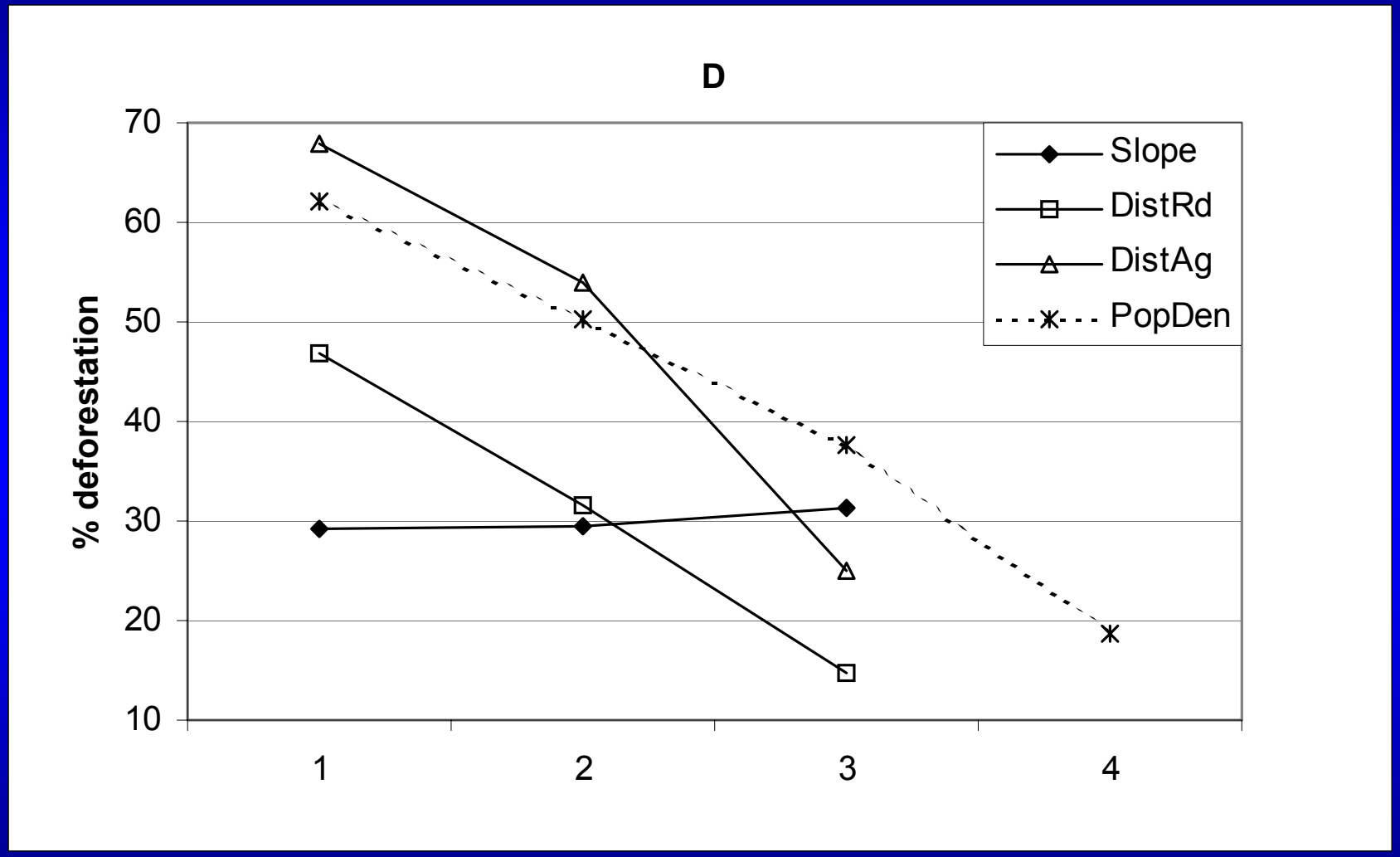


TABLE III

DistAg-PopDens Risk matrix, expressed in % deforestation between 1975–1996, including the 95% confidence intervals.

PopDens (hab/km^2)	DistAg (m)		
	0–500	1500–1000	>1000
>30	65.2±2.4	54.1±2.8	51.3±3.1
>15–30	58.2±2.2	49.1±2.4	43.1±2.7
>0–15	56.2±2.5	46.8±2.8	40.5±3.5
0	50.8±4.7	38.3±5.1	29.9±4.4

TABLE IV

DistRd-PopDens Risk matrix, expressed in % deforestation between 1975–1996, including the 95% confidence intervals.

PopDens (hab/km^2)	DistRd (in m)		
	0–1000	1000–2000	>2000
>30	59.7±3.2	51.5±3.0	42.7±9.9
>15–30	53.1±2.3	46.1±2.4	40.7±5.9
>0–15	48.6±2.6	38.1±2.4	29.4±3.3
0	38.8±4.0	28.8±3.1	25.7±4.5

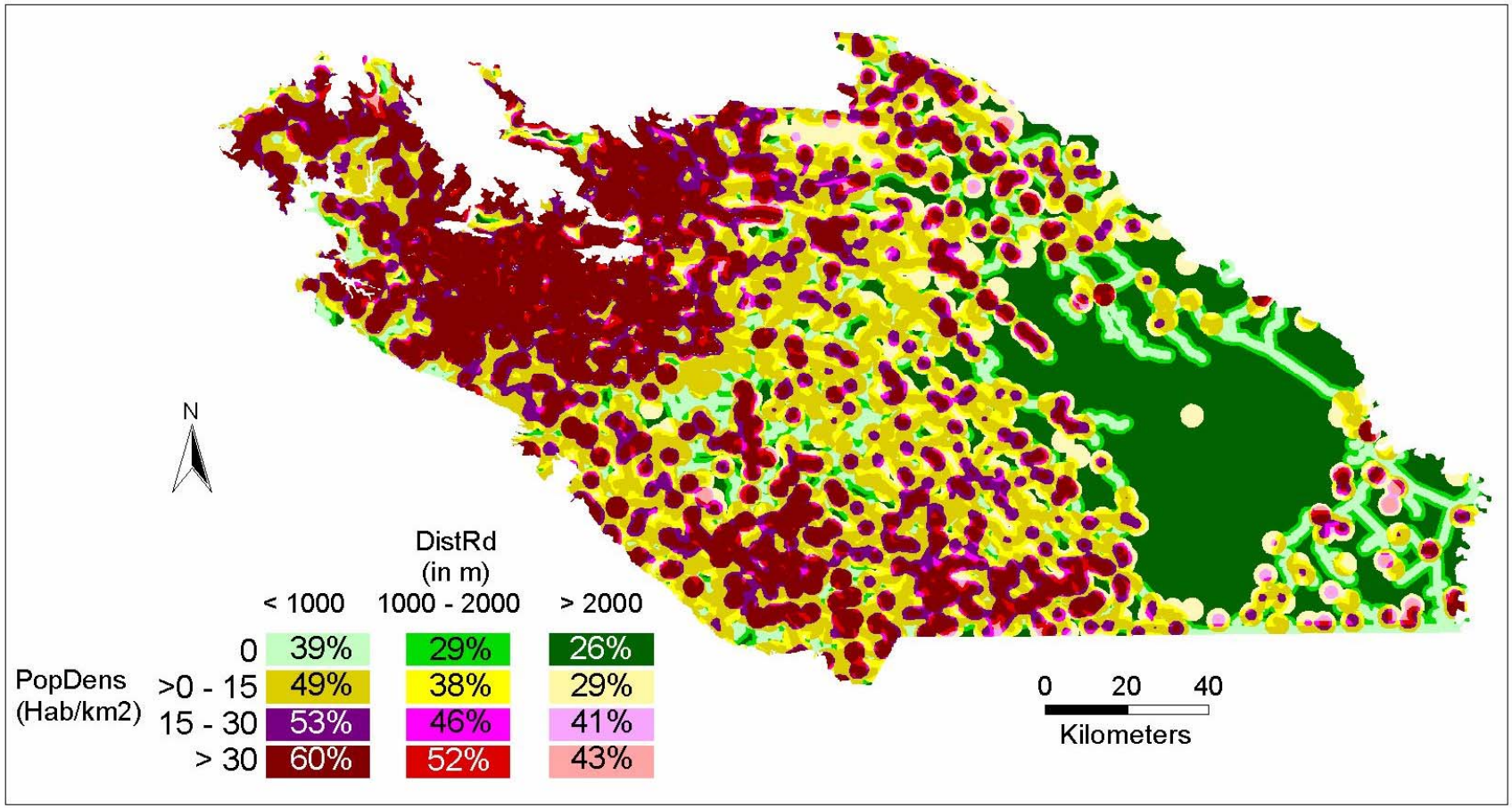
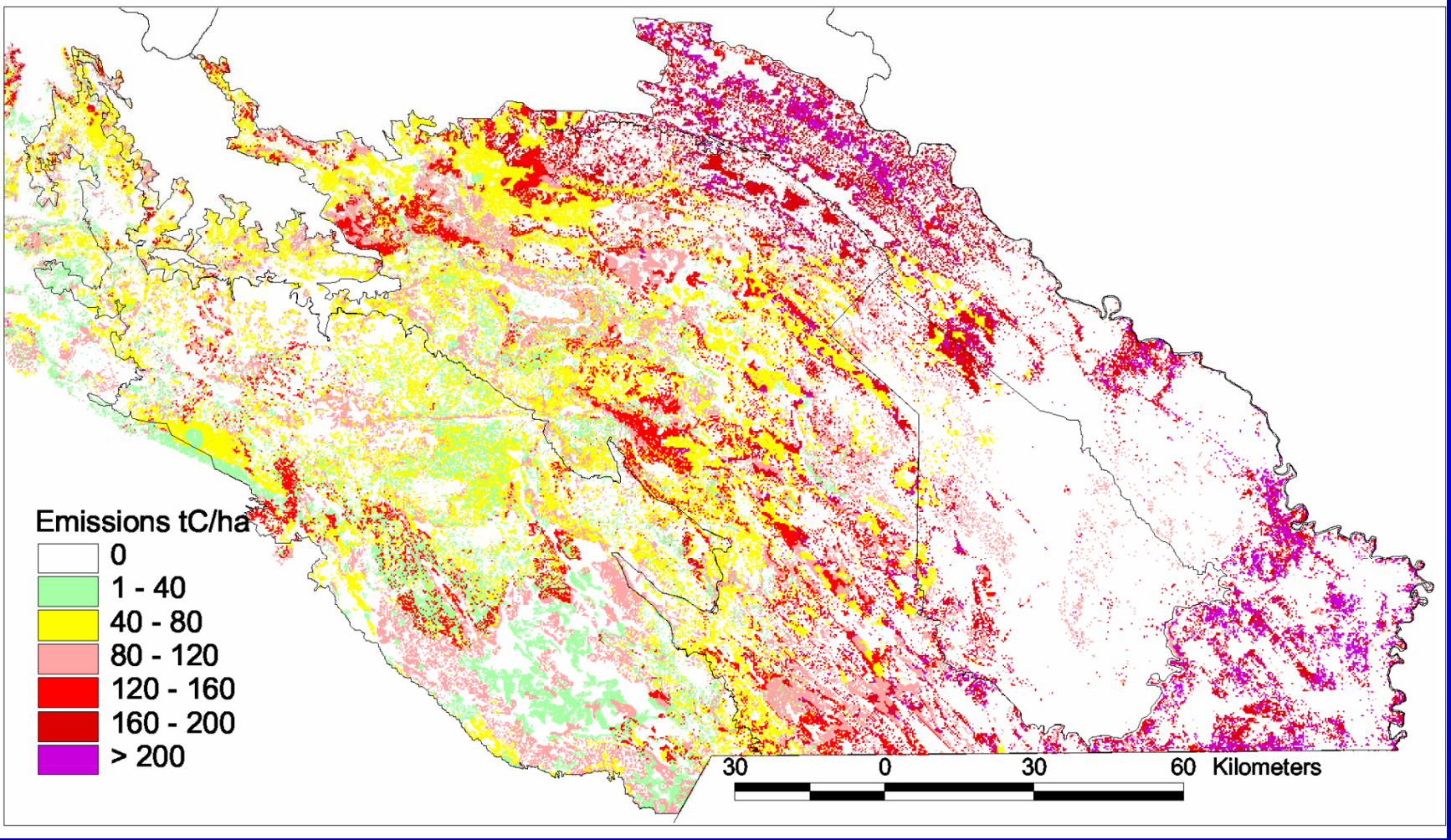

N
DistRd
(in m)
< 1000
1000 - 2000
> 2000
PopDens
(Hab/km2)
0
39%
29%
26%
>0 - 15
49%
38%
29%
15 - 30
53%
46%
41%
> 30
60%
52%
43%
0
20
40
Kilometers

Table 1. Aboveground (95% conf. interval) and vulnerable C-density in the composite classes

Aboveground (95% conf. interval) and vulnerable C-density in the composite LU classes (derived from De Jong et al 1999, 2000)

Vegetation type	Aboveground C ($tC\ ha^{-1}$)	Vulnerable C ($tC\ ha^{-1}$)
Tropical region		
Non disturbed Forests	236.5 (± 13.0)	222.2 (± 9.9)
Disturbed Forest	114.4 (± 33.9)	100.0 (± 24.3)
Agriculture	14.3 (± 7.7)	0
Temperate region		
Non disturbed forest	136.4 (± 23.1)	121.9 (± 19.7)
Disturbed forest	69.1 (± 13.7)	56.6 (± 11.2)
Agriculture	12.1 (± 7.4)	0


Emissions tC/ha
0
1 - 40
40 - 80
80 - 120
120 - 160
160 - 200
> 200
30
0
30
60 Kilometers

Next steps to calculate emission reduction from Deforestation

1.Apply the matrices to community LU-map

2.Calculate forest area and Carbon in each risk class

3.Estimate expected Deforestation rate and expected emission in each risk class for each matrix

4.Calculate uncertainty for each class.

5.Estimated emission reduction from the lowest estimate.

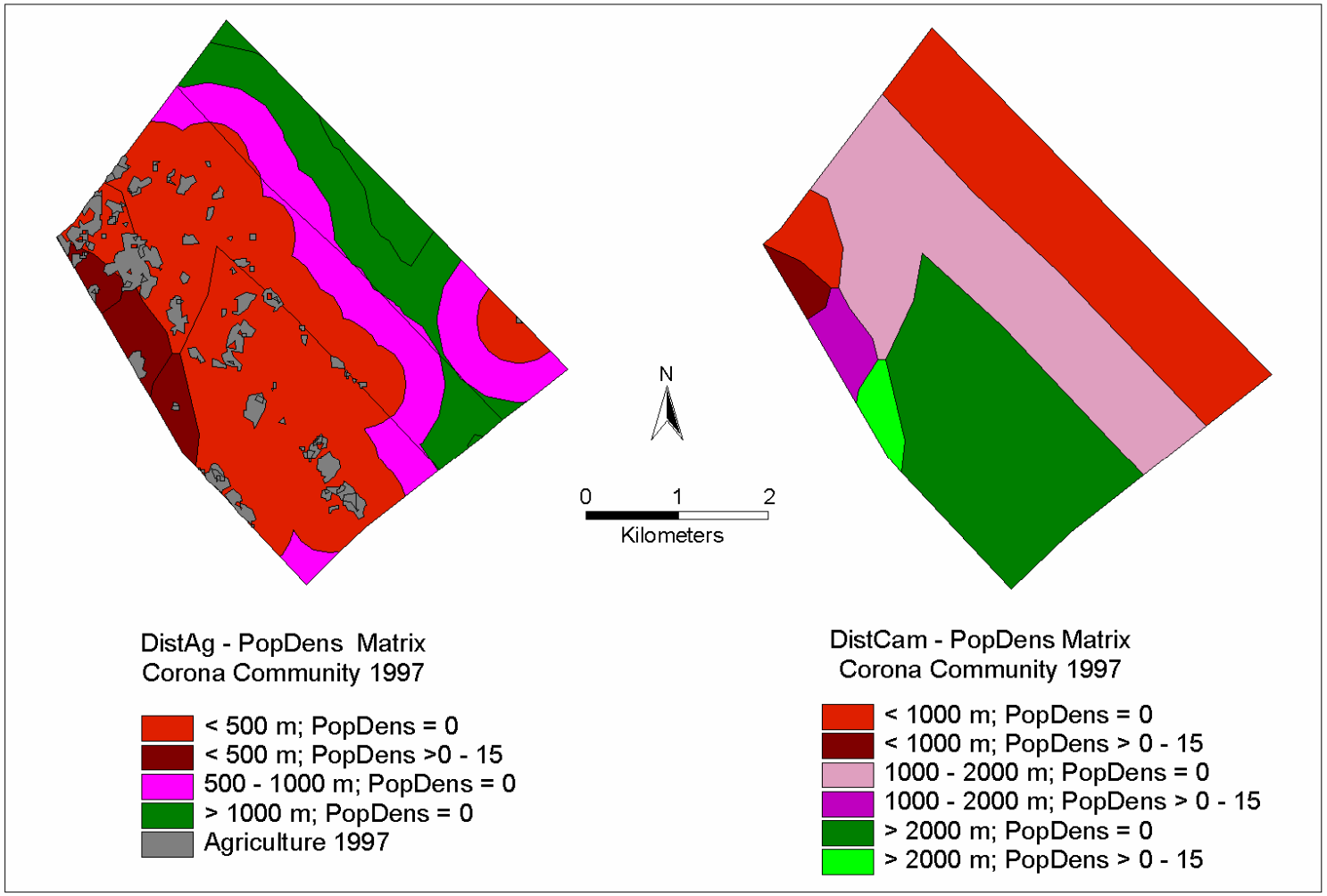

N
0
1
2
Kilometers
DistAg - PopDens Matrix
Corona Community 1997
< 500 m; PopDens = 0
< 500 m; PopDens >0 - 15
500 - 1000 m; PopDens = 0
> 1000 m; PopDens = 0
Agriculture 1997
DistCam - PopDens Matrix
Corona Community 1997
< 1000 m; PopDens = 0
< 1000 m; PopDens > 0 - 15
1000 - 2000 m; PopDens = 0
1000 - 2000 m; PopDens > 0 - 15
> 2000 m; PopDens = 0
> 2000 m; PopDens > 0 - 15

TABLE V

Vulnerable carbon stock in La Corona by vegetation type in 1997.

Vegetation type	Area (ha)	Vulnerable carbon (t)
Forest	1,823	405,140±18,051
Disturbed forest	12	1,219±296
Secondary shrub vegetation	278	0
Agriculture	7	0
Pasture	148	0
Settlement	8	0
Total	2,277	406,359±18,347

TABLE VII

Estimated and allowable baseline emissions from deforestation between 1998–2007 (tC) for the La Corona community, based on the DistRd-PopDens matrix and total compound error.

		Estimated emissions (in tC)		Total error (in %)		Allowable emissions (in tC)		
	PopDens	>0–15	0	>0–15	0	>0–15	0	Total
Dist	<1000 m	800	23,067	26.5%	21.5%	588	18,107	18,696
	1000–2000 m	1,540	18,535	21.3%	22.2%	1,212	14,420	15,632
	>2000 m	1,180	15,780	22.7%	34.0%	912	10,414	11,326
	Total	3,520	57,381			2,712	42,942	45,654

Limitations of the approach:

•Only comparison of two LU maps, does not incorporate differences of LU-change over time.

•Few biomass density data points.

•Does not take into considerations changes in drivers over time

•Does not incorporate effects of historical and future LU policies

Advances of Mexico to establish REDD policy

Reference emission scenario

•National Forest inventory in place with 22,000 permanent sample plots and development of REDD pilot projects (within a national accounting system)

•Clearing house of all available Landsat imagery (22,000 images covering Mexico)

•MODIS data since 2001-2009 to construct BPP and NPP maps and detect LU-change on a weekly basis (similar to Brasil).

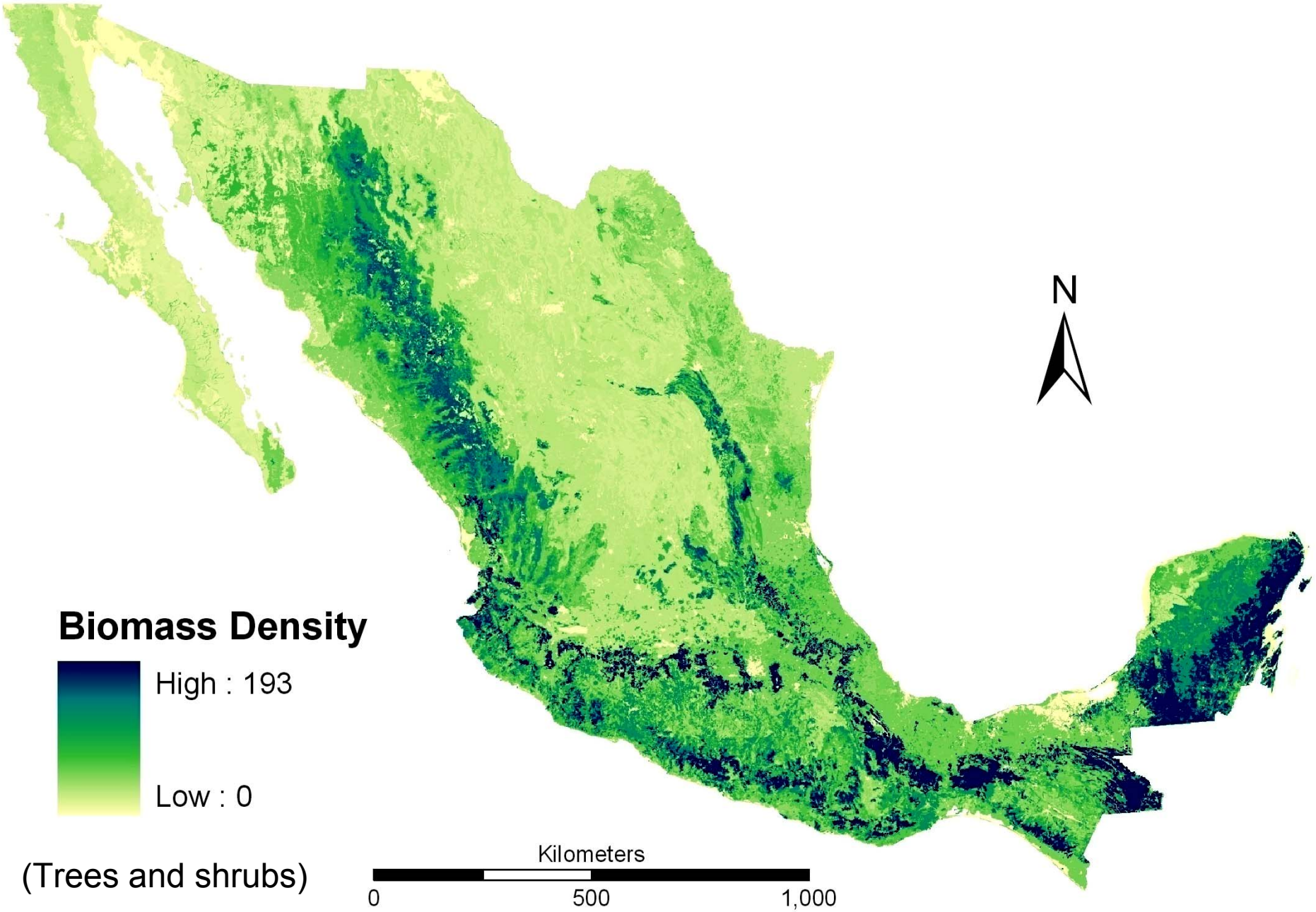
Drivers

•National goals of Forest and Agricultural policies 2007-2012 (at municipality level)

•Geo-referenced polulation census 1990-1995-2000-2005

•Geo-referenced agricultural census 2007

•Geo-referenced data on land tenure, infraestructure, slope,


N
Biomass Density
High : 193
Low : 0
(Trees and shrubs)
Kilometers
0
500
1,000
(Based on de Jong et al, 2006)

Plan 2009-2010:

1. Estimate forest conversion to set national deforestation target from 4-5 points in time (historical trend) 1990, 1993, 1997, 2000, 2002, 2007.
2. Identify forest areas that are under high risk due to drivers, such as access or pressure.
3. Analyse impact of recent LU programs (2000-2007) on deforestation and estimate impact of National Development Plan 2007-2012
4. Develop reference scenario
5. Define priority areas = f (Risk, Quantity of carbon, Social importance, Conservation).

Thanks

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