

Population and Poverty: Scale, extent, depth

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For each problem, consider the ...

■ Scale

- What resolution is required?

■ Extent

- Which geography:

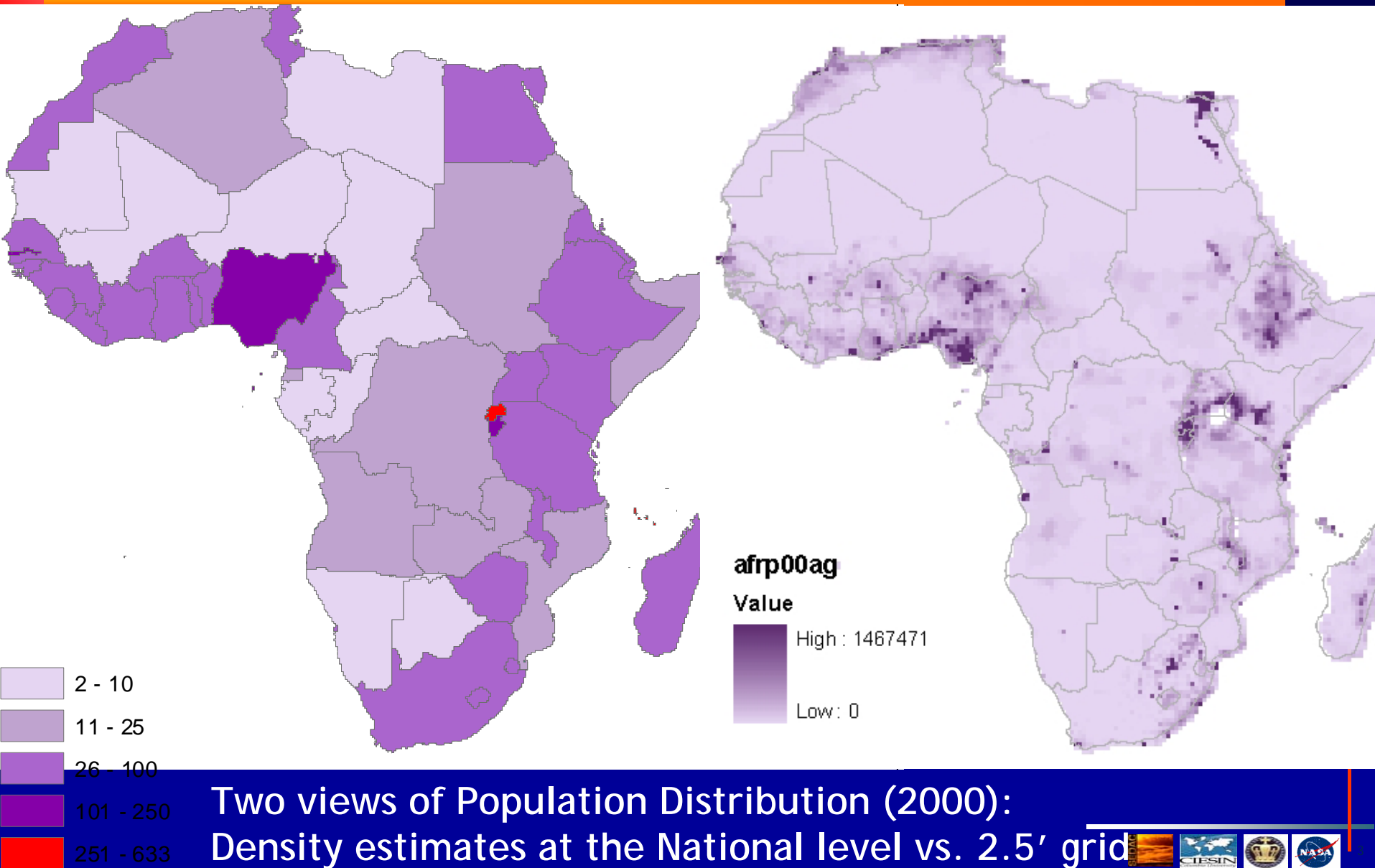
- Ecozone, Marine Protected Area, coastal buffer, administrative units (county, province)

- Local or global?

■ Unit of analysis

- Individuals or households, species, system, territories, and so on ...

Population: Ten years to change our world view



Two views of Population Distribution (2000):
Density estimates at the National level vs. 2.5' grid



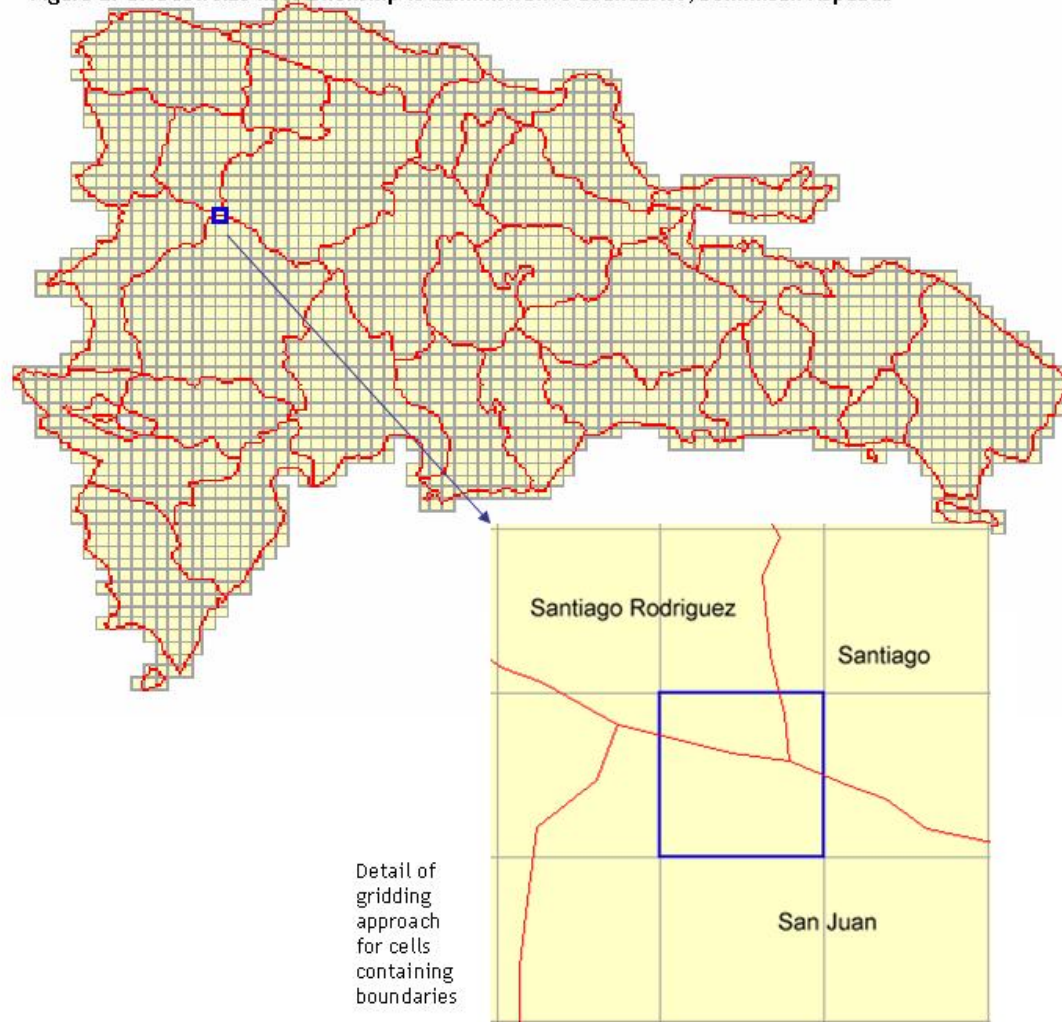


Why bother gridding?

- Distributes population across a common global grid
 - Gridded Population of the World - 2.5 arc-minutes (~4.5 km) resolution
 - Other grid cell sizes possible
- Allows aggregation of population by any other spatial and geographic phenomenon and facilitates analysis with these other data types
 - E.g., land cover, ecosystems, coastal proximity, etc.
- Subnational data—boundaries in particular—are often proprietary
 - E.g., Population distribution by administrative boundaries

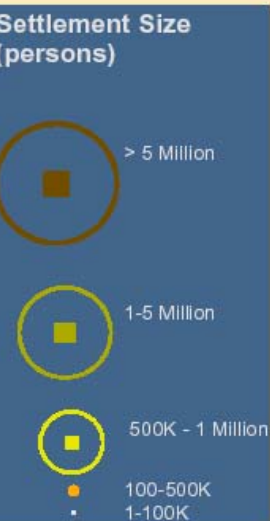
Transforming irregular shape to uniform ones

Figure 2. Grid cell size in relationship to administrative boundaries, Dominican Republic



Urban areas

- By increasing the settlement threshold, vastly greater number of urban areas are revealed
- About 75,000 in the data set



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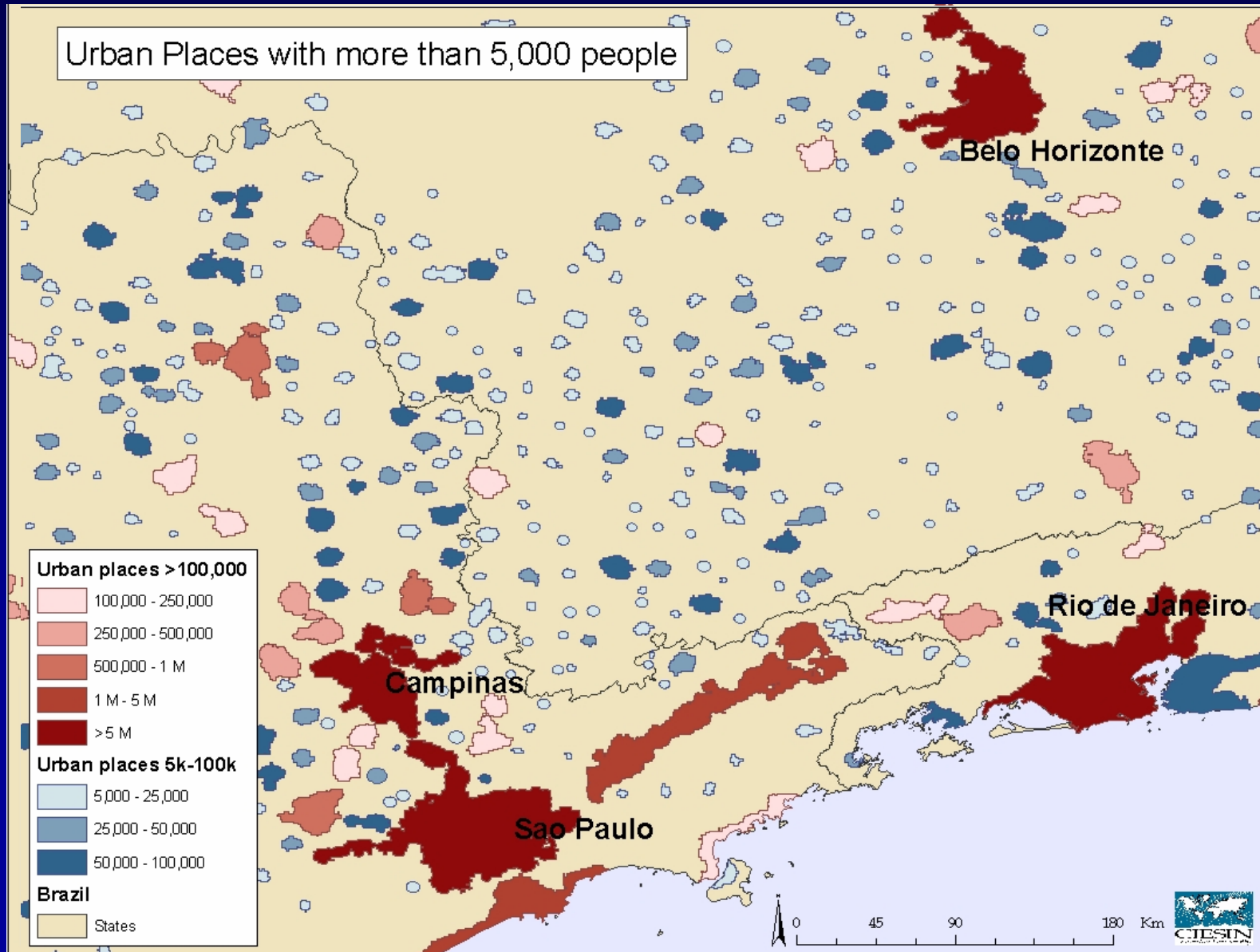
Extents: Understanding space

Close up of Brazil using the 100K person cut off

Note the variety of shape

■ Much more than points convey

About 25,000 extents globally



Urbanization: The newest global dataset

United Nations *WUP* with GRUMP

Size class of urban settlement (number of inhabitants)	UN	GRUMP			UN	GRUMP
	Total Population (000s)		Number of settlements	Population Density	% of Total Population	
Total	6,057,000	6,049,000		46		
Urban area	2,862,000	2,796,000	24,173	762	47.3	46.2
10 million or more	225,000	407,000	22	2162	3.7	6.7
5 million to 10 million	169,000	272,000	40	1556	2.8	4.5
1 million to 5 million	675,000	714,000	347	1213	11.1	11.8
500,000 to 1 million	290,000	278,000	393	824	4.8	4.6
under 500,000	1,503,000	1,125,000	23,371		24.8	18.6
100,000 to 500,000		566,000	2778	702		9.4
50,000 to 100,000		221,000	3176	517		3.7
20,000 to 500,000		229,000	7,291	417		3.8
5,000 to 20,000		109,000	10,126	182		1.8
Rural area	3,195,000	3,253,000		26	52.7	53.8

Urban and Rural population by ecosystem

Ecosystem	Population Estimates (000s)			
	Total	Urban	Rural	% Urban
Coastal	1,146,000	734,000	412,000	64.0
Cultivated	4,222,000	1,894,000	2,328,000	44.9
Dryland	2,150,000	964,000	1,186,000	44.8
Forest	1,132,000	396,000	736,000	35.0
Inland Water	1,502,000	770,000	732,000	51.3
Island	634,000	364,000	270,000	57.4
Mountain	1,161,000	348,000	813,000	30.0
Overall	6,049,000	2,796,000	3,253,000	46.2

Urban and rural land area, by ecosystem

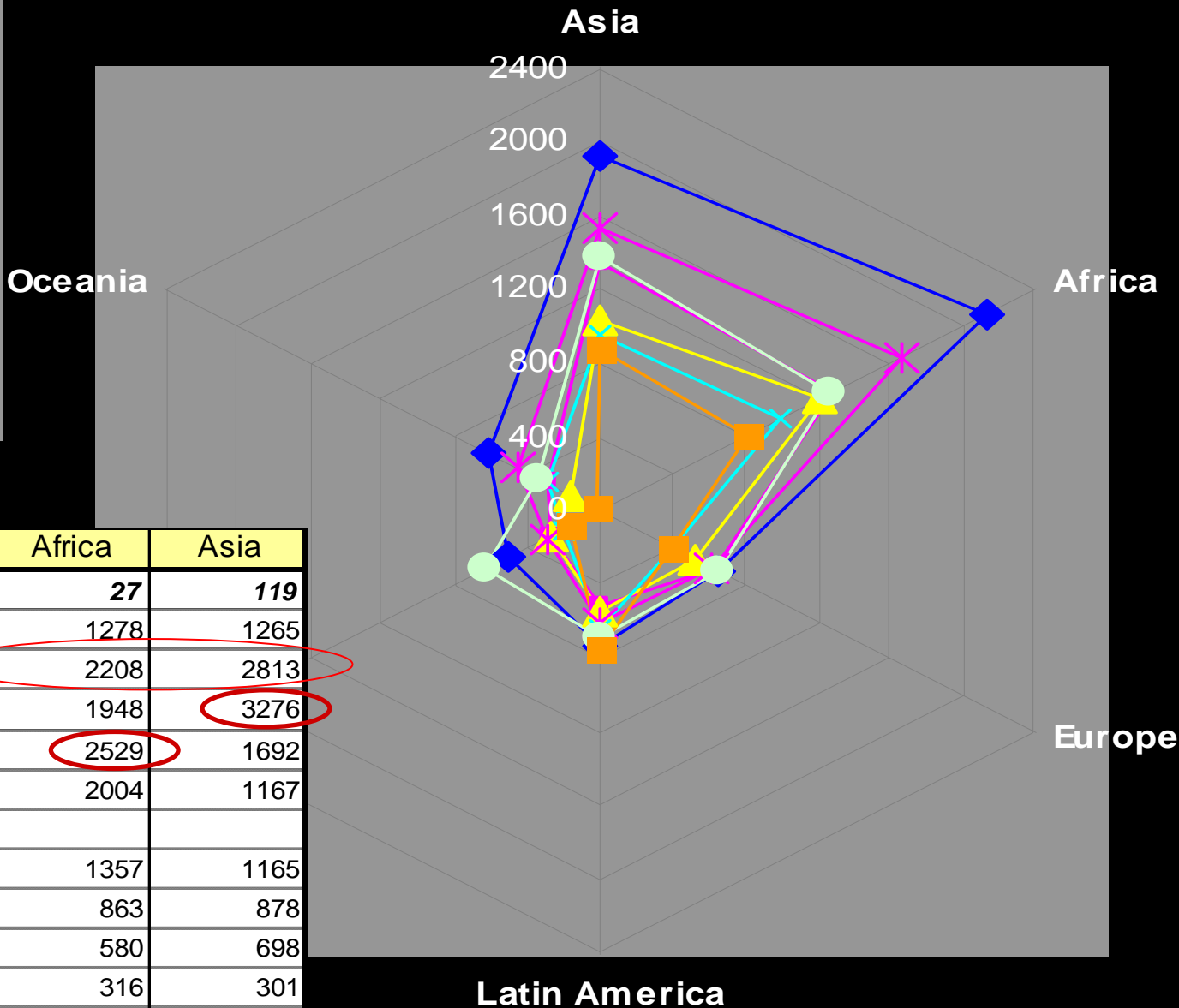
Ecosystem	Land Areas (square kilometers)			
	Total	Urban	Rural	% Urban
Coastal	6,537,248	664,139	5,873,109	10.2
Cultivated	35,474,755	2,408,775	33,065,980	6.8
Dryland	59,966,189	1,286,589	58,679,600	2.1
Forest	42,091,243	838,773	41,252,470	2.0
Inland Water	29,418,837	942,607	28,476,230	3.2
Island	7,579,706	356,631	7,223,075	4.7
Mountain	32,066,433	548,373	31,518,060	1.7
Overall	130,637,900	3,668,694	126,969,200	2.8

Population density by ecosystem

Ecosystem	Population Density (persons/km ²)		
	Overall	Urban	Rural
Coastal	175	1105	70
Cultivated	119	786	70
Dryland	36	750	20
Forest	27	472	18
Inland Water	51	817	26
Island	84	1020	37
Mountain	36	634	26
Overall	46	762	26

Urban Population Densities in various ecosystems, by Continent

- ◆ Coastal zone
- Cultivated
- ▲ Dryland
- ✕ Forest
- ✱ Inland Water
- Island
- Mountain

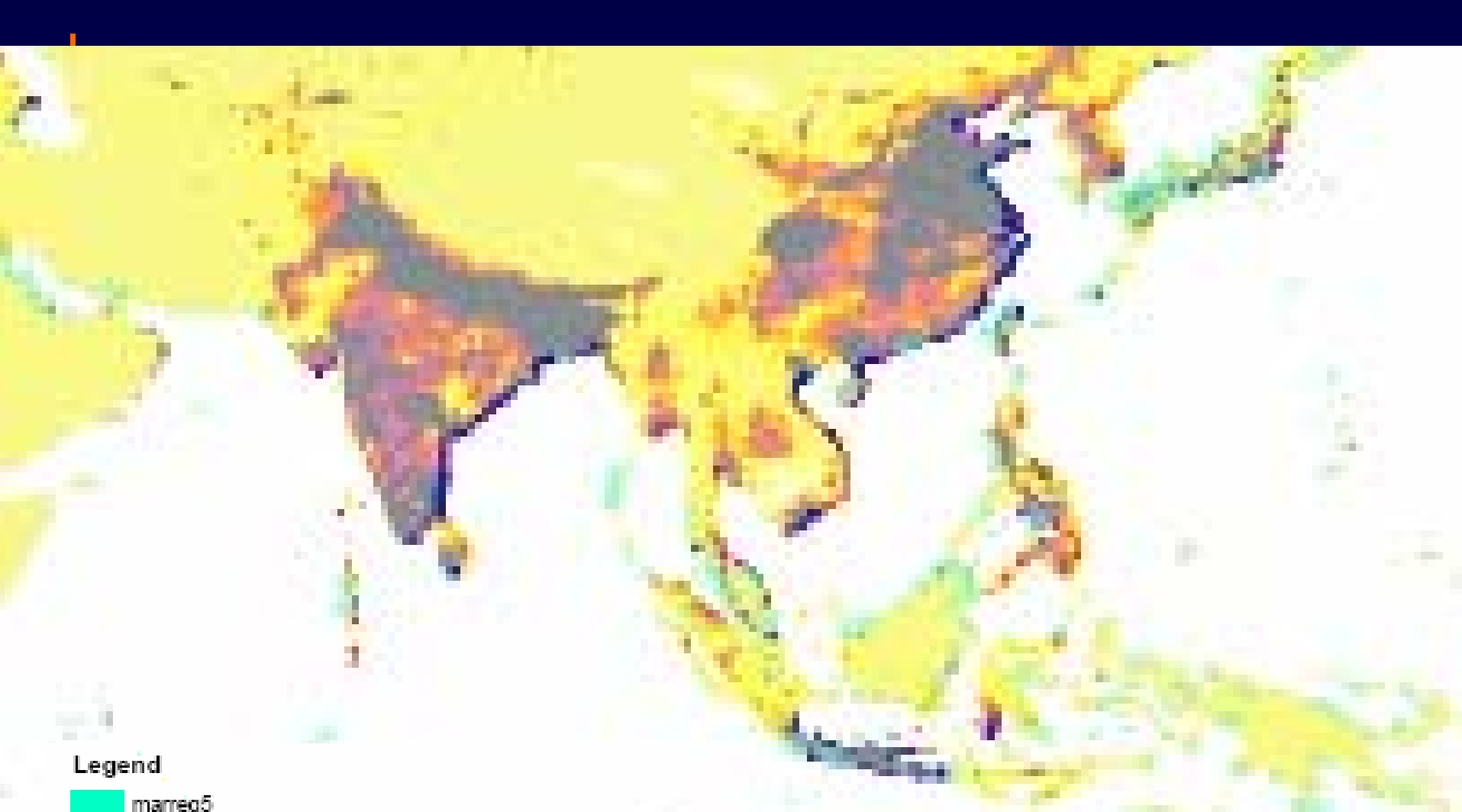


	Africa	Asia
Overall	27	119
Urban area	1278	1265
10 million or more	2208	2813
5 million to 10 million	1948	3276
1 million to 5 million	2529	1692
500,000 to 1 million	2004	1167
under 500,000		
100,000 to 500,000	1357	1165
50,000 to 100,000	863	878
20,000 to 50,000	580	698
5,000 to 20,000	316	301
Rural area	17	78

China: 1990 vs. 2000

	Urban Population Density*		
	1990	2000	
Coastal	1632	2297	40.8%
Cultivated	1321	1631	23.4%
Dryland	1231	1435	16.6%
Forest	1166	1446	24.0%
Inland Water	1487	1938	30.4%
Mountain	842	1068	26.8%
Overall	1293	1616	25.0%

World Pop		Pop within 50km	Pop within 100km	Pop within 150km	
Population	5,996,803,192		1,693,522,088	2,267,511,302	2,662,881,505
	Population	% of Wld Pop	% of Coast Pop 50	% of Coast Pop 100	% of Coast Pop 150
Corals (50km)	407,166,429	6.79%	24.04%	17.96%	15.29%
Corals (100km)	710,583,010	11.85%	41.96%	31.34%	26.68%
Corals (150km)	951,026,718	15.86%	56.16%	41.94%	35.71%
Estuaries (50km)	1,000,170,823	16.68%	59.06%	44.11%	37.56%
Estuaries (100km)	1,598,940,542	26.66%	94.42%	70.52%	60.05%
Estuaries (150km)	2,096,805,582	34.97%	123.81%	92.47%	78.74%
Mangroves (50km)	646,359,416	10.78%	38.17%	28.51%	24.27%
Mangroves (100km)	1,030,295,102	17.18%	60.84%	45.44%	38.69%
Mangroves (150km)	1,223,300,344	20.40%	72.23%	53.95%	45.94%
Seagrass (50km)	672,228,991	11.21%	39.69%	29.65%	25.24%
Seagrass (100km)	1,119,706,255	18.67%	66.12%	49.38%	42.05%
Seagrass (150km)	1,657,936,259	27.65%	97.90%	73.12%	62.26%
MPA (50km)	569,498,563	9.50%	33.63%	25.12%	21.39%
MPA (100km)	1,146,100,829	19.11%	67.68%	50.54%	43.04%
MPA (150km)	1,579,744,761	26.34%	93.28%	69.67%	59.32%



Legend

marreg5

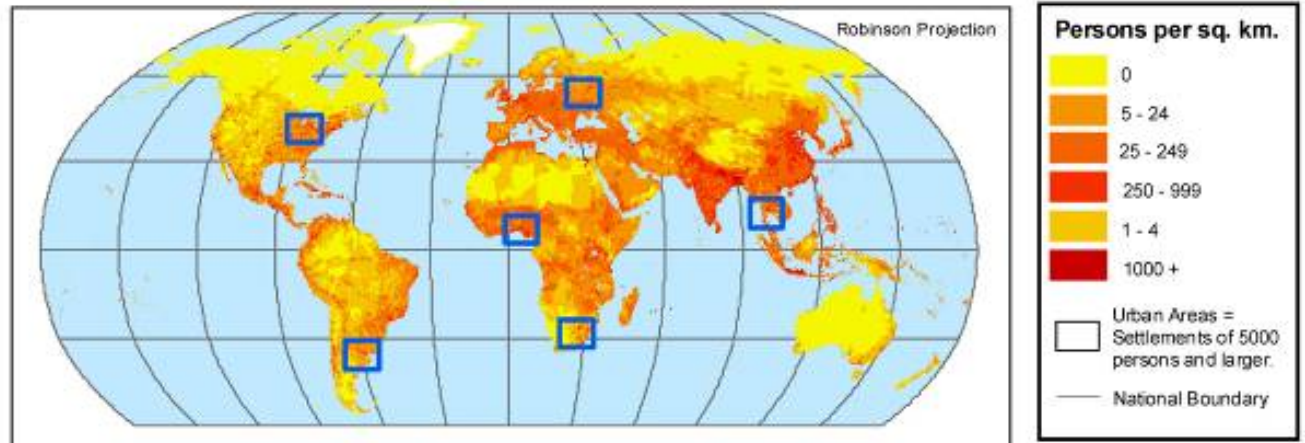
world_popag

Value



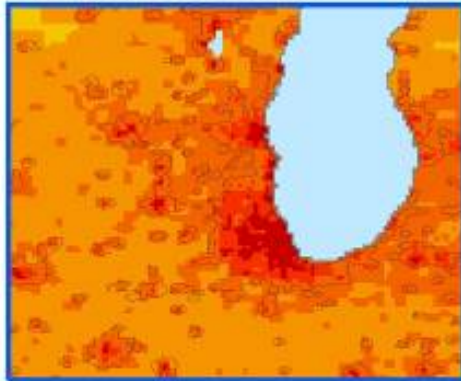
Population Density Estimates for the year 2015

overlaid with urban area boundaries for the year 2000



USA - Chicago, Milwaukee and vicinity

0 50 km



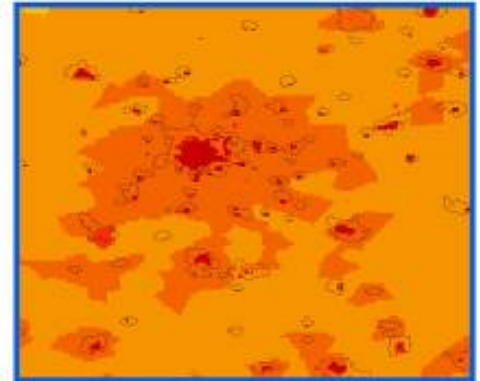
Nigeria - Port Harcourt, Onitsha and vicinity

0 50 km



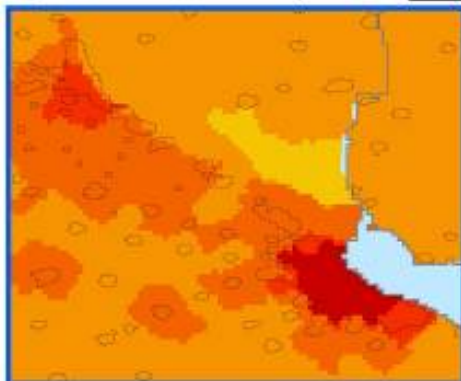
Russia - Moscow and vicinity

0 50 km



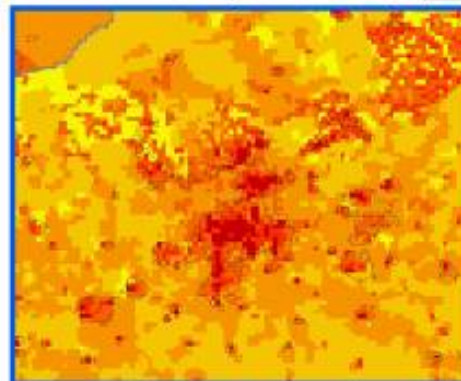
Argentina - Buenos Aires and vicinity

0 50 km



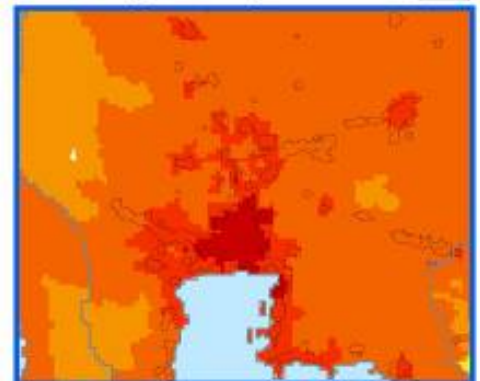
South Africa - Johannesburg, Pretoria and vicinity

0 50 km



Thailand - Bangkok and vicinity

0 50 km





Tsunami exposure: scale & extent revisited

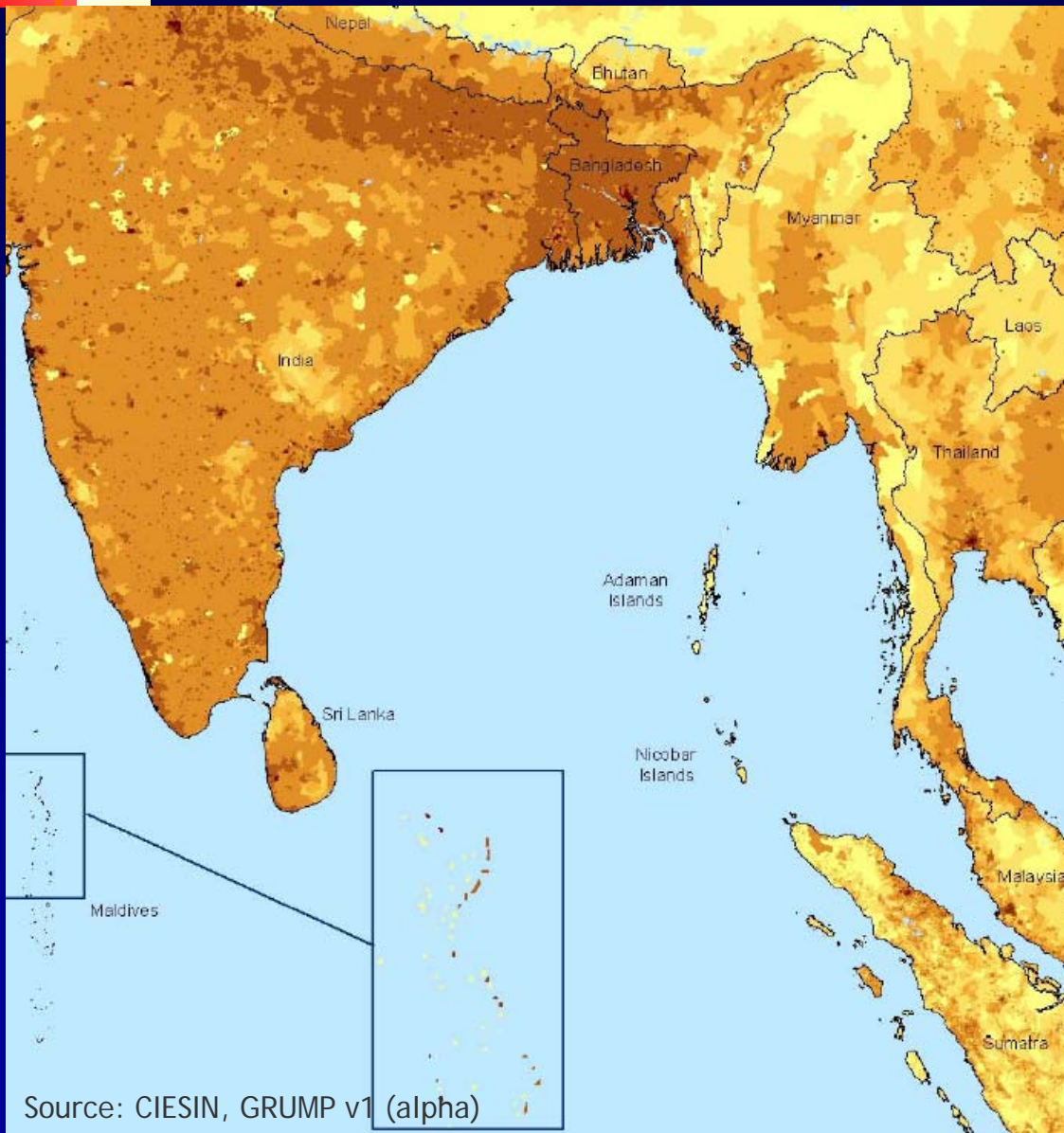
■ Extent

- Indian ocean coastal buffer
 - Amount of buffer required initially unknown

■ Scale

- Input resolution highly variable

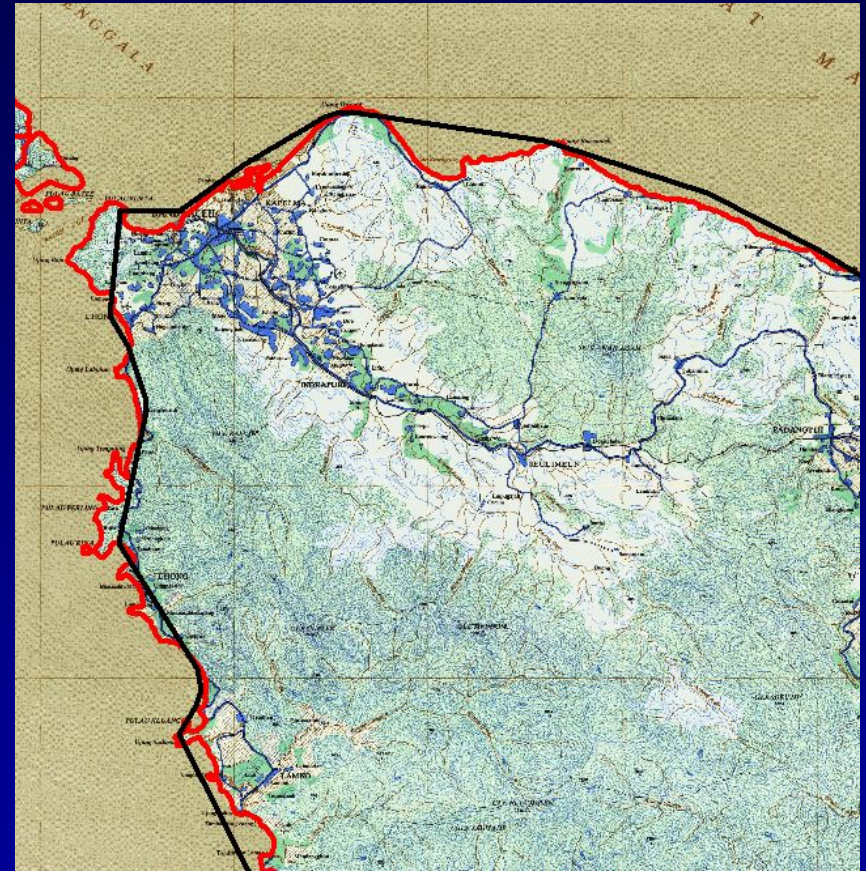
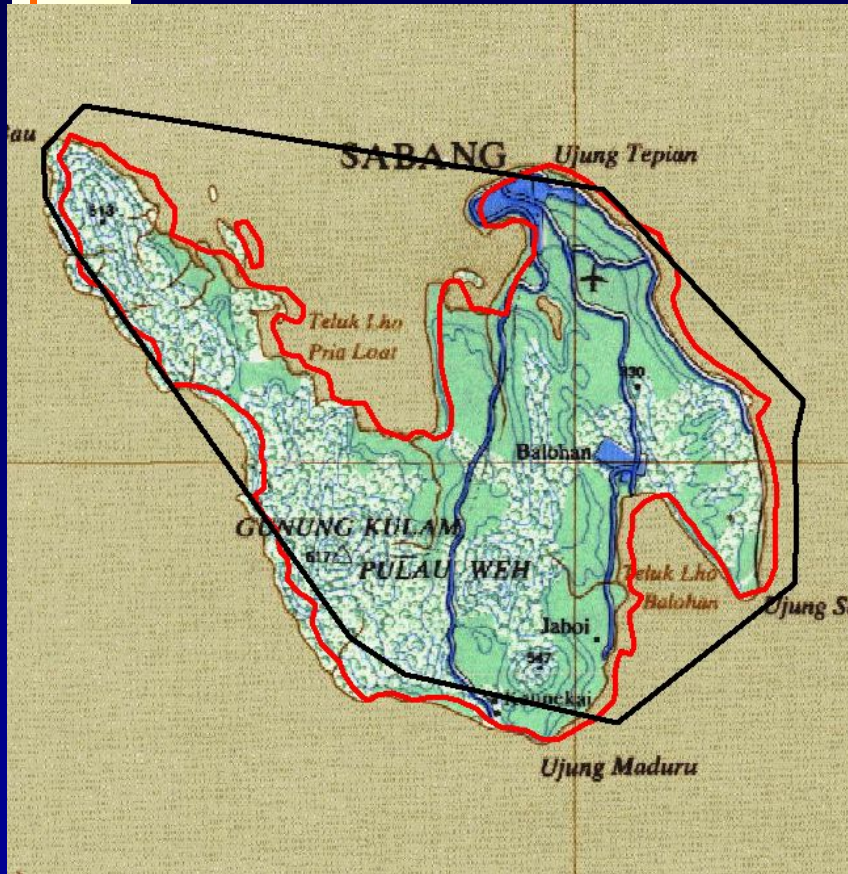
Population density



- Asia—particularly south and southeast Asia—are the most densely populated place on earth
- Coastal zones have disproportionately high population densities
 - 450 persons/km², Asia
 - vs. 175, globally
- Coastal areas are more urban

Source: CIESIN, GRUMP v1 (alpha)

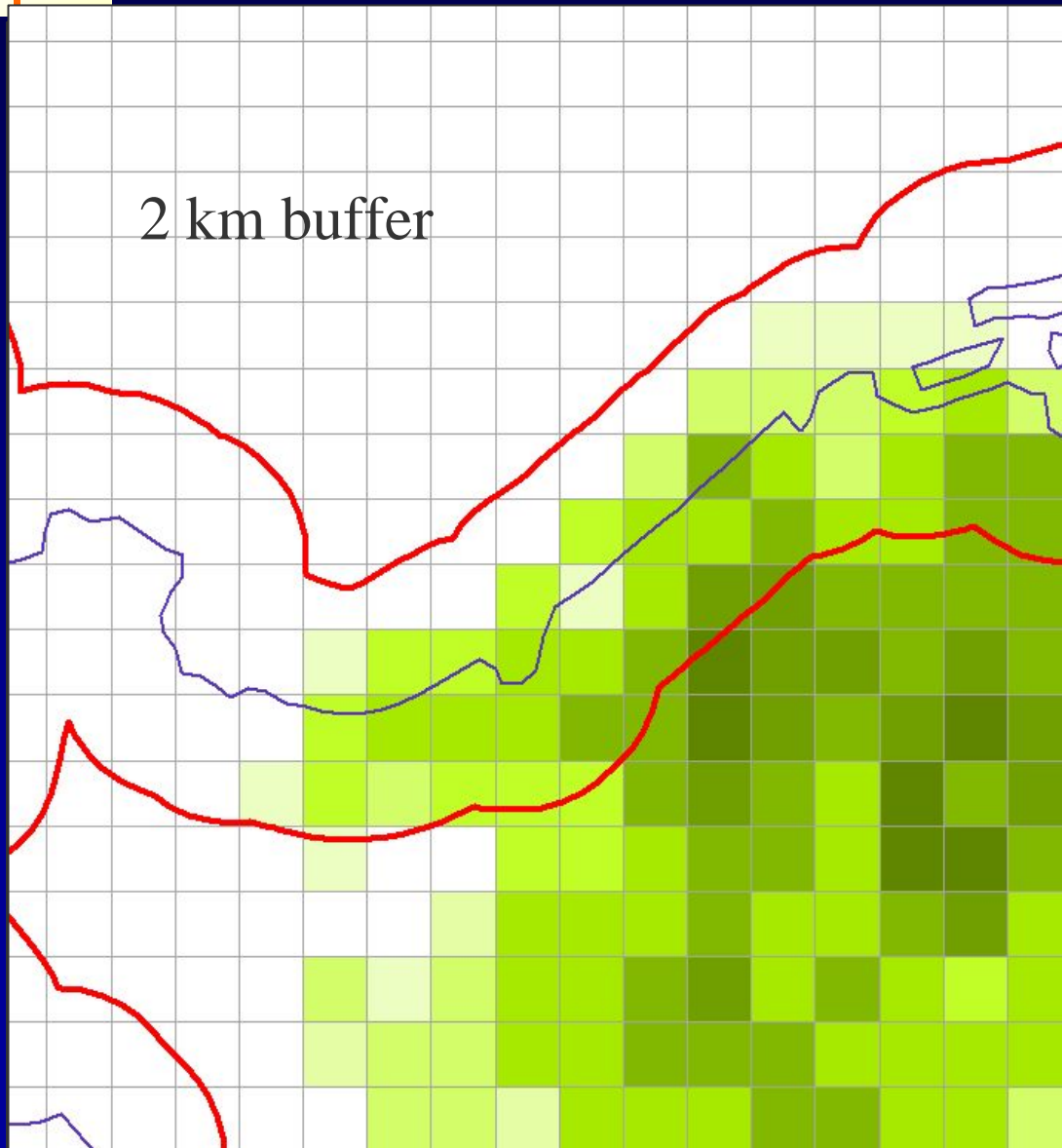
Coastlines must match, but often don't



Shorelines of data sources do not match:

- Black shoreline: ESRI
- Red shoreline: Administrative Units, BPS
- The finer the scale the more the differences matter

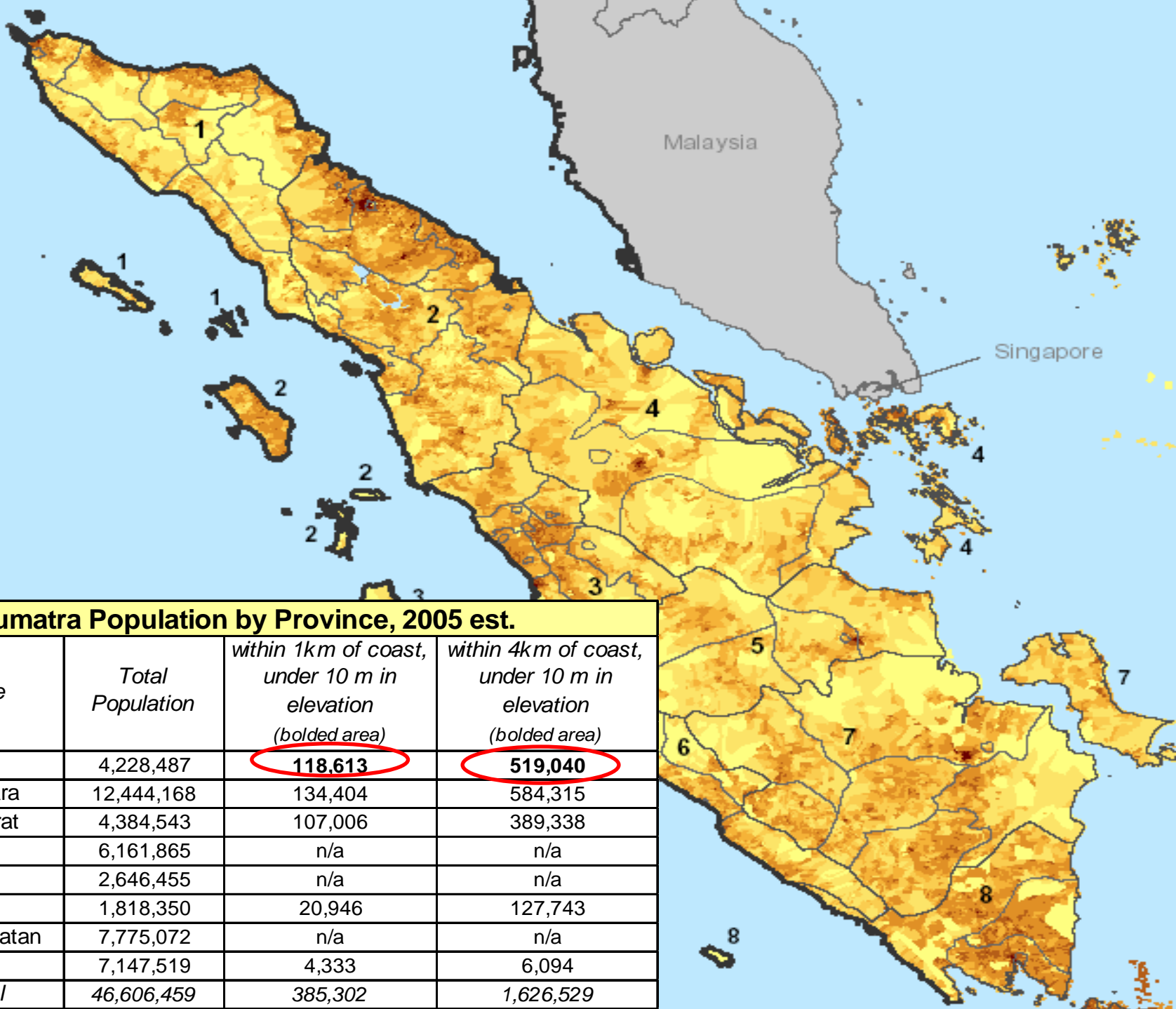
Vector and raster data combination



GRUMP (1 km resolution) population data are now Gridded (i.e., rasterized)

Shoreline is vector (convert to raster)

Note: coastlines do not match

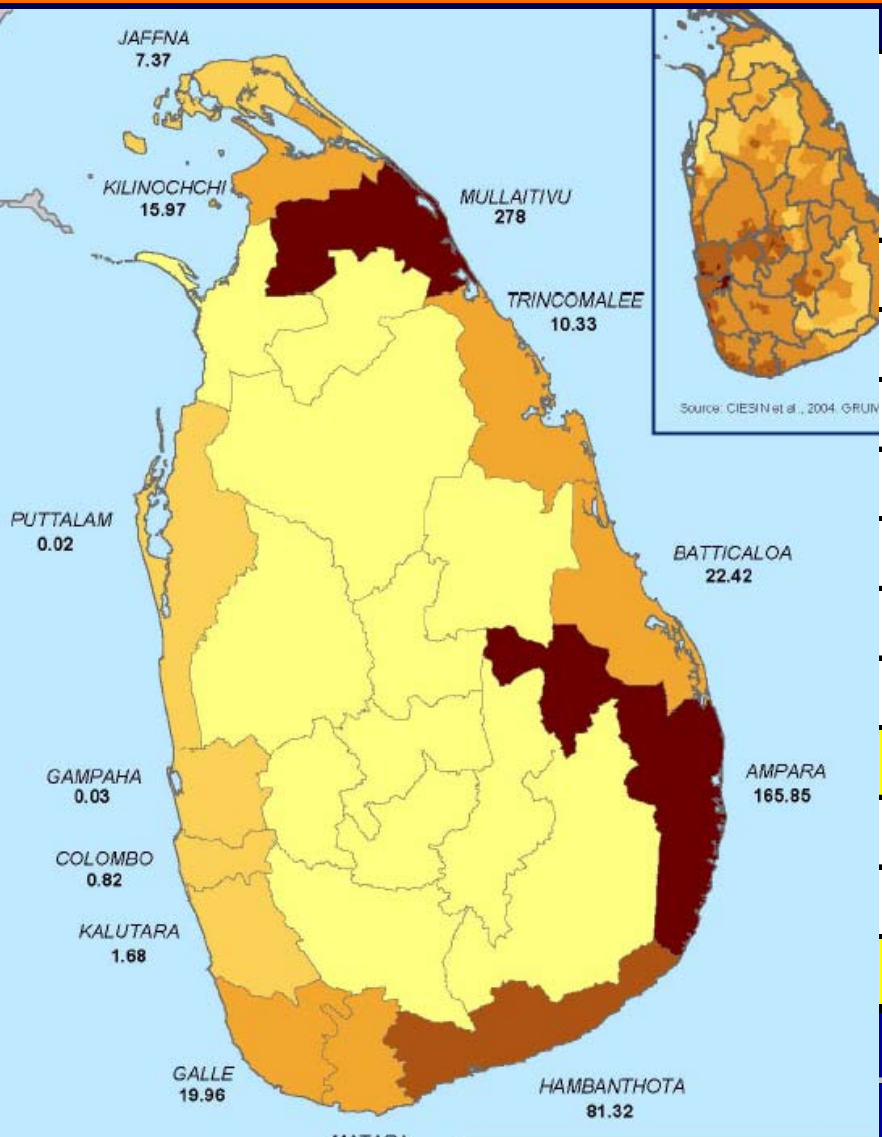


Sumatra Population by Province, 2005 est.

#	Province	Total Population	<i>within 1km of coast, under 10 m in elevation (bolded area)</i>	<i>within 4km of coast, under 10 m in elevation (bolded area)</i>
1	Aceh	4,228,487	118,613	519,040
2	Sumatera Utara	12,444,168	134,404	584,315
3	Sumatera Barat	4,384,543	107,006	389,338
4	Riau	6,161,865	n/a	n/a
5	Jambi	2,646,455	n/a	n/a
6	Bengkulu	1,818,350	20,946	127,743
7	Sumatera Selatan	7,775,072	n/a	n/a
8	Lampung	7,147,519	4,333	6,094
<i>Sumatra Total</i>		<i>46,606,459</i>	<i>385,302</i>	<i>1,626,529</i>

Exposed → affected population estimation: Rates could depend on spatially precise denominator

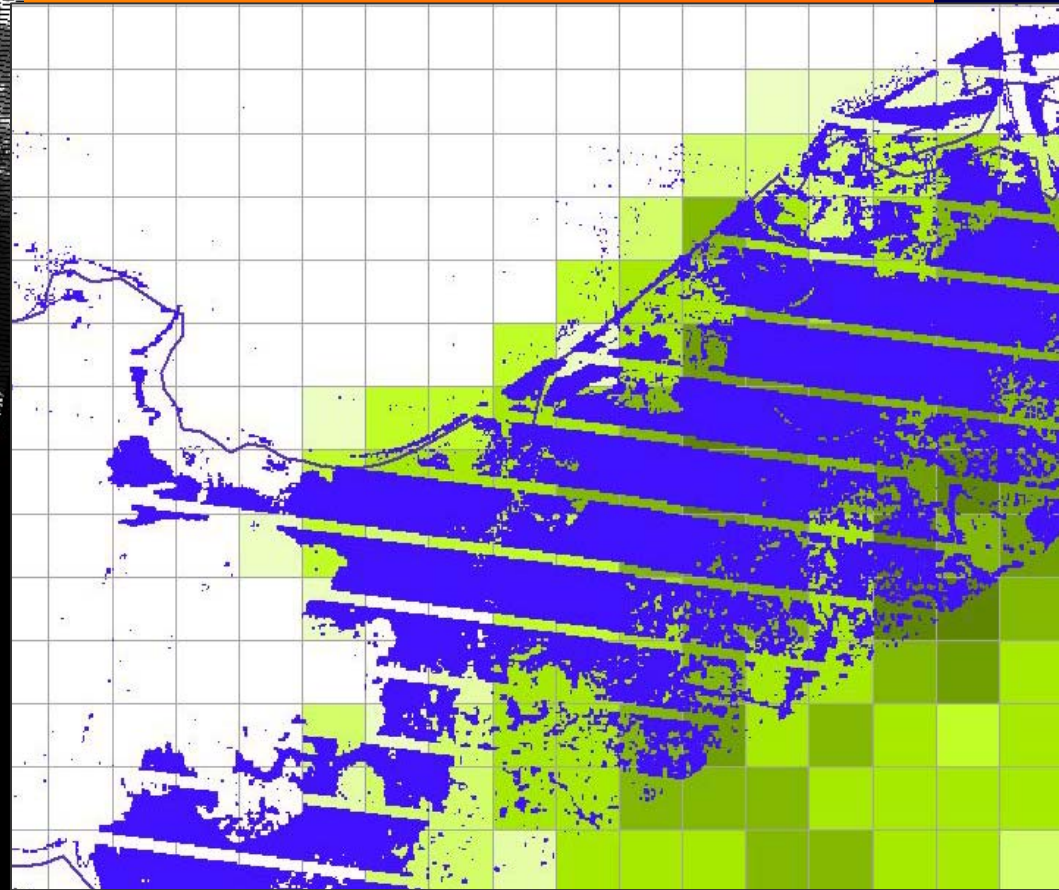
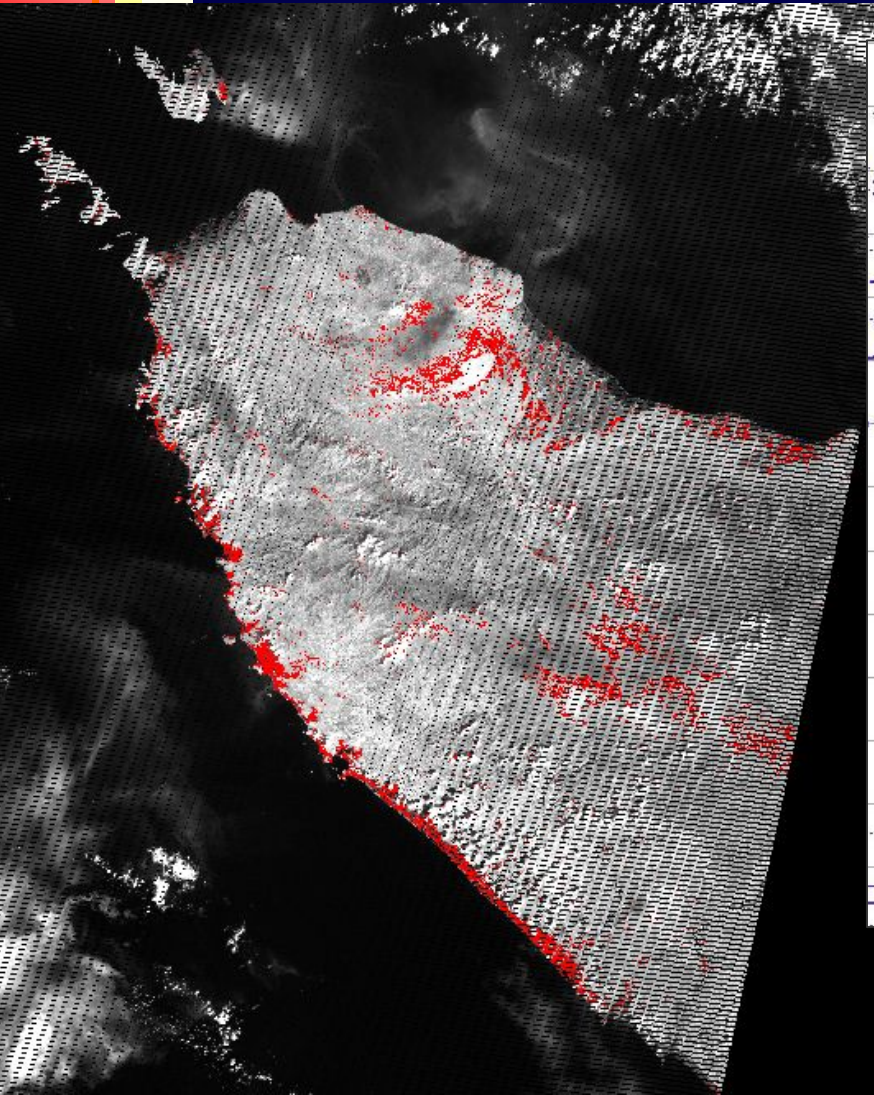
District
Colombo
Kalutara
Kilinochchi
Trincomalee
Matara
Batticaloa
Jaffna
Mullaitivu
Galle
Hambanthota
Ampara



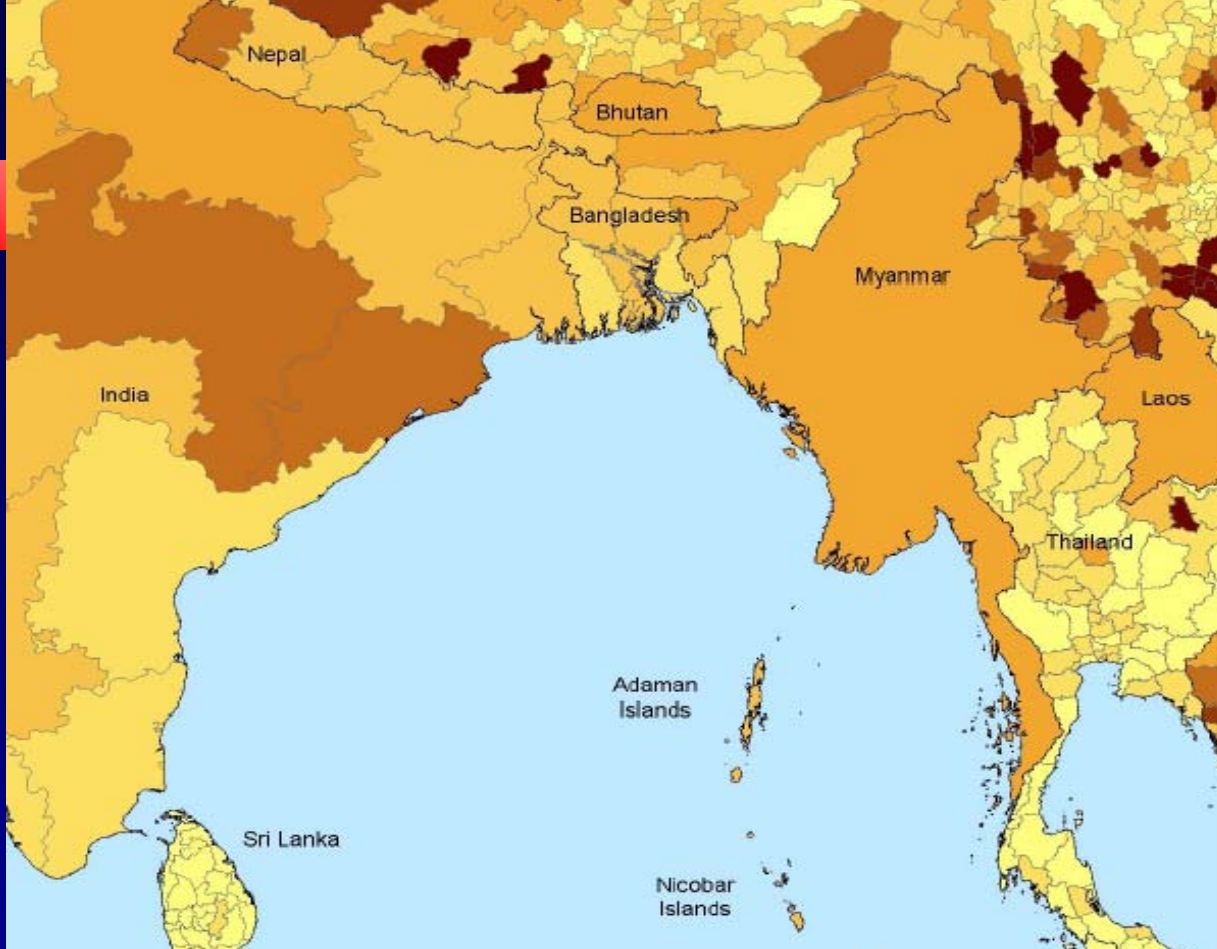
Total pop.	Coastal pop.
0.3	8.2
1.9	16.8
38.6	159.7
25.1	103.3
14.8	132.5
44.0	224.2
63.4	73.7
205.5	2,780.0
38.3	199.6
78.6	813.2
150.0	1,658.5

This is a revised estimated. The nu expressed at a district level, but the

Detected changed areas from the Landsat images



Landsat scene (30 meters resolution) of northern tip of Sumatra



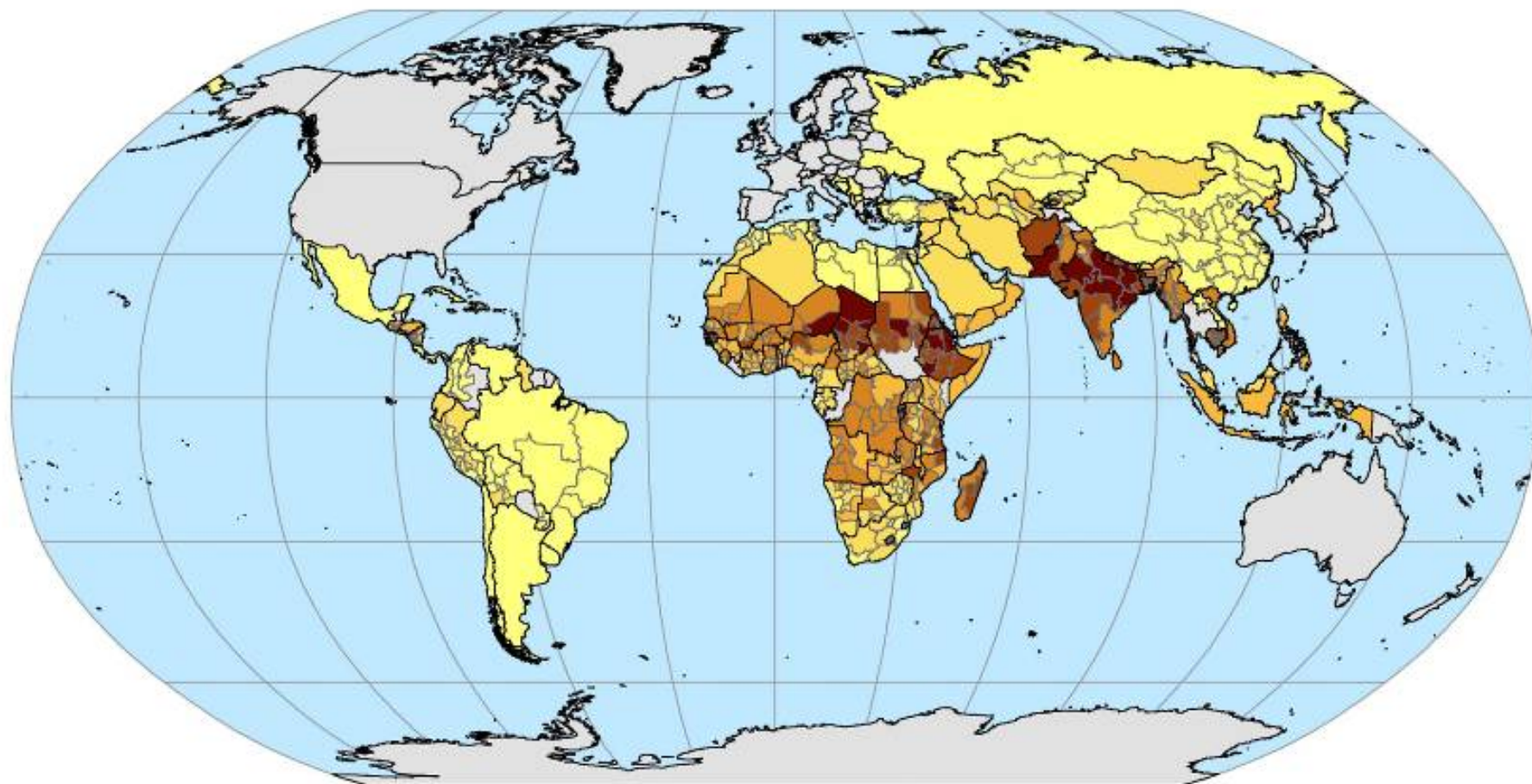
Socio-economic conditions of the affected region

The relative well-off areas hit hardest

Poverty estimate	In all exposed regions	In highly exposed regions
Low poverty (IMR under 30)	9%	29%
Moderate poverty (IMR between 30 and 60)	22%	71%
High poverty (IMR above 60)	69%	0%

Source: CIESIN, DHS, MICS.

Prevalence of Child Malnutrition



Robinson Projection

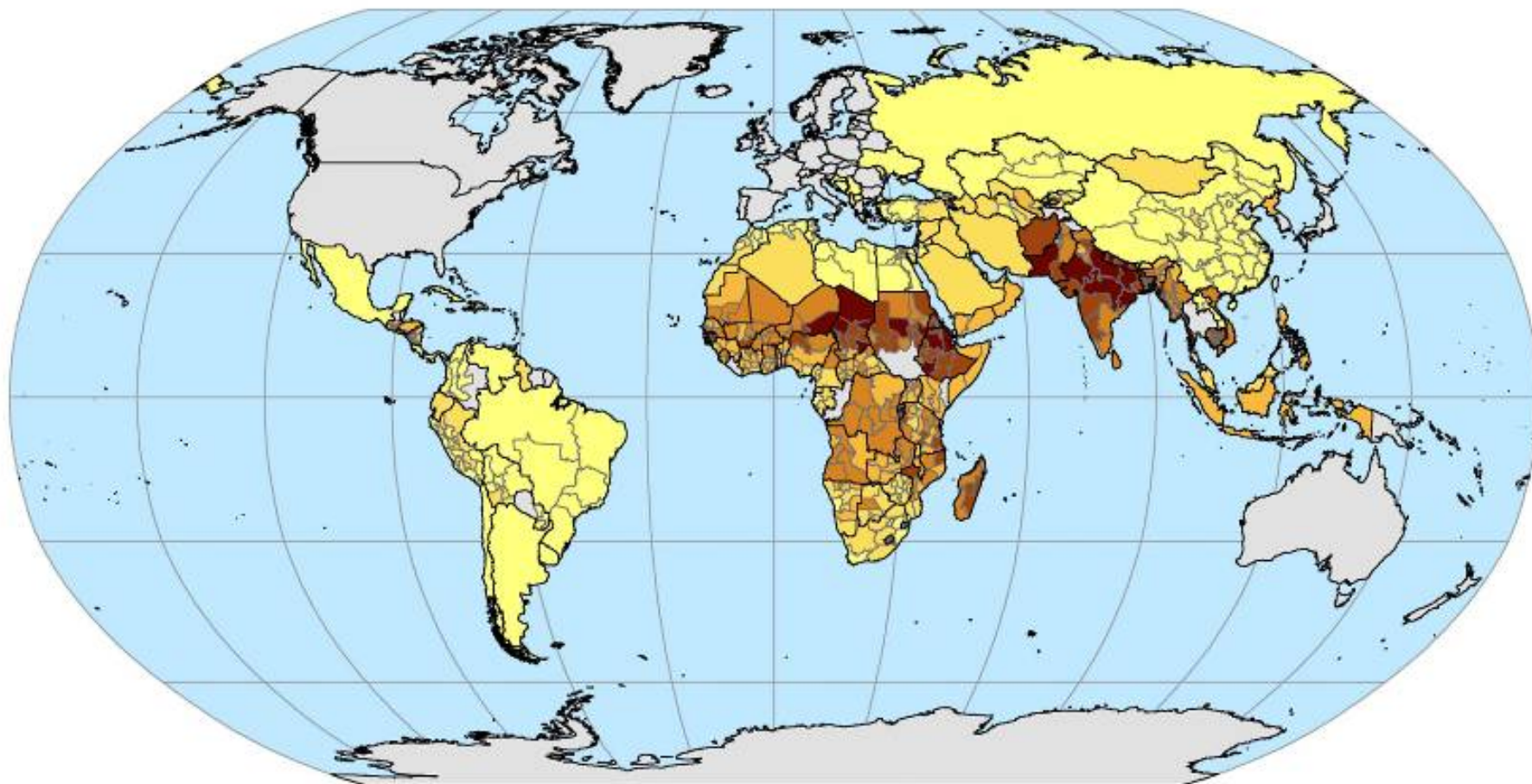
Percent of children underweight



Children are defined as underweight if their weight-for-age z-scores are more than two standard deviations (2 SD) below the median of the NCHS/CDC/WHO International Reference Population.

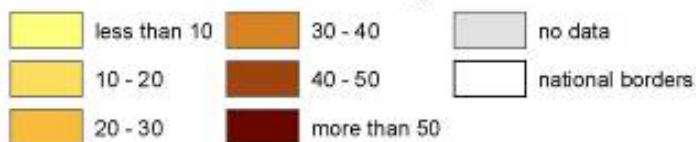
Data Coverage	Countries	Data units	Avg. units/country	% of world Population	% of non-OECD Population
National data only	43	43	1.0	16	18
Subnational data	74	639	8.6	65	78
Total	117	682	5.8	81	96

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Mozambique

Poverty
Headcount,
unweighted (fgt_0)

red indicates
more greater
poverty

With urban extent
overlays

