ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

Thematic Cartography

Session 5: Types of thematic maps

Michail Agorastakis

Department of Planning & Regional Development

Άδειες Χρήσης

- Το παρόν εκπαιδευτικό υλικό υπόκειται σε άδειες χρήσης Creative Commons.
- Για εκπαιδευτικό υλικό, όπως εικόνες, που υπόκειται σε άλλου τύπου άδειας χρήσης, η άδεια χρήσης αναφέρεται ρητώς.

Χρηματοδότηση

- Το παρόν εκπαιδευτικό υλικό έχει αναπτυχθεί στα πλαίσια του εκπαιδευτικού έργου του διδάσκοντα.
- Το έργο «**Ανοικτά Ακαδημαϊκά Μαθήματα στο Πανεπιστήμιο Θεσσαλίας**» έχει χρηματοδοτήσει μόνο τη αναδιαμόρφωση του εκπαιδευτικού υλικού.
- Το έργο υλοποιείται στο πλαίσιο του Επιχειρησιακού Προγράμματος «Εκπαίδευση και Δια Βίου Μάθηση» και συγχρηματοδοτείται από την Ευρωπαϊκή Ένωση (Ευρωπαϊκό Κοινωνικό Ταμείο) και από εθνικούς πόρους.

Outline

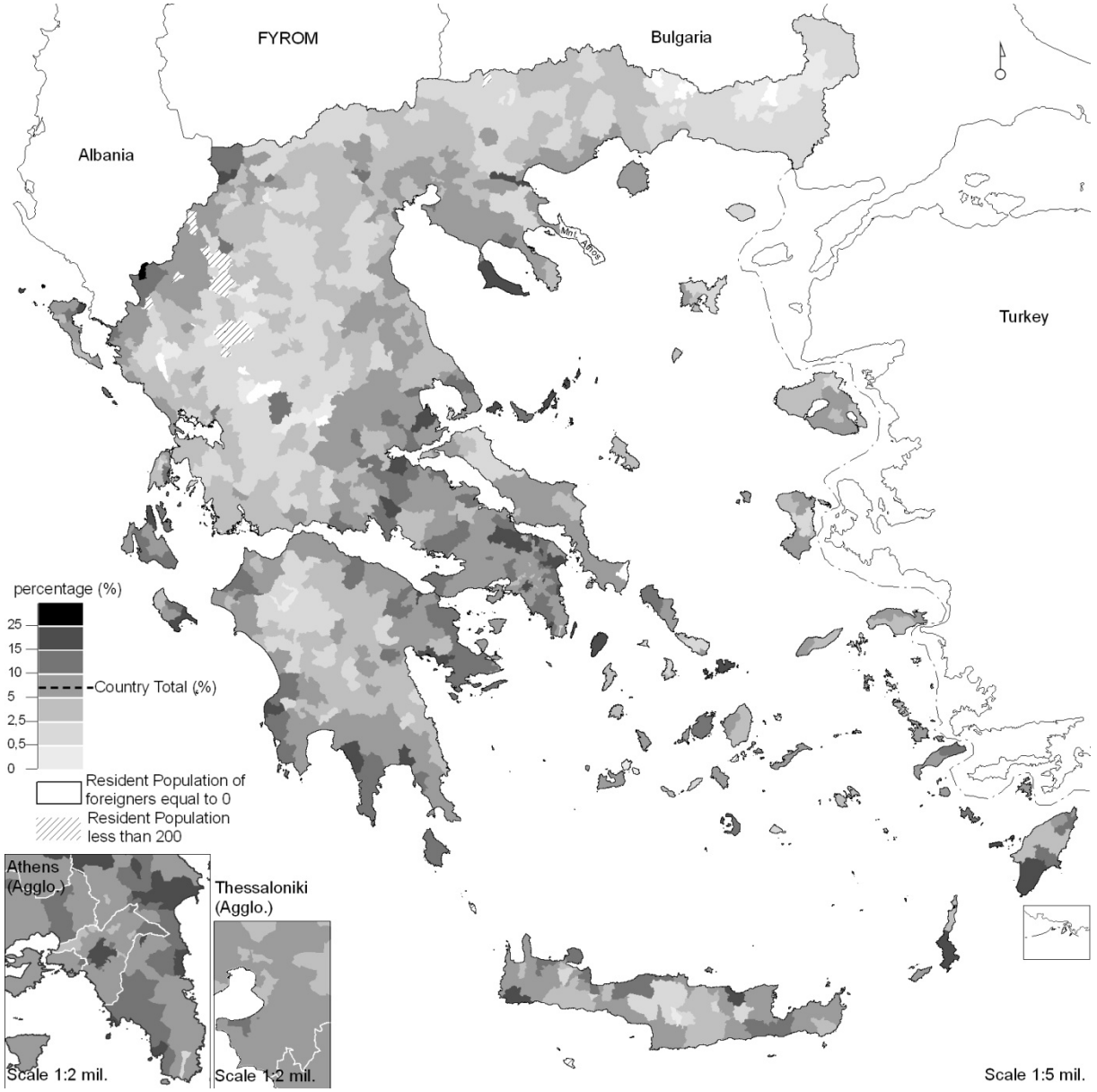
- Choropleth map
- Common dot map
- Proportional symbol map
- Isarithmic and 3D Statistical Maps
- Flow Maps
- The Cartogram

Choropleth map (1)

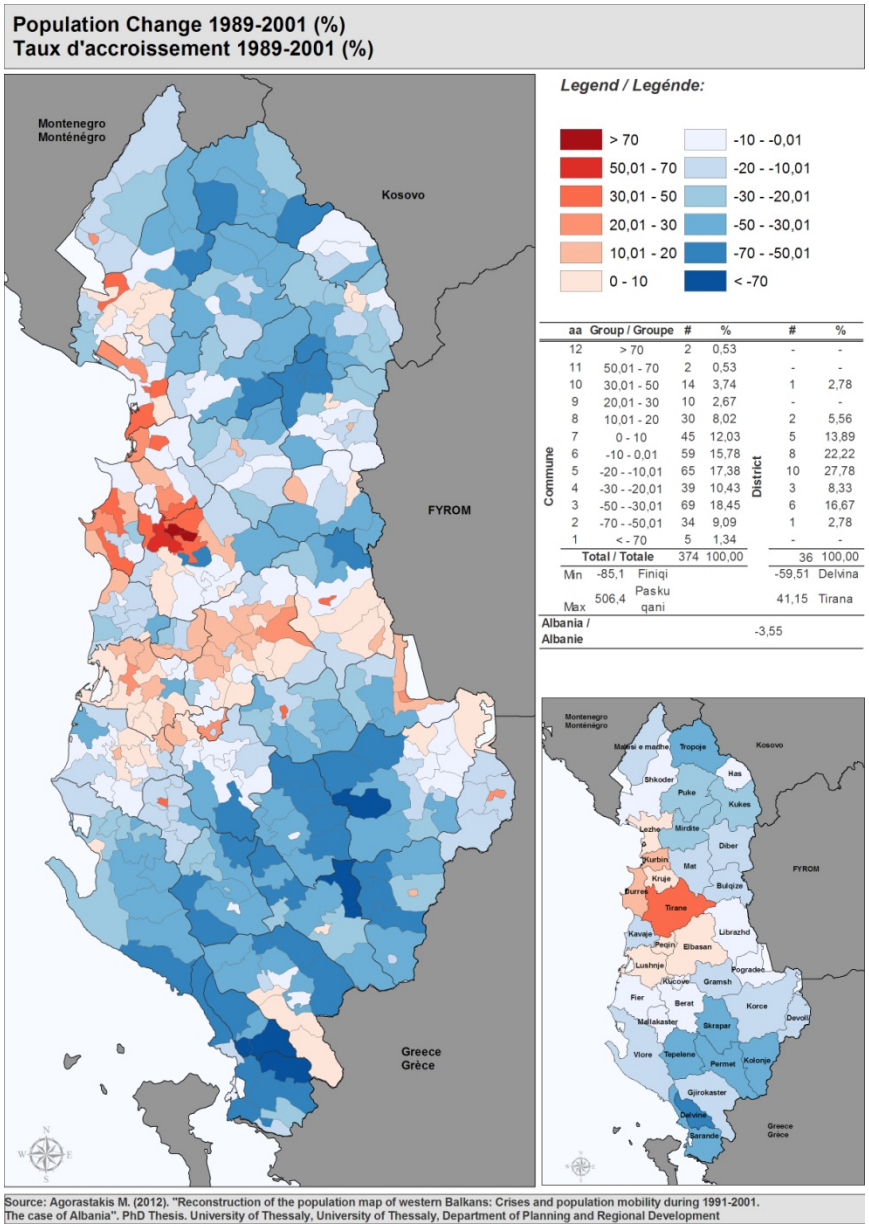
Choropleth technique as defined by the International Cartographic Association: "*A method of cartographic representation which employs distinctive color or shading applied to areas other than those bounded by isolines. These are usually statistical or administrative areas*."

Where statistical or administrative areas can be municipalities, districts, census tracts etc.

Choropleth map (2)



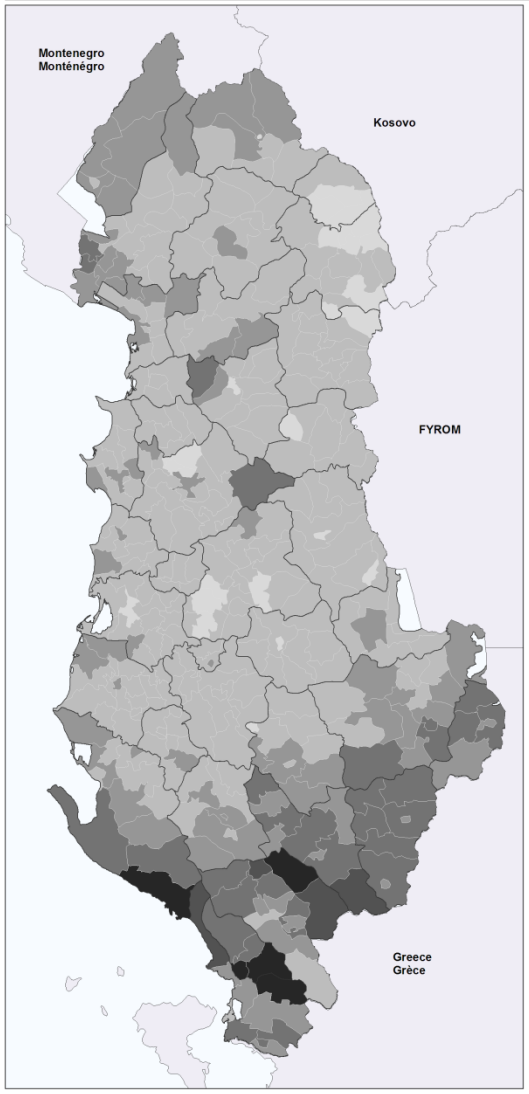
Choropleth map (3)



	aa	Group / Groupe	#	%		#	%
Commune	12	> 70	2	0,53	District	-	-
	11	50,01 - 70	2	0,53		-	-
	10	30,01 - 50	14	3,74		1	2,78
	9	20,01 - 30	10	2,67		-	-
	8	10,01 - 20	30	8,02		2	5,56
	7	0 - 10	45	12,03		5	13,89
	6	-10 - 0,01	59	15,78		8	22,22
	5	-20 - -10,01	65	17,38		10	27,78
	4	-30 - -20,01	39	10,43		3	8,33
	3	-50 - -30,01	69	18,45		6	16,67
	2	-70 - -50,01	34	9,09		1	2,78
	1	< - 70	5	1,34		-	-
		Total / Totale	374	100,00		36	100,00
		Min -85,1 Finiqi				-59,51	Delvina
		Max 506,4 Pasku qani				41,15	Tirana
Albania / Albanie						-3,55	

Source: Agorastakis M. (2012). "Reconstruction of the population map of western Balkans: Crises and population mobility during 1991-2001. The case of Albania". PhD Thesis. University of Thessaly, University of Thessaly, Department of Planning and Regional Development

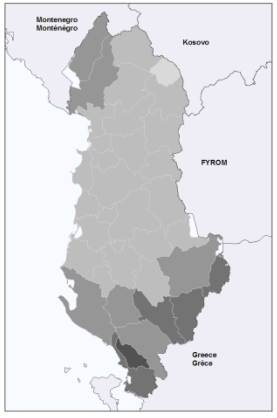
Map 2.3b: Population (%) aged 65+ y to total population in 2001
Carte 2.3b : Proportion (%) 65+ ans, population totale en 2001



Ratio of individuals aged 65+ years to the total population of 2001
Ratio des personnes âgées de 65+ ans à la population totale de 2001

	aa	Group / Groupe	#	%
Commune	7	> 20	5	1,34
	6	15,01 - 20	4	1,07
	5	10,01 - 15	30	8,02
	4	8,01 - 10	75	20,05
	3	5,01 - 8	234	62,57
	2	3,01 - 5	26	6,95
	1	<= 3	-	-
		Total / Totale	374	100,00
		Min 3,2 Bulqiza		
		Max 36,18 Dhiveri		

	aa	Group / Groupe	#	%
District	7	> 20	-	-
	6	15,01 - 20	1	2,78
	5	10,01 - 15	4	11,11
	4	8,01 - 10	6	16,67
	3	5,01 - 8	24	66,67
	2	3,01 - 5	1	2,78
	1	<= 3	-	-
		Total / Totale	36	100,00
		Min 4,83 Hasi		
		Max 15,24 Delvina		
Albania / Albanie			7,54	



Source: INSTAT (2001), authors' calculations

Choropleth map (4)

Use the Choropleth Map when:

- *data occur in well defined enumeration units*
- *representing rates or ratios*

If exact or precise data values within enumeration units must be shown, than it is better to avoid choropleth maps (unclassified choropleth maps are difficult to "get anything from the map").

There is never one definite choropleth solution, but several mapping alternatives due to alternative data classification schemes (e.g. equal interval, standard deviation etc.).

Choropleth - Data classification schemes (1)

In a “standard” choropleth map, a discrete data array is classified into groups (classes) and the groups (classes) are symbolized on the map with areal symbols.

More classes equal to less data generalization, however up to 7 classes (e.g. per color scheme) are recommended for readability purposes.

There is no “perfect” number of classes for a map. The number of classes is related, on one hand, to the nature of the data and on the other, to their distribution and corresponding histogram.

Choropleth - Data classification schemes (2)

Classification schemes can be divided into 4 major types:

Exogenous – set intervals (classes) that do not relate to the data and corresponding distribution. Namely, there are critical values – thresholds, that are resulting from e.g. literature.

examples: 2.1 children per woman in TFR, income poverty level, country's life expectancy when mapping life expectancy for districts.

Arbitrary – rounded numbers with no particular relevance to the class interval breaks, i.e.. 10, 20, 30.

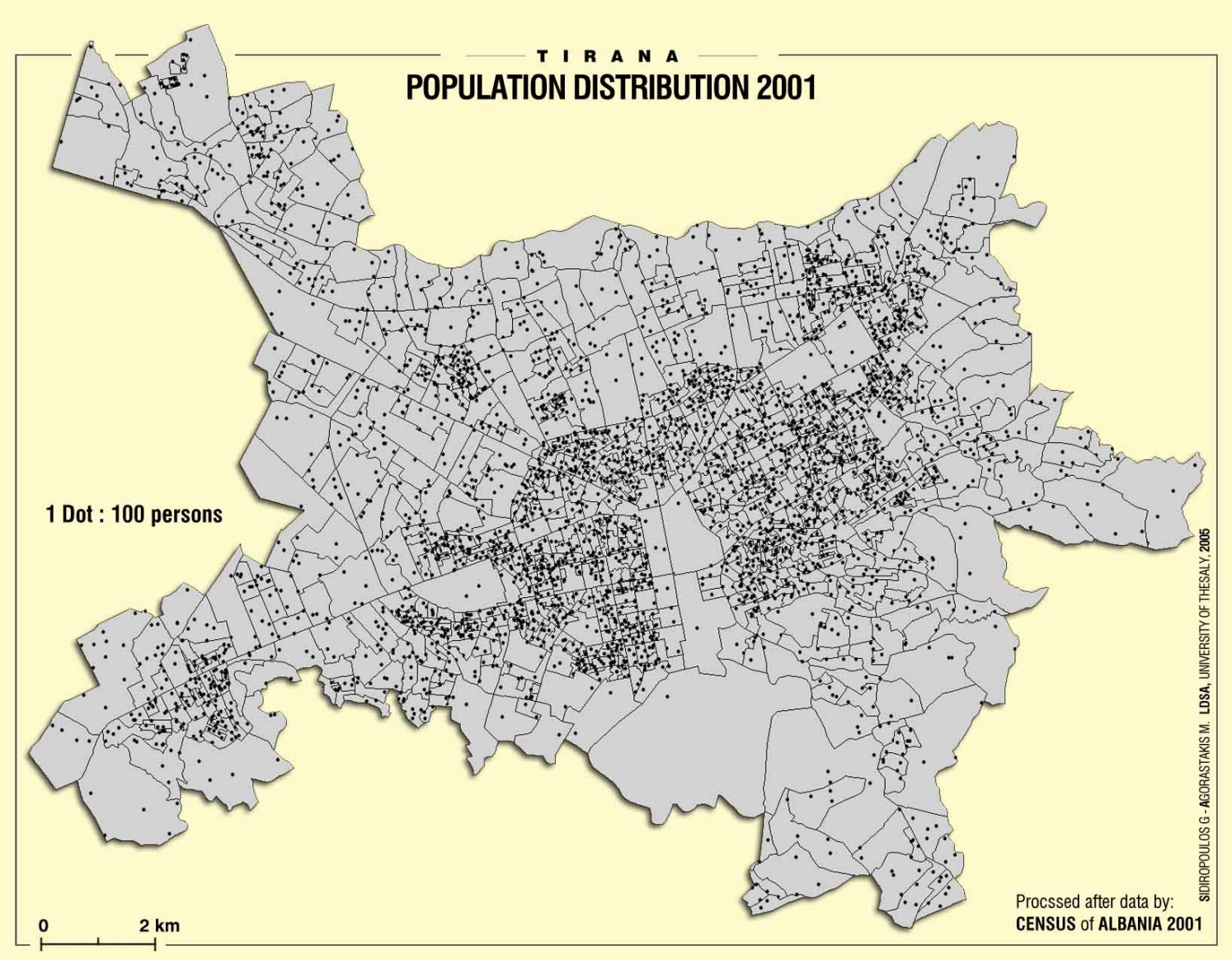
Choropleth - Data classification schemes (3)

Idiographic – Breaks determined by the data, i.e.. natural breaks, quartiles (quintiles).

Serial – mathematically derived class intervals, i.e.. standard deviation, equal interval, arithmetic or geometric progressions.

Before deciding a classification scheme, keep in mind concepts such as simplicity and logical division and most important you should experiment!!!!!

The Common Dot Map (1)



The Common Dot Map (2)

A method of producing a map that:

- is easily understood

- represents spatial variability and density

- past production problems are resolved by advances in software

- allows mapping of count data, rates and ratios

- allows a “view” inside enumeration units

- doesn’t require color schemes

The Common Dot Map (3)

However, there are possible biases regarding dot distribution, regarding:

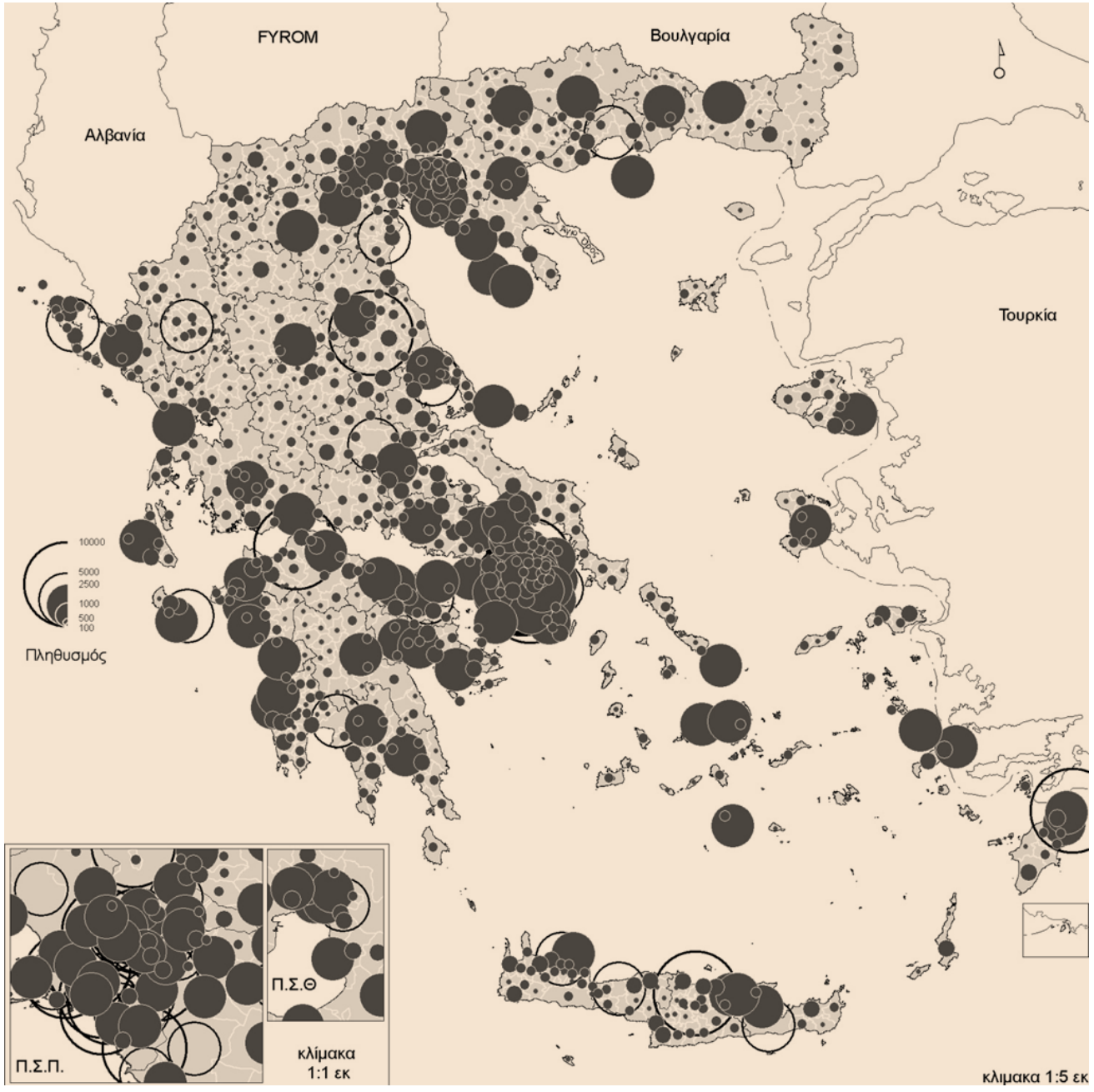
- exact location (true location) of each dot within the enumeration unit, and

-uniform location within the enumeration unit (e.g. dot distribution is based upon the centroid of the unit).

Smaller enumeration units will produce a more accurate dot distribution.

Dot size and value are related to map scale.

Proportional symbol map (1)



Proportional symbol map (2)

“Proportional symbol maps scale the size of simple symbols (usually a circle or square) proportionally to the data value found at that location. “

“They are a simple concept to grasp: The larger the symbol, the “more” of something exists at a location.”

“However, you can also group your observations into categories or numerical ranges and created graduated symbol maps that may, for example, only have three symbol sizes corresponding to three categories of city size (e.g., cities of <1 million, 1-4 million, and over 4 million people).”

Source: Adopted by http://axismaps.github.io/thematic-cartography/articles/proportional_symbols.html,

Proportional symbol map (3)

Advantages include:

-flexibility, numerical or ordered categorical data. Data attached to geographic points or attached to geographic areas.

- easier to read over dot maps (relative size vs number of dots).

- the size of the enumeration unit doesn't matter, since we focus on the symbol over it.

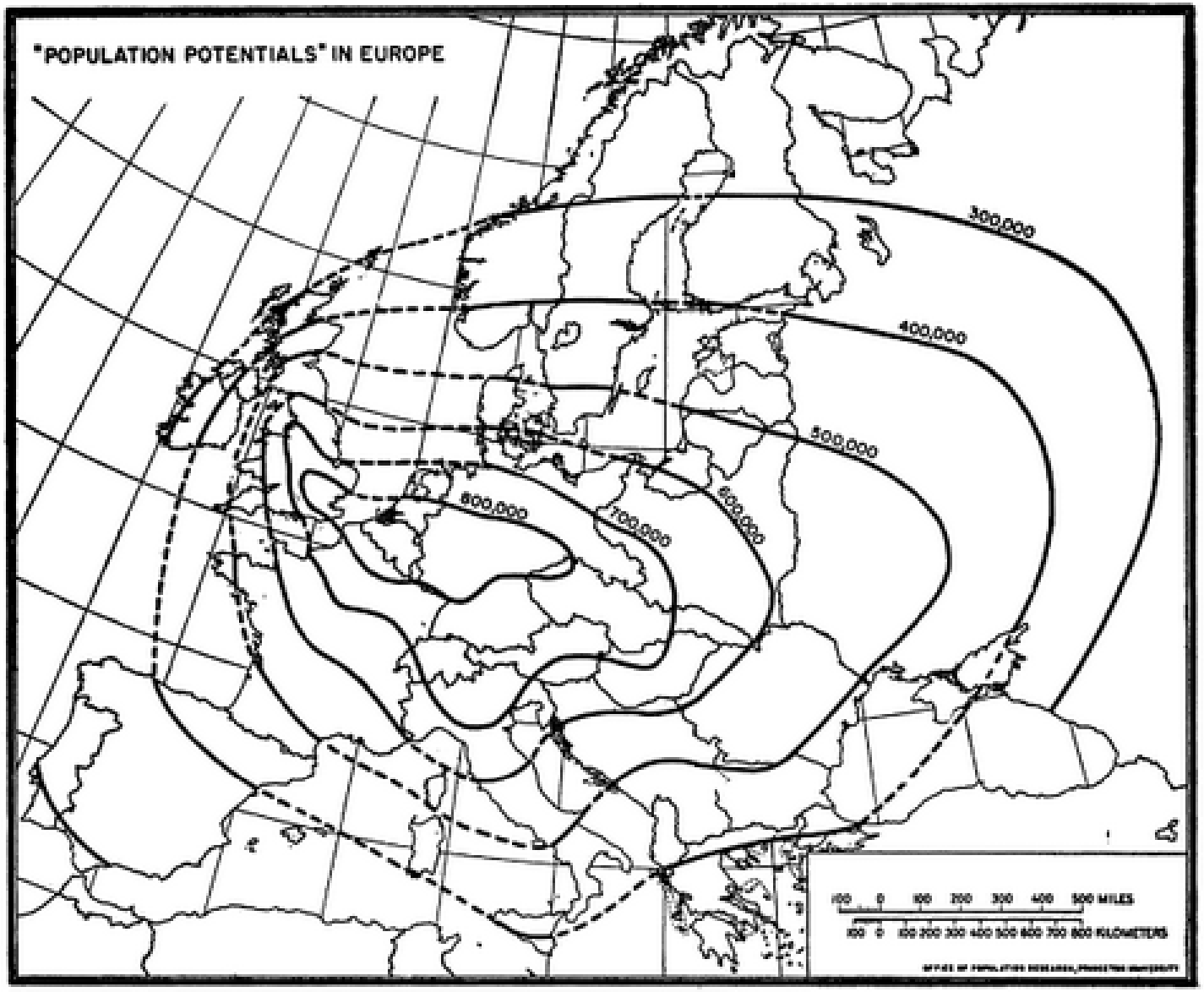
However, there are problems regarding:

- symbol congestion/overlap (solved by symbol transparency or intervening manually)

- Proportional symbols are not estimated very well. In most cases softwares' defaults are not adequate. So, additional computational steps are required (e.g. mathematical or perceptual scaling).

Source: Adopted by http://axismaps.github.io/thematic-cartography/articles/proportional_symbols.html,

Isarithmic and 3D Statistical Maps (1)



Source: Dudley Kirk, *Europe's Population in the Interwar Years*, Princeton, N.J., Princeton University Press for the League of Nations, 1946, p. 9.

Isarithmic and 3D Statistical Maps (1)

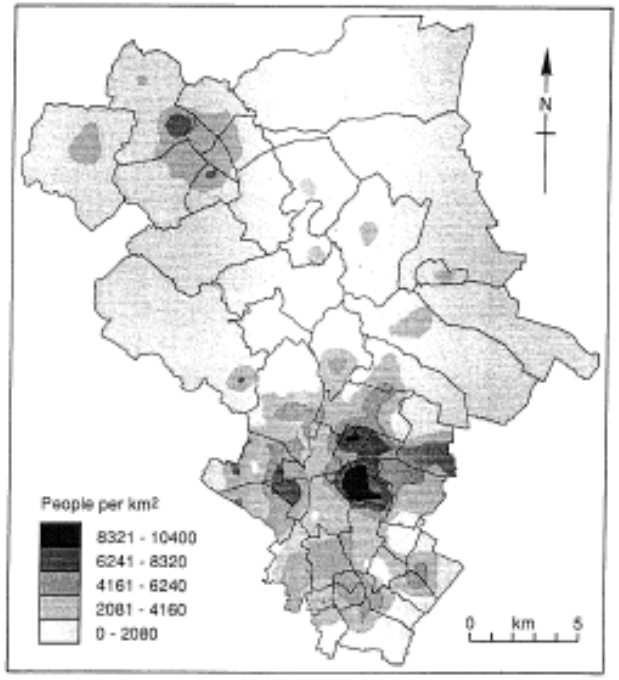


Figure 5a. Population density surface (0.5 km search radius).

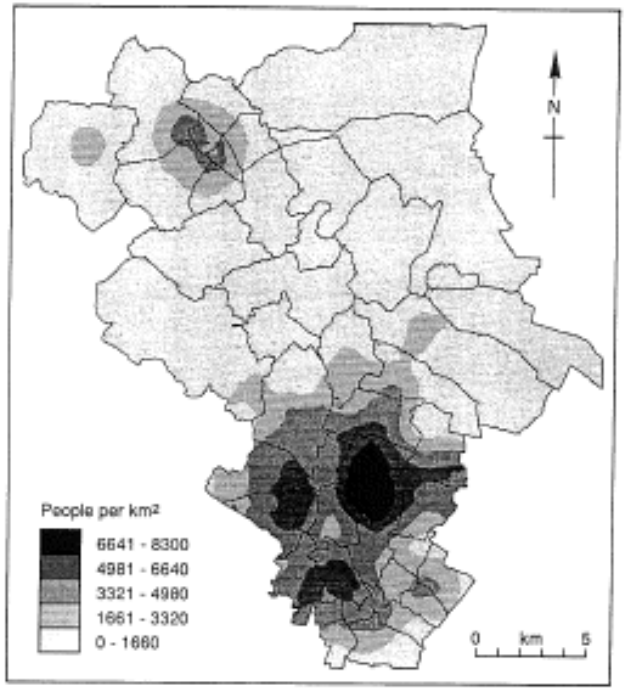


Figure 5c. Population density surface (1 km search radius).

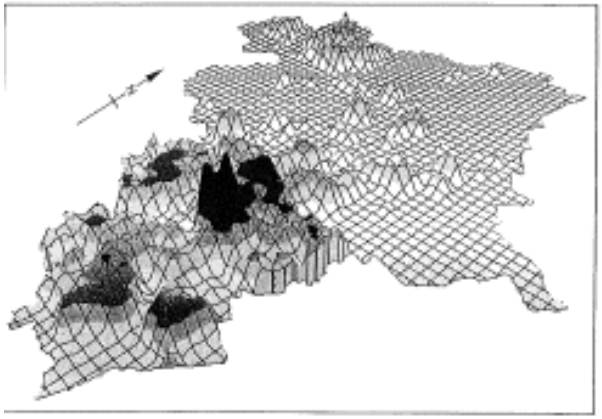


Figure 5b. Pseudo-3-D population density surface (0.5 km search radius).

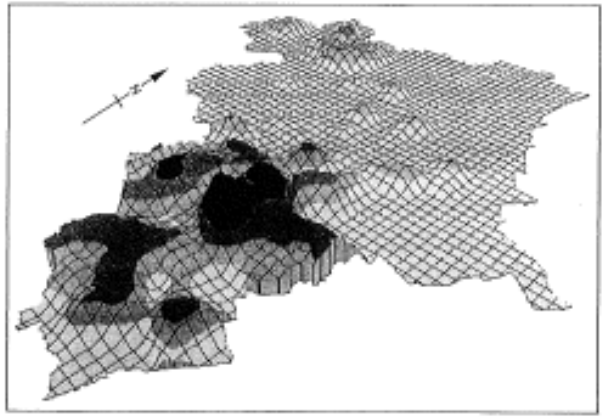


Figure 5d. Pseudo-3-D population density surface (1 km search radius).

Source:http://www.researchgate.net/profile/Mitchel_Langford/publication/11132767_Generating_and_mapping_population_density_surfaces_within_a_geographical_information_system/links/02e7e5333fc9e6a262000000.pdf ,

Isarithmic and 3D Statistical Maps (1)

Map in which line symbols illustrate a smooth, continuous phenomenon.

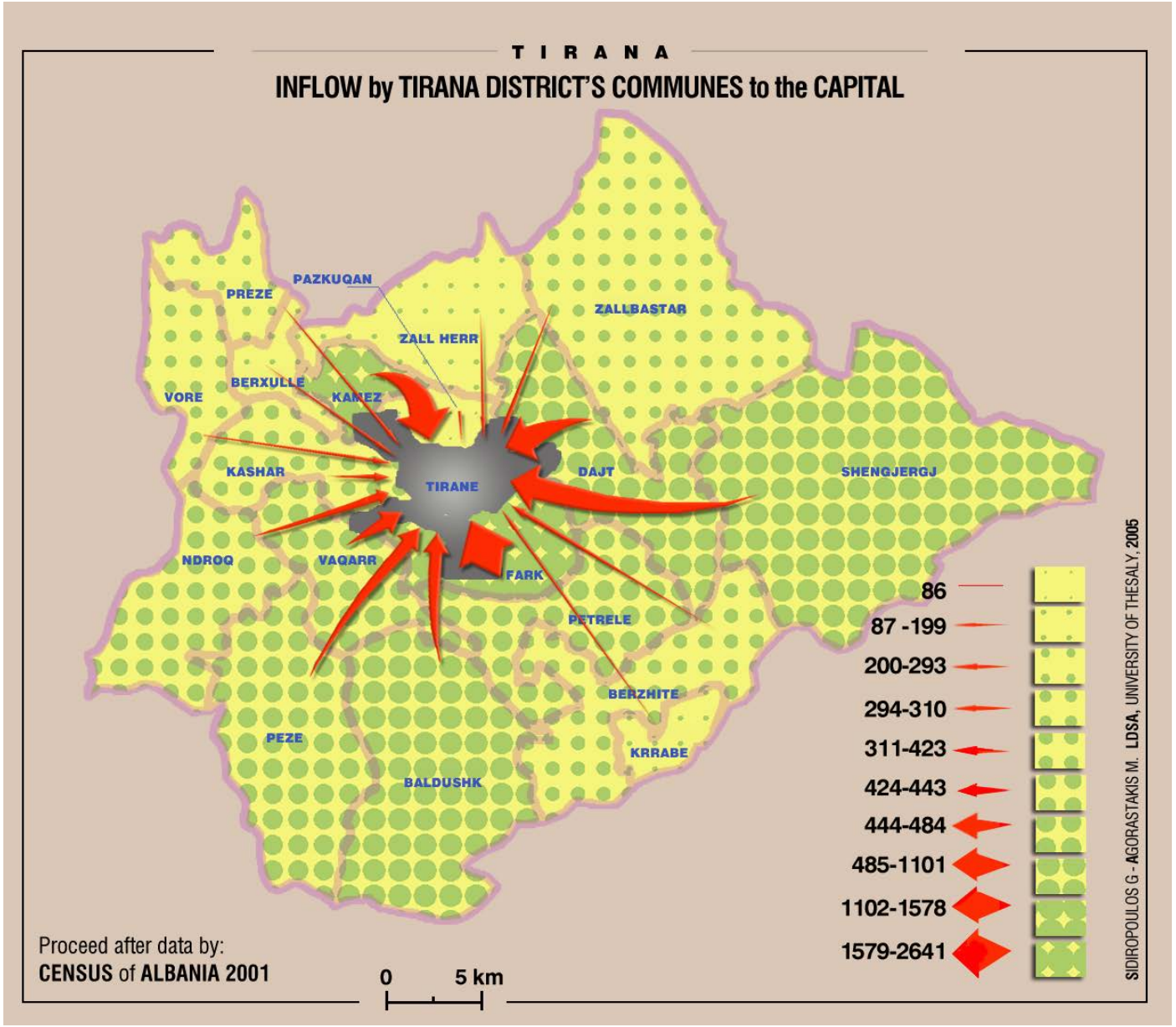
Data across the map surface are continuous (if not, such as in the case of points then specific methods of interpolation are used).

Assumes continuity, hence continuous and not discrete data.

Geographic location (x,y,z components).

Great progress regarding related software.

Flow Maps (1)


TIRANA
INFLOW by TIRANA DISTRICT'S COMMUNES to the CAPITAL
PAZKUQAN
PREZE
ZALLBASTAR
ZALL HERR
BERXULLE
VORE
KAMEZ
KASHAR
TIRANE
DAJT
SHENGJERGJ
NDROQ
VAQARR
FARK
PETRELE
BERZHITE
PEZE
KRRABE
BALDUSHK
86
87 -199
200-293
294-310
311-423
424-443
444-484
485-1101
1102-1578
1579-2641
Proceed after data by:
CENSUS of ALBANIA 2001
0
5 km
SIDIROPOULOS G - AGORASTAKIS M. LDSA, UNIVERSITY OF THESALY, 2005

Flow Maps (2)

Flow maps show the "**movement**" between places (good for representing migration flows)

Qualitative or **quantitative** flow maps

"**Network flow maps** - show interconnectivity between places and are usually based on transportation or communication linkages

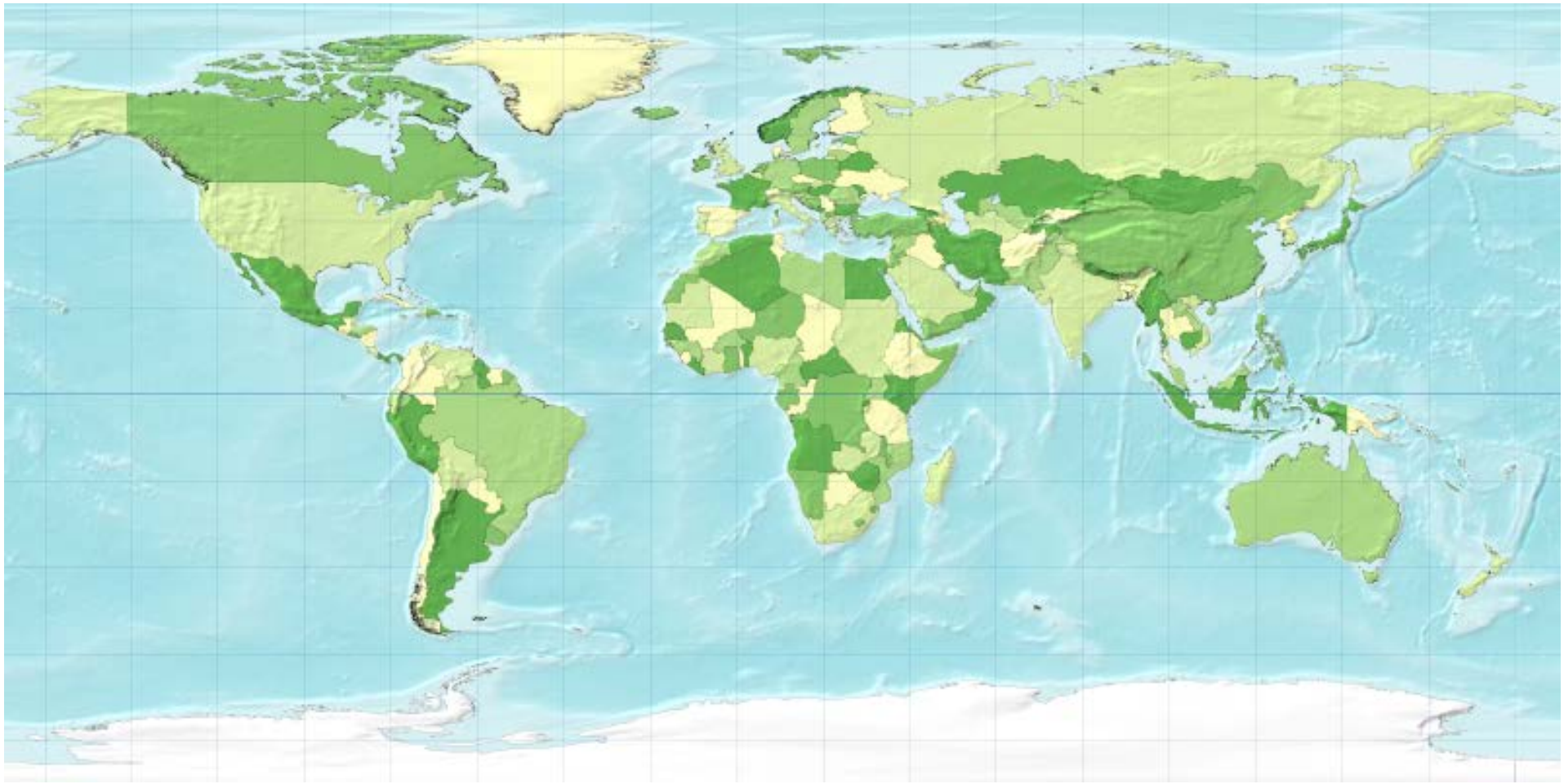
Radial flow maps - have a spoke-like pattern because the features and places are mapped in nodal form with one place being a common origin or destination

Distributive flow maps - show the distribution of commodities or some other flow that diffuses from one or only a few origins to multiple destinations

(Point) vector flow maps – show phenomena that change continuously and smoothly over space and time using Euclidean vectors (point locations with magnitude and direction)"

Source: http://blogs.esri.com/esri/arcgis/2013/04/23/aag-flow-mapping-presentation-available-for-download/

Cartograms (1)



Source: http://www-personal.umich.edu/~mejn/cartograms/

Cartograms (2)

Population

Source: http://www-personal.umich.edu/~mejn/cartograms/

Cartograms (3)

Instead of apply different classification and representations schemes to data within polygons, we change the polygon per se according to their corresponding data.

Cartograms distort the size and shape of polygons to portray sizes proportional our data.

"We use cartogram primarily when we have data that show strong and unexpected size disparities among locations—small places become large, large places, small."

Source: Adopted by http://axismaps.github.io/thematic-cartography/articles/proportional_symbols.html,

ΠΑΝΕΠΙΣΤΗΜΙΟ ΘΕΣΣΑΛΙΑΣ

End of Session