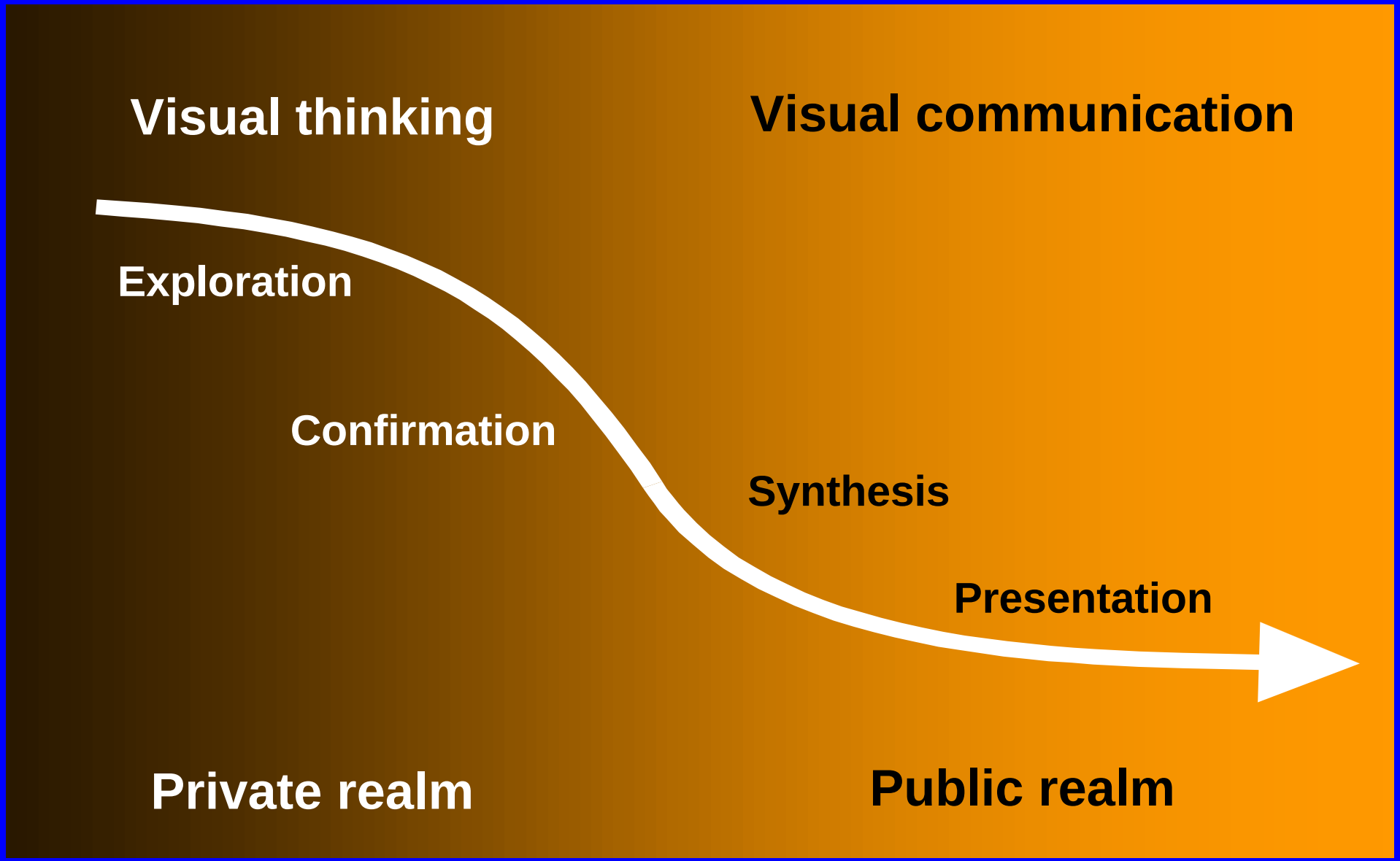
Thematic mapping

Cartographic abstraction



after DiBiase, 1990

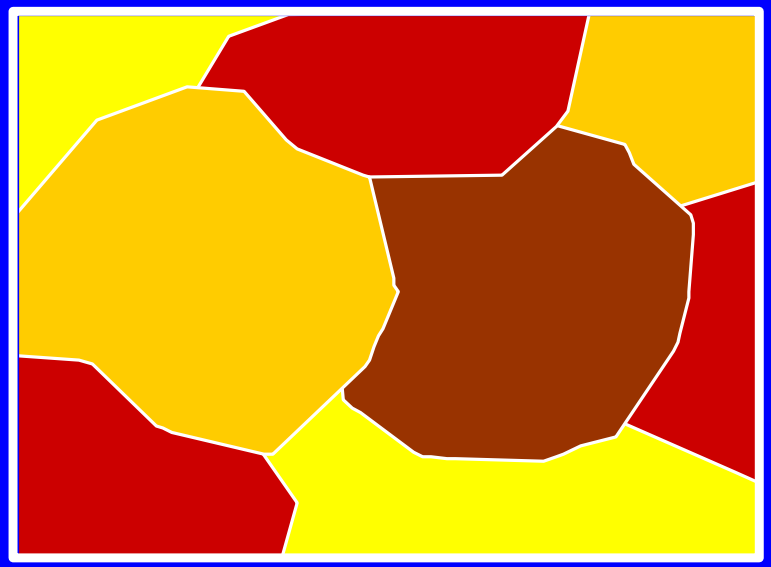
Two general types of maps

- **Topographic maps**
  - show outlines of selected natural and man-made features
  - often serves as frame of reference
- **Thematic maps**
  - show “geographical concepts” such as population density, climate, movement of goods

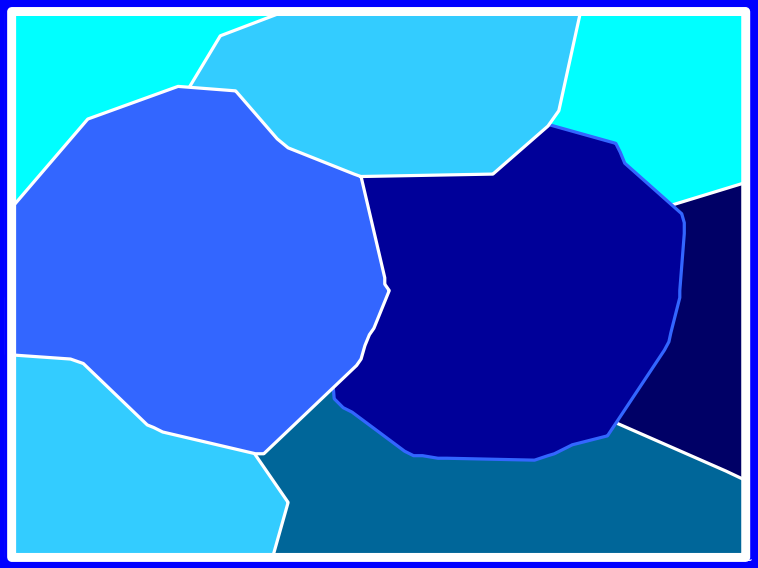
Choropleth maps

- uses reporting zones such as districts
- shows data such as average income, mortality rates, or percentages
- boundaries of the zones are established independently of the data
- zones may be used to present many types of data

Choropleth maps

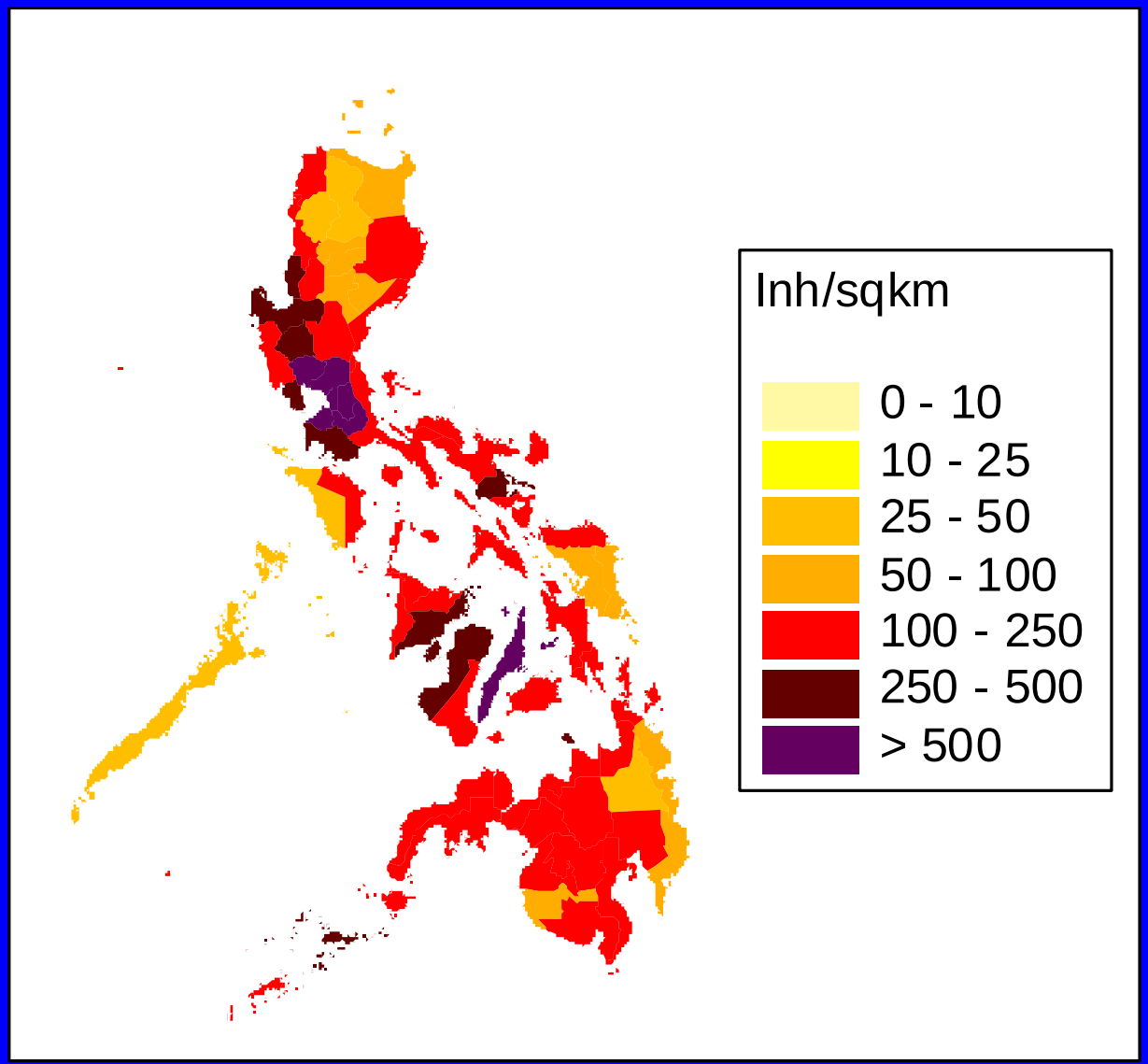


Population Density



Total Fertility Rate

Choropleth maps



Philippines
Population Density
by Province

Choropleth maps

- **equal intervals**

0 - 10
10 - 20
20 - 30
30 - 40

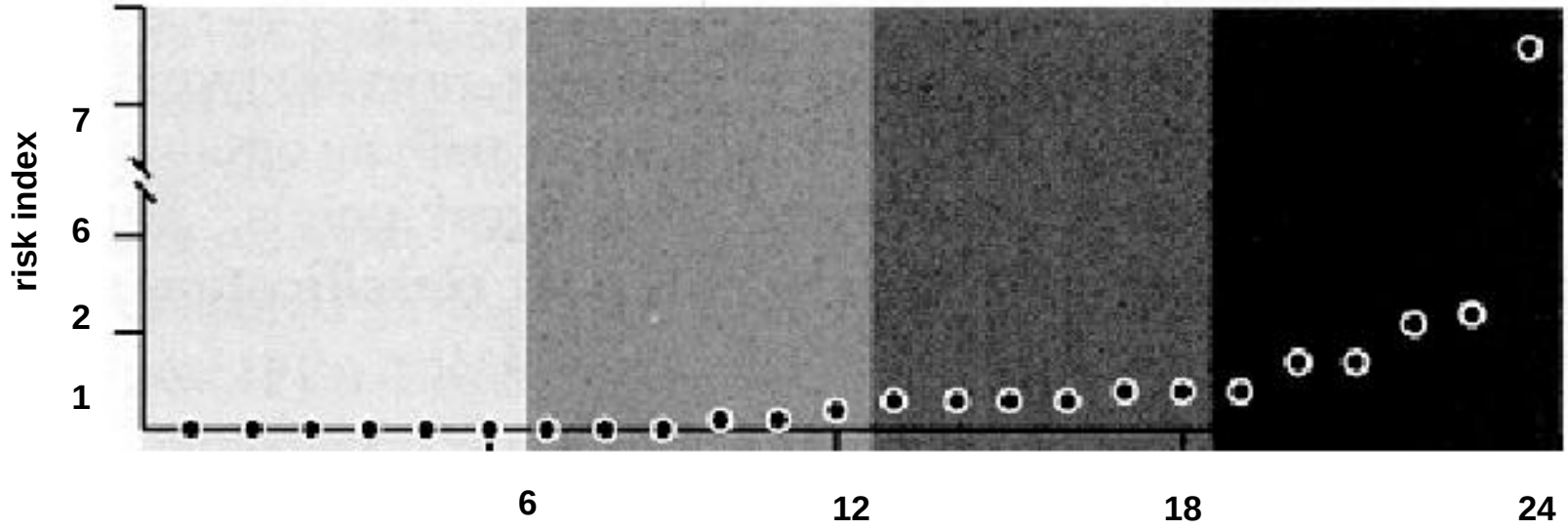
Choropleth maps

- equal number of cases (quantile mapping)

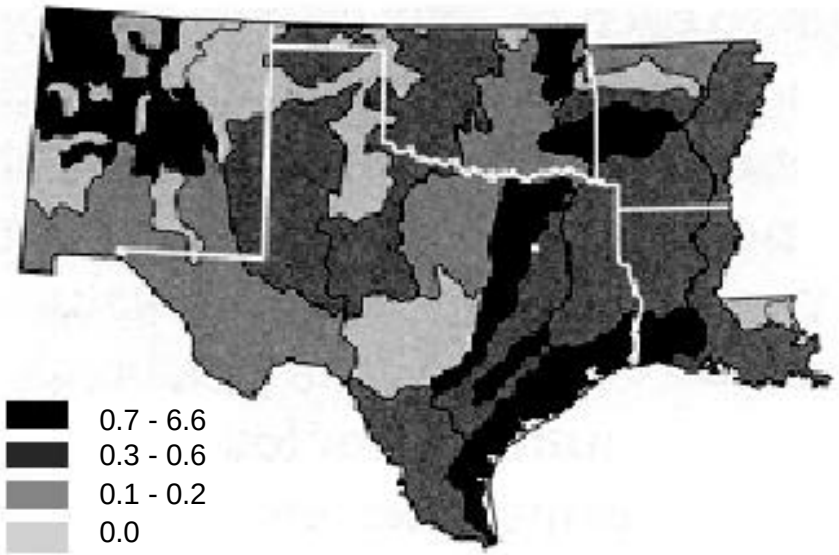
  - same number of observations in each class

  - problem if there are many similar values -> cases with the same value may be put into different classes

Problems with quantile mapping



Risk index values in rank order with the resulting class break points indicated

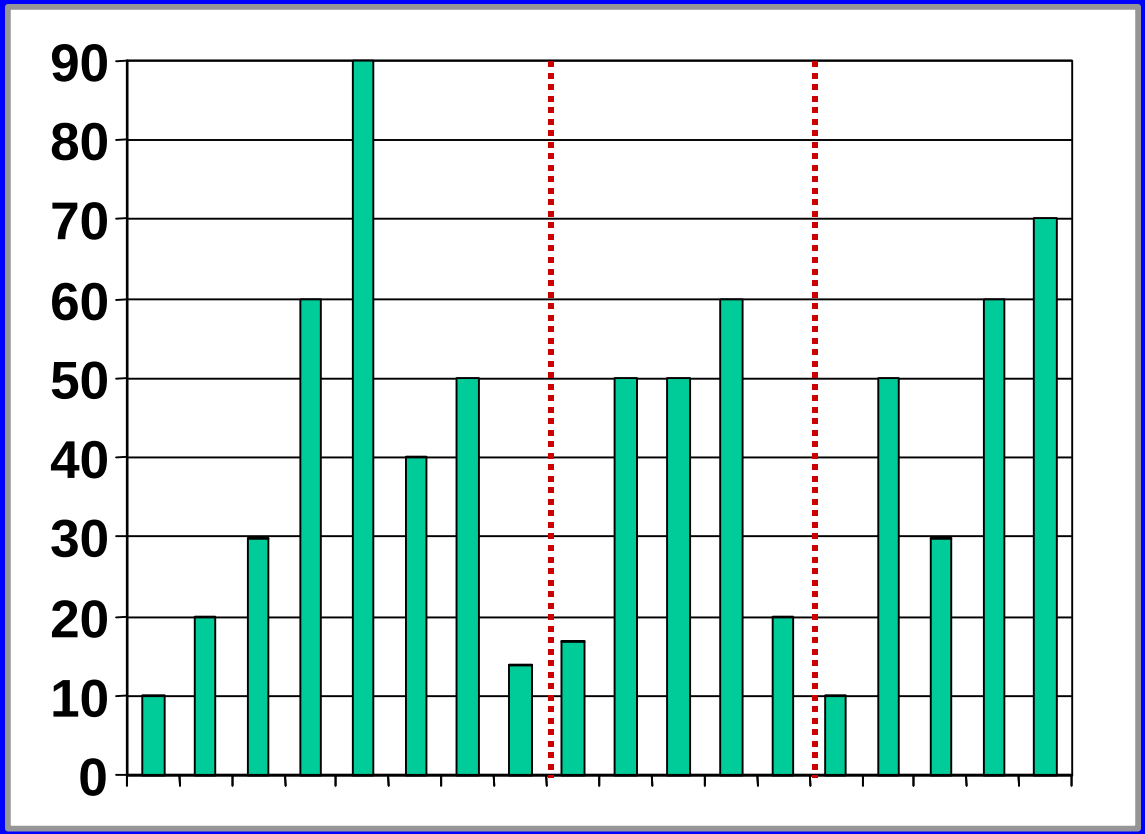


Map of risk indices using adjusted quantile classes

Source: MacEachren (1994)

Choropleth maps

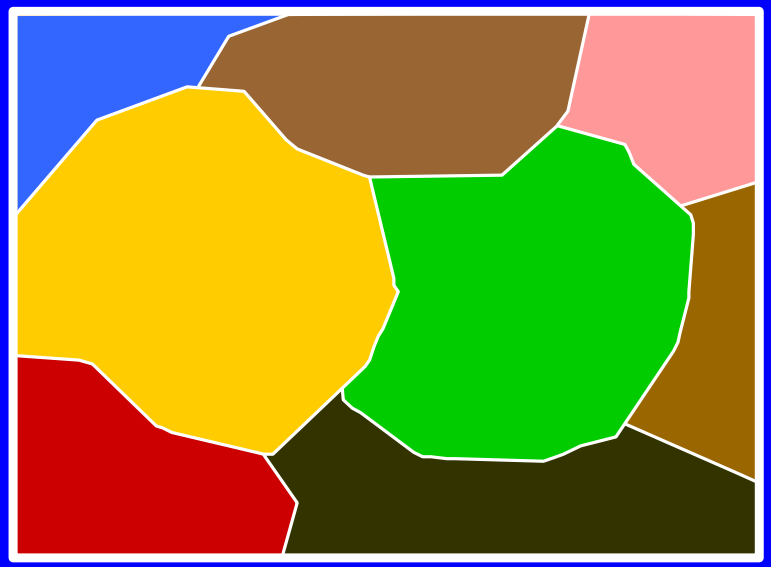
- often useful to plot a histogram of the data before determining class breaks



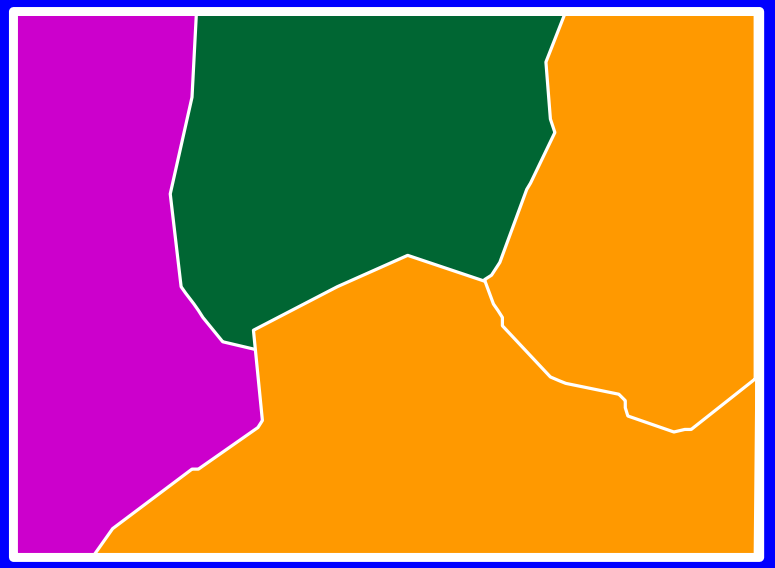
Area class maps

- shows zones of constant attributes such as vegetation or soil classes
- zones are different for each map because they are dependent on the feature mapped
- e.g., boundaries between vegetation types are different from those for soils

Area class maps



Soil Categories

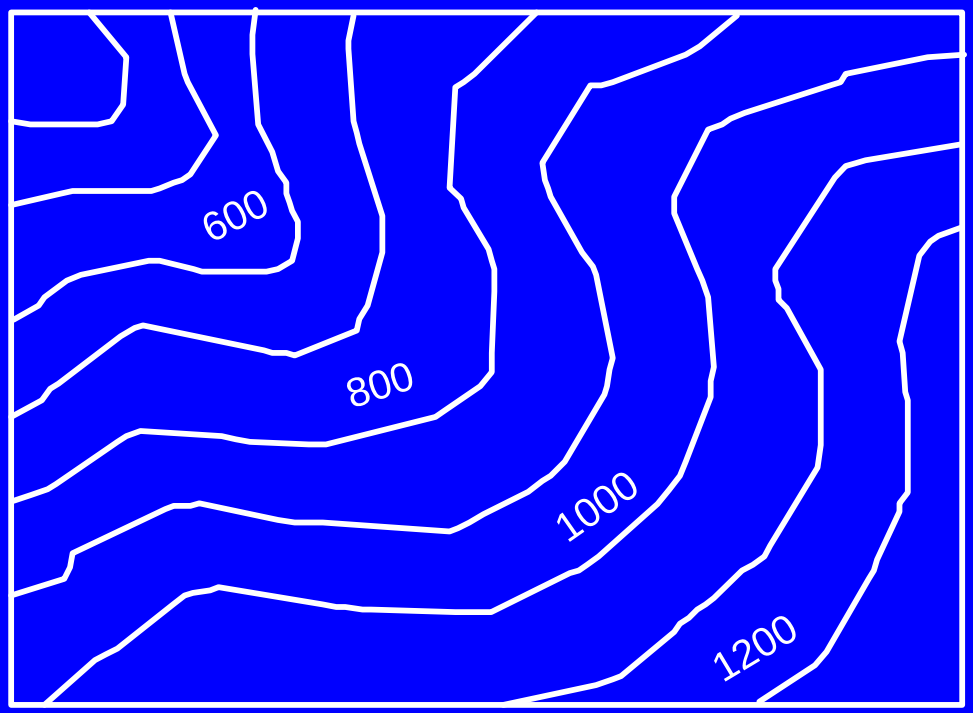


Vegetation Classes

Isopleth maps

- shows an imaginary surface by means of lines joining locations of constant value called **isolines**
  e.g., elevation contours
- used for phenomena which vary smoothly such as temperature, pressure or sometimes population density

Isopleth map

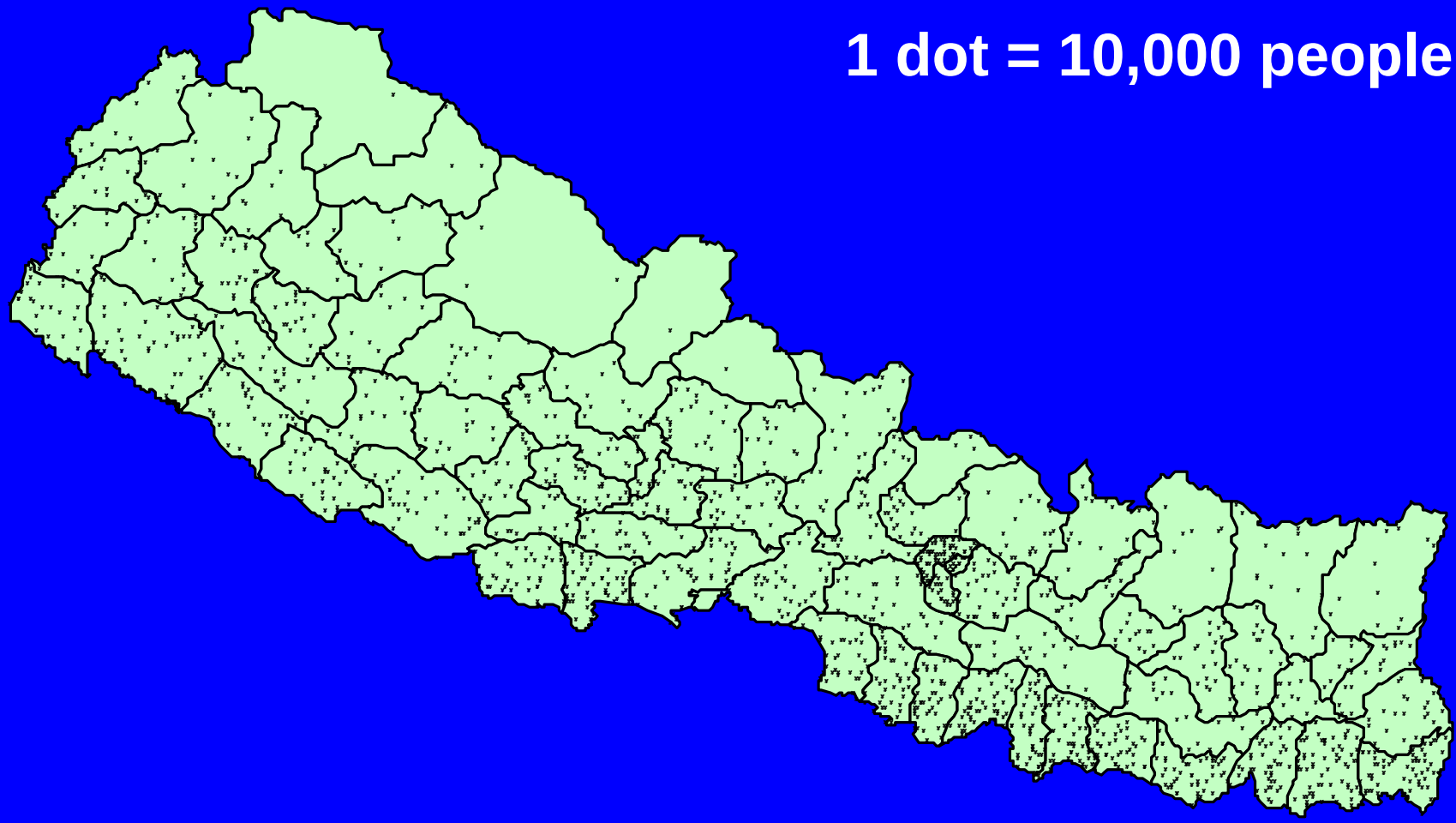


Mean annual
rainfall

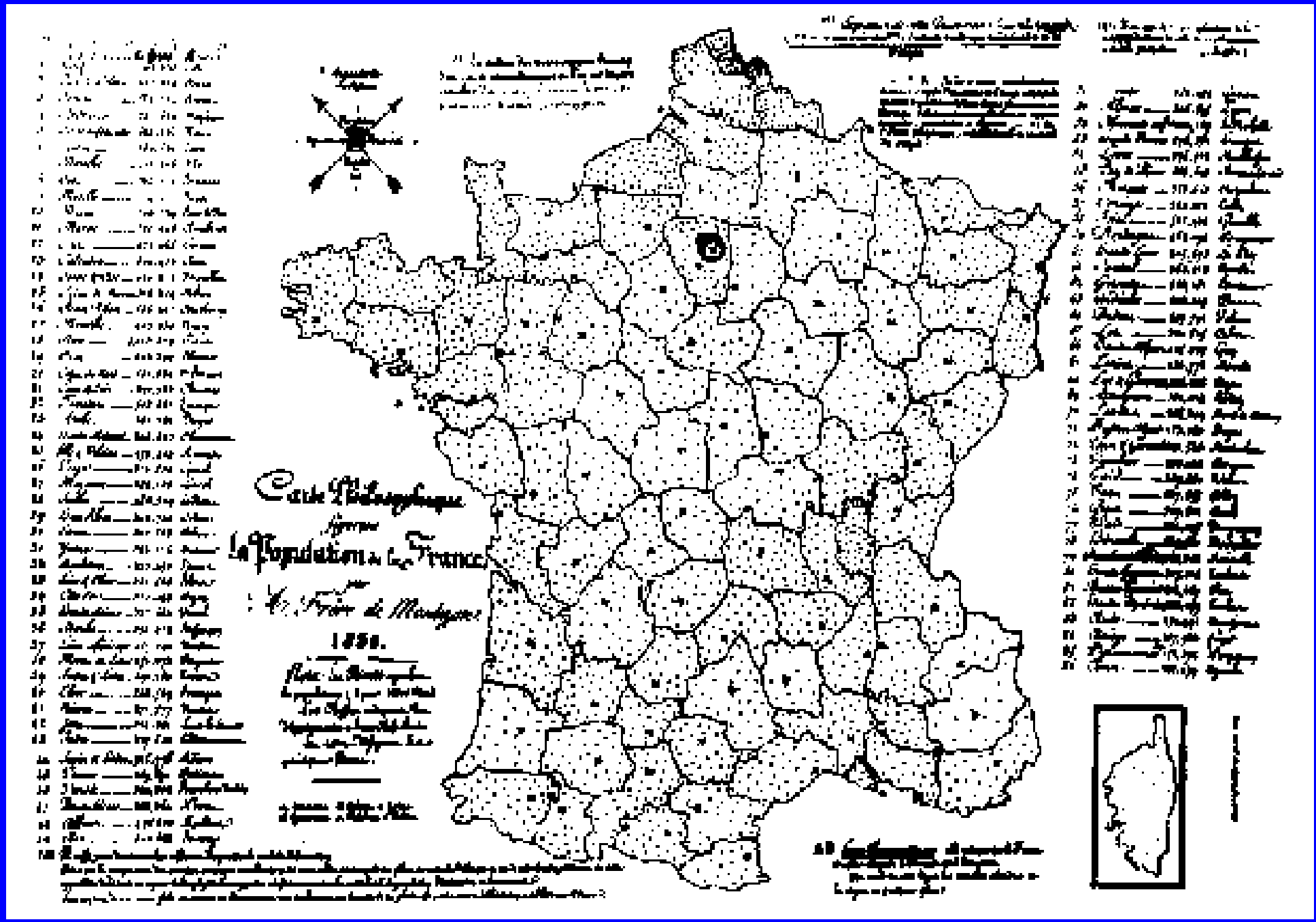
Dot density maps

- represents the magnitude of a variable by varying the density of dots within each area
- popular for population applications
- good for black/white publications (can be easily photocopied)

Population Distribution in Nepal - 1991



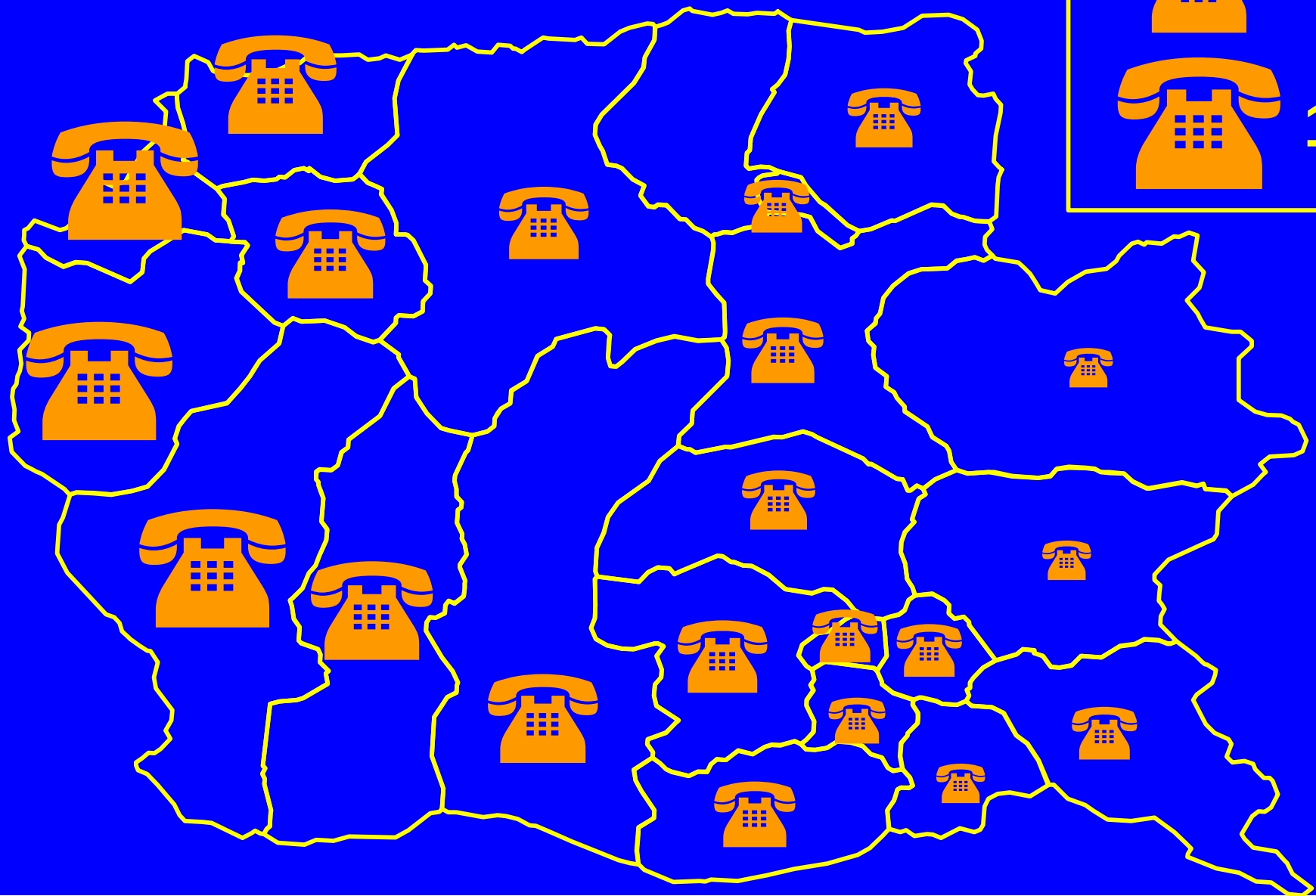
De Montizon's Population Dot Map of 1830



Graduated symbol maps

- size of a symbol represents the magnitude of a variable
- often appropriate for socioeconomic variables
- can use a symbol or icon that represents the variable

Number of telephones per 1000 people

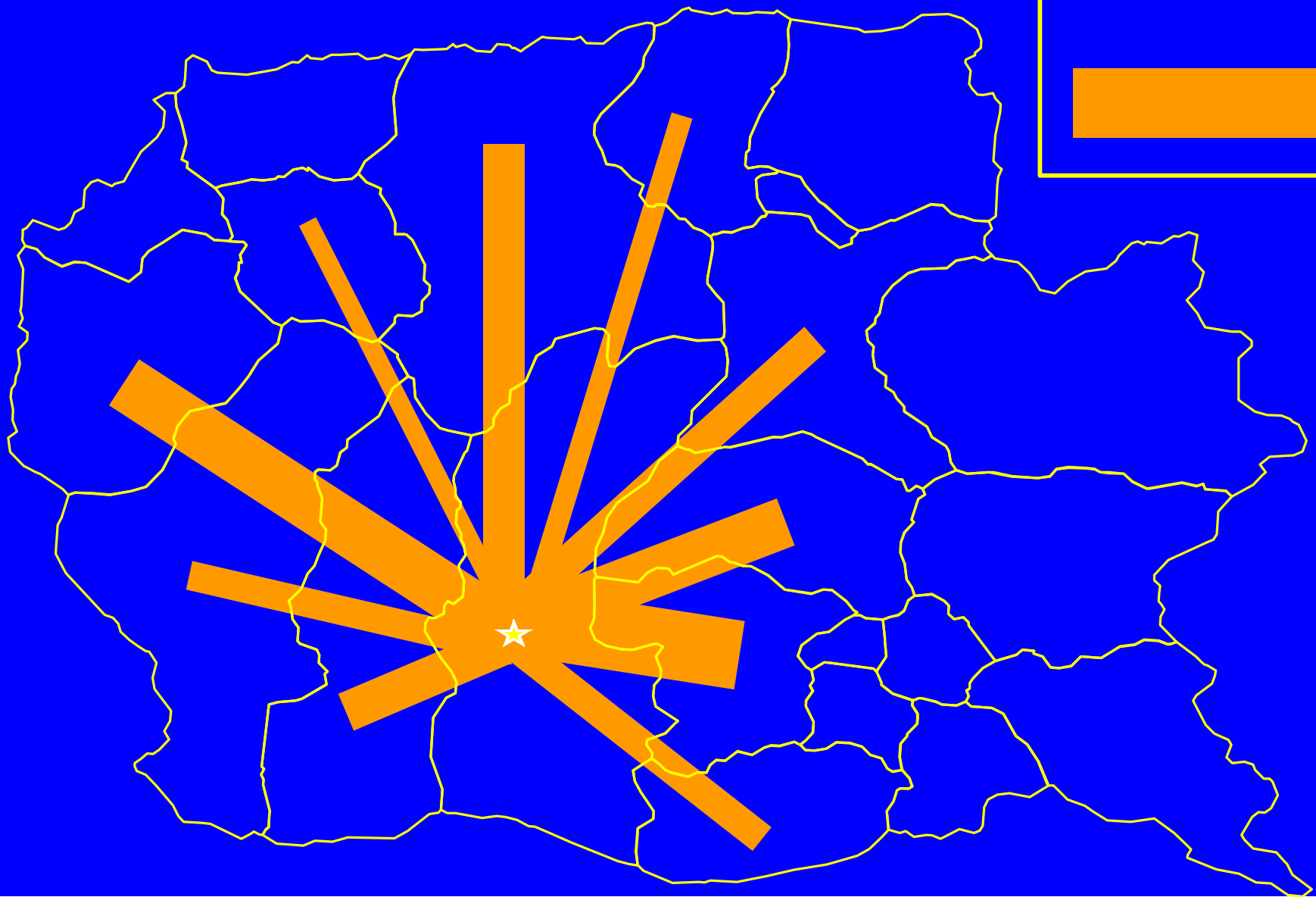


10
25
50
100

Flow maps

- width of a bar or arrow is proportional to the corresponding flow
- direction shows from where to where the flow occurs
- few mapping packages implement this feature

Where do people migrate to from this district?



net migration

1000

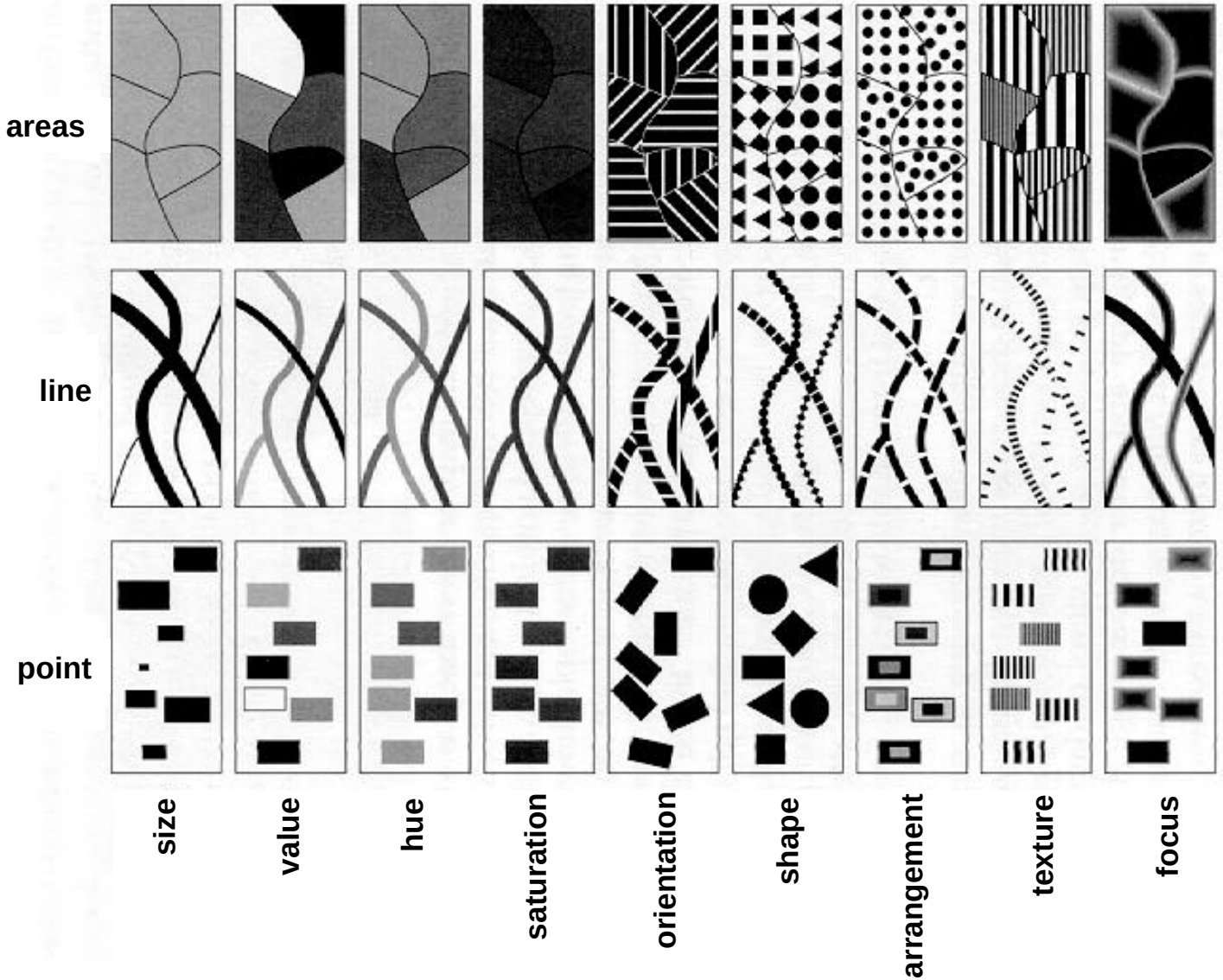
5000

10000

Thematic mapping

- design issues
- data need to be represented correctly and in an easy-to-understand way
- choice of colors, symbols, fonts, etc. needs to be matched to the variable mapped

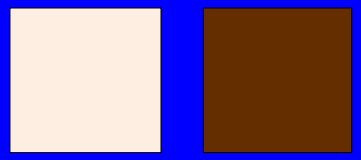
Graphic variables for points, lines and areas



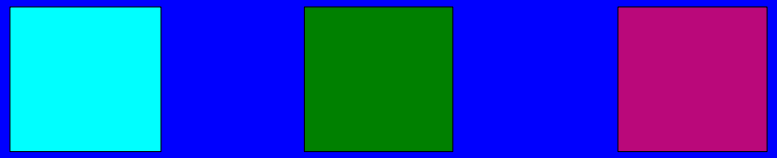
Source: MacEachren (1995) after DiBiase (1991) and Bertin (1983)

Color scheme depends on the type of variable

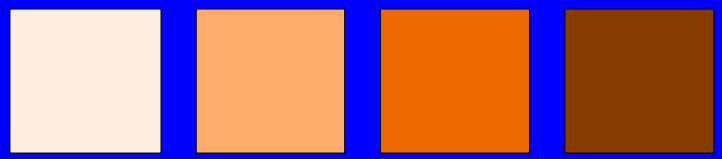
- binary



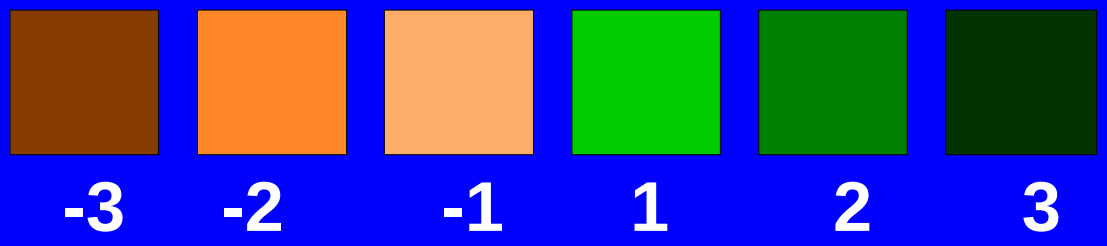
- qualitative



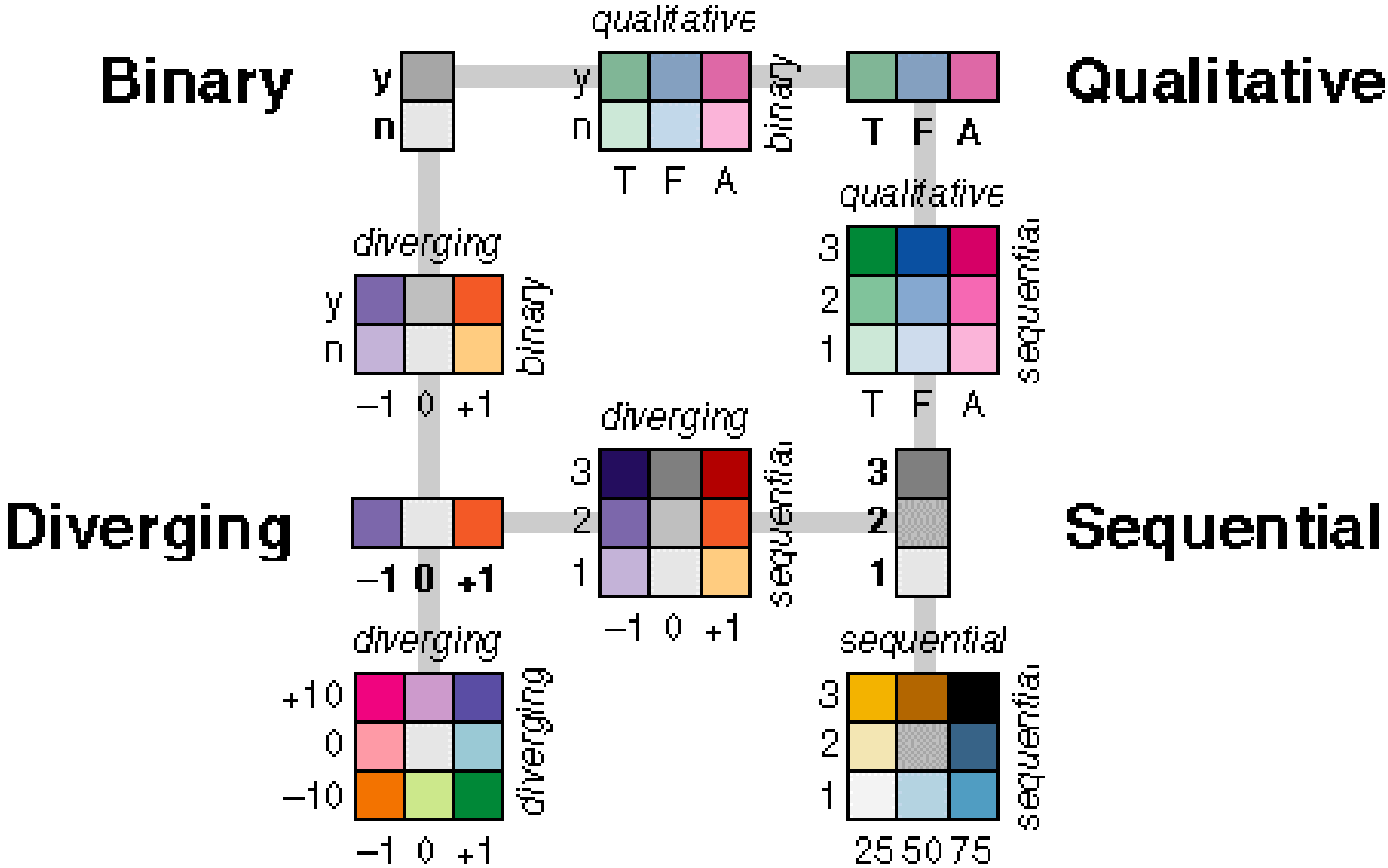
- sequential



- diverging



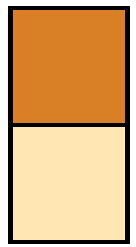
Color choice guidelines



Source: Brewer (1994)

Binary Scheme

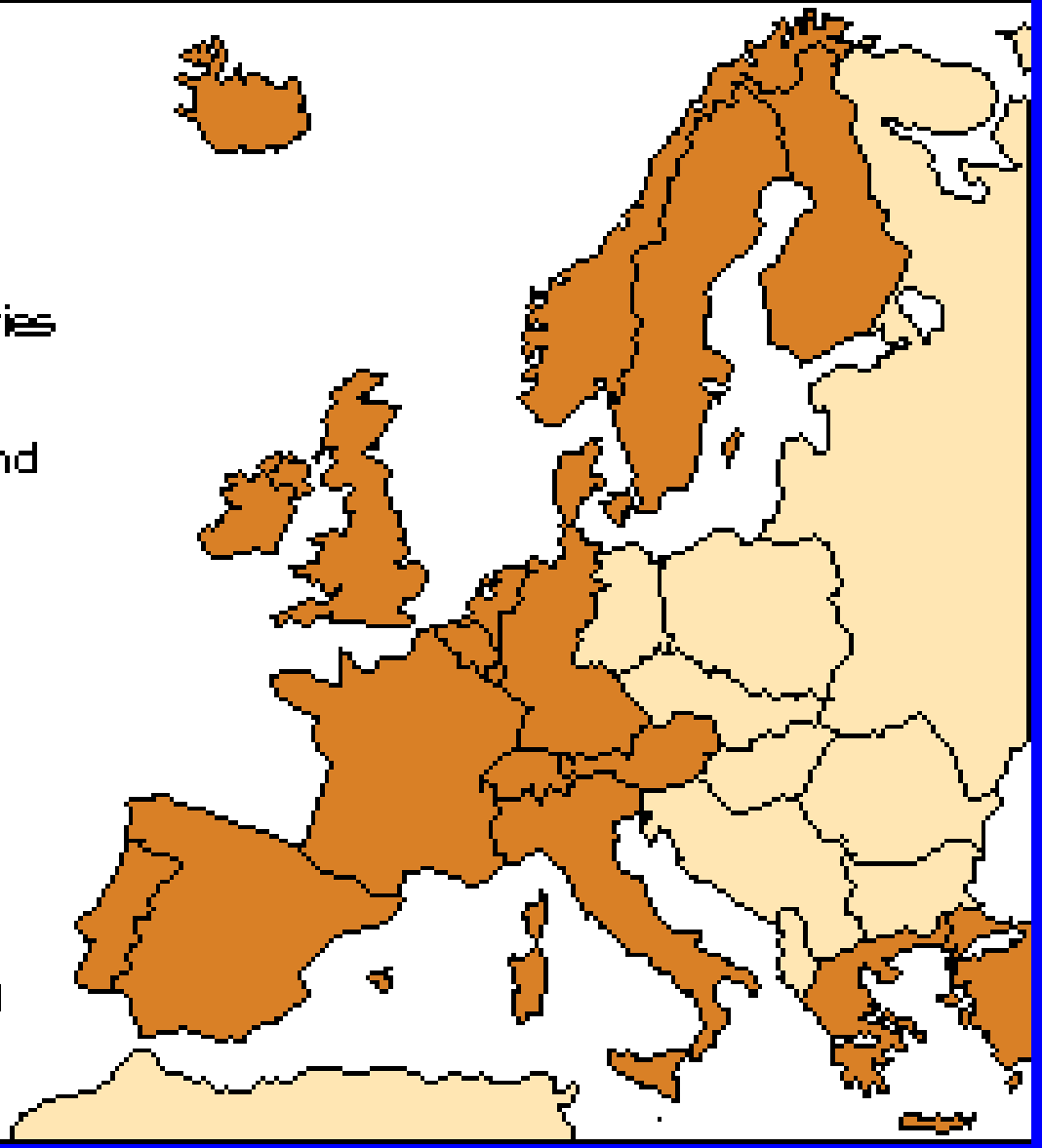
European Member Countries
of the
Organization for
Economic Cooperation and
Development, 1980

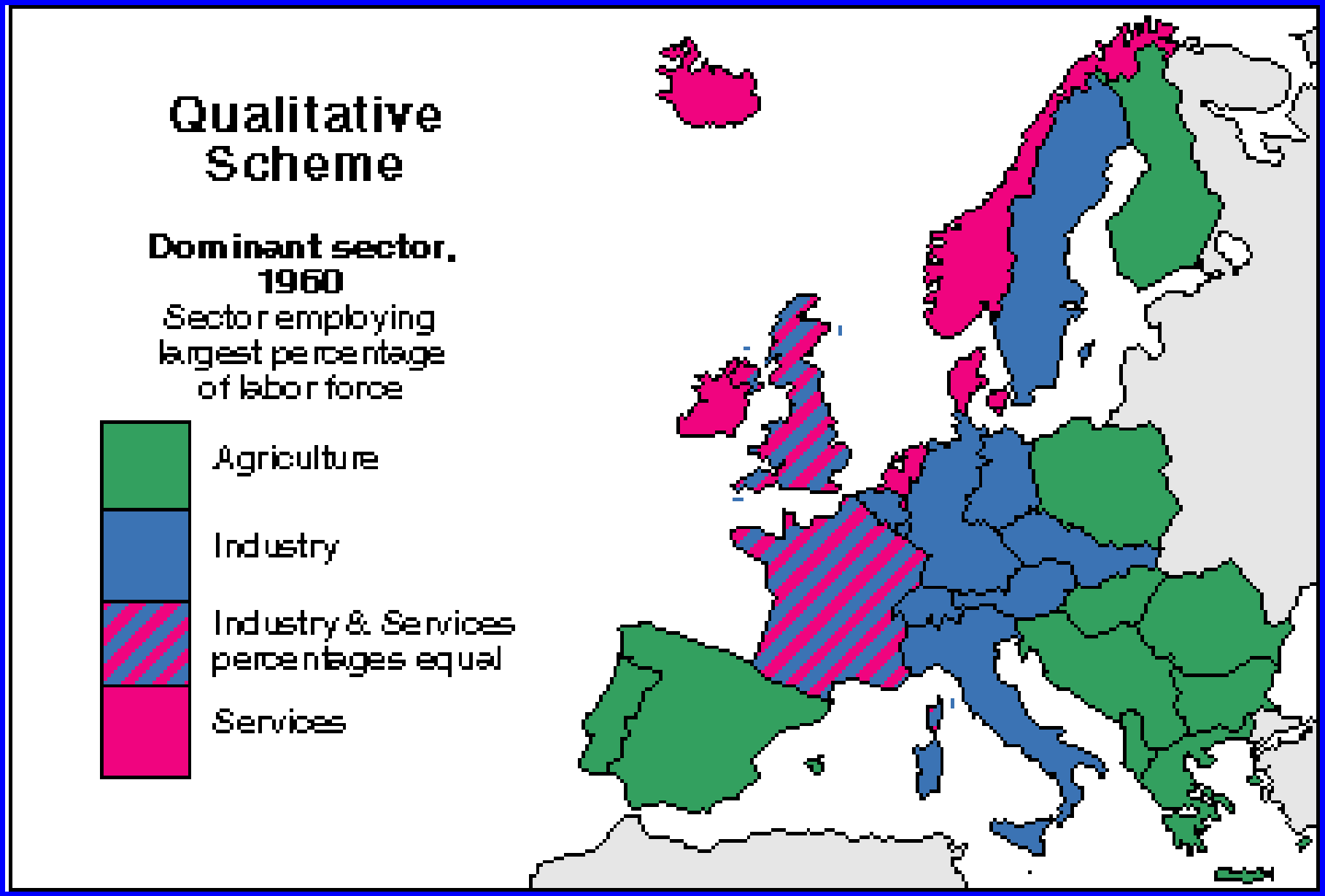


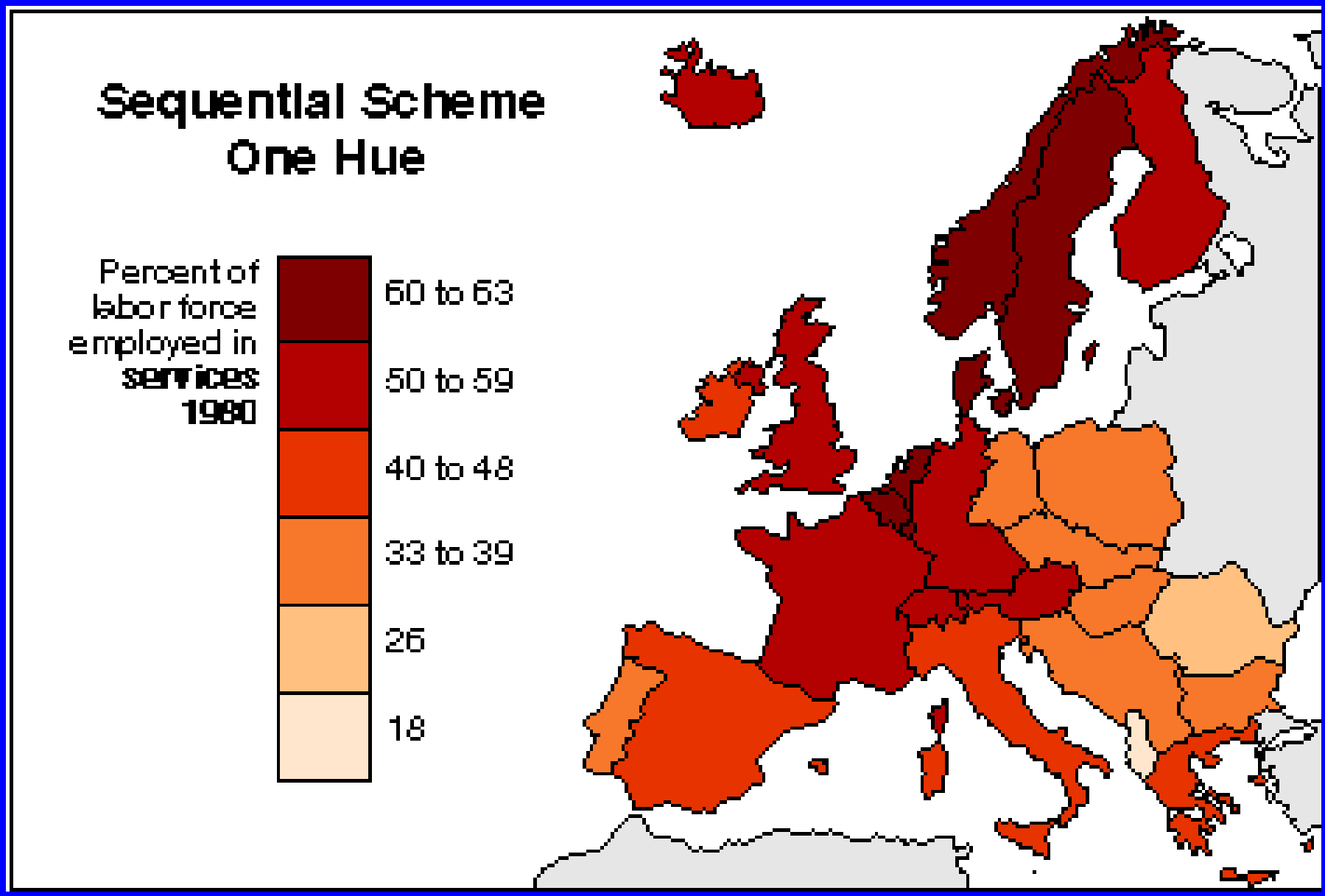
OECD
member

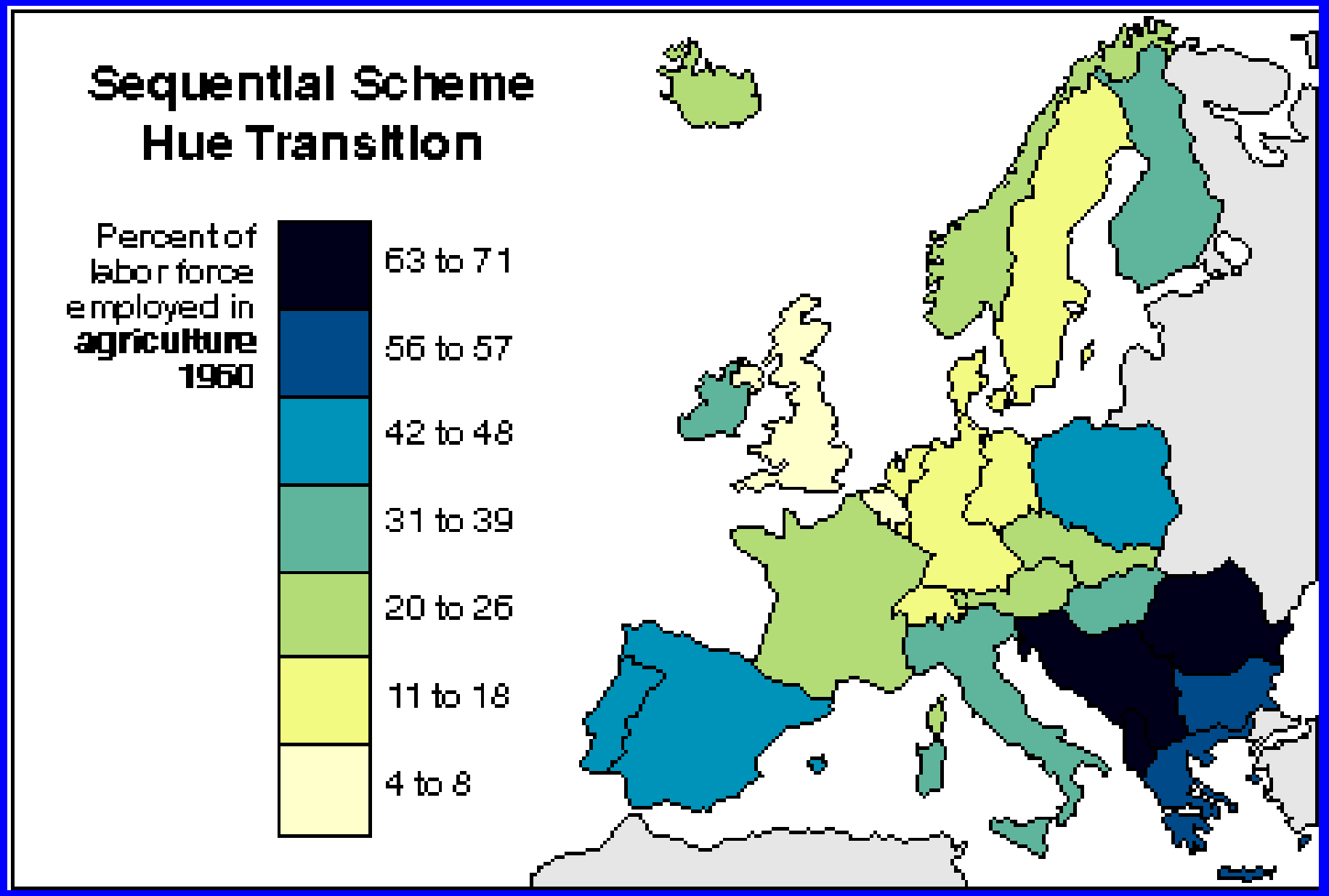
non-
member

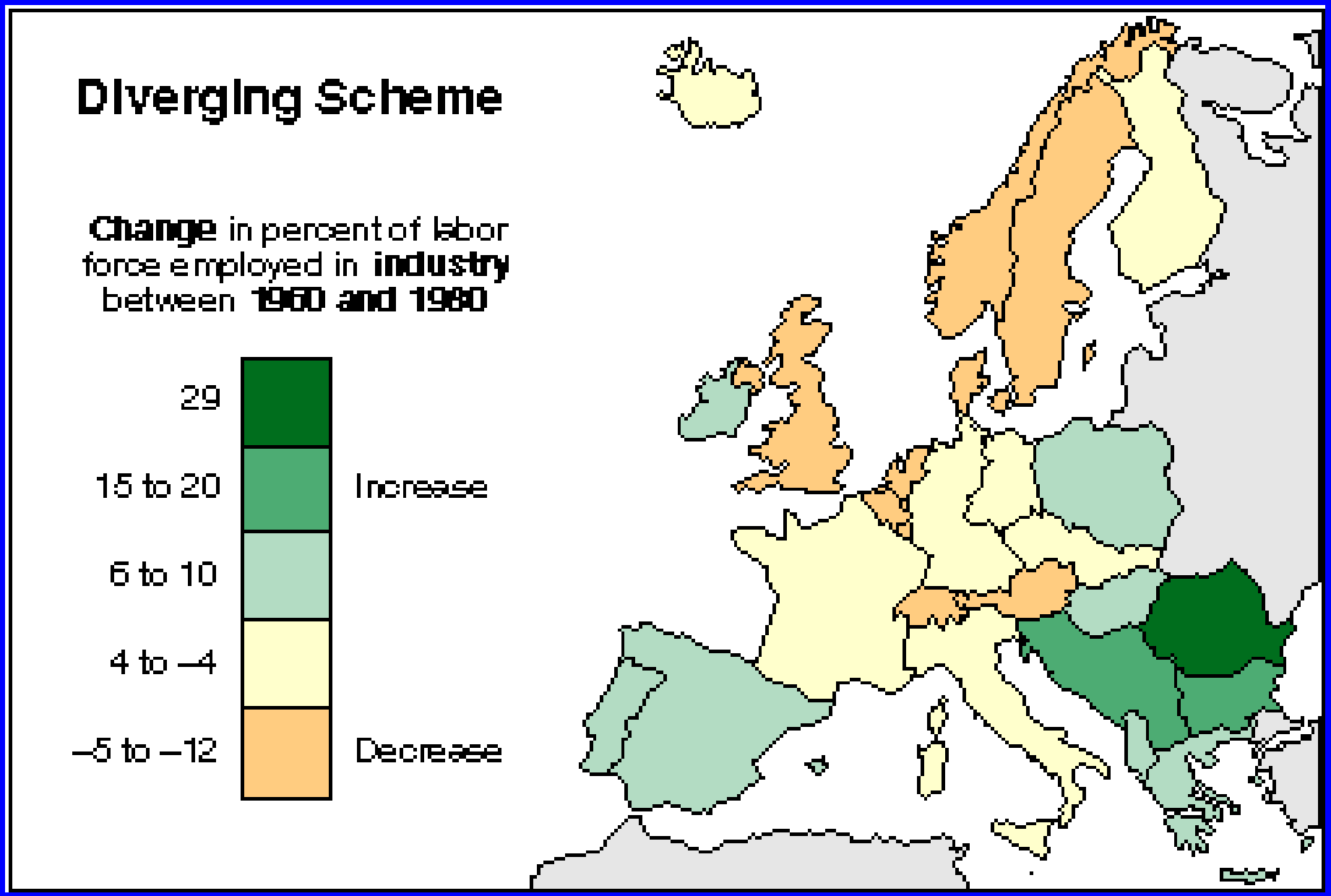
Remaining OECD Members:
Canada, United States,
Japan, Australia, New Zealand



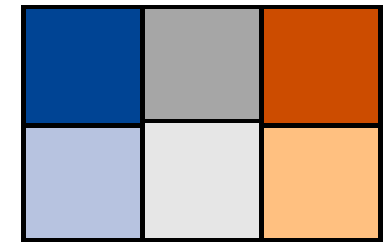

Qualitative Scheme
Dominant sector, 1960
Sector employing largest percentage of labor force
Agriculture
Industry
Industry & Services percentages equal
Services


Sequential Scheme
One Hue
Percent of labor force employed in services 1980
60 to 63
50 to 59
40 to 48
33 to 39
26
18


Sequential Scheme
Hue Transition
Percent of labor force employed in agriculture 1960
63 to 71
56 to 57
42 to 48
31 to 39
20 to 26
11 to 18
4 to 8


Diverging Scheme
Change in percent of labor force employed in industry between 1960 and 1980
29
15 to 20
6 to 10
4 to –4
–5 to –12
Increase
Decrease

Diverging/Binary Scheme

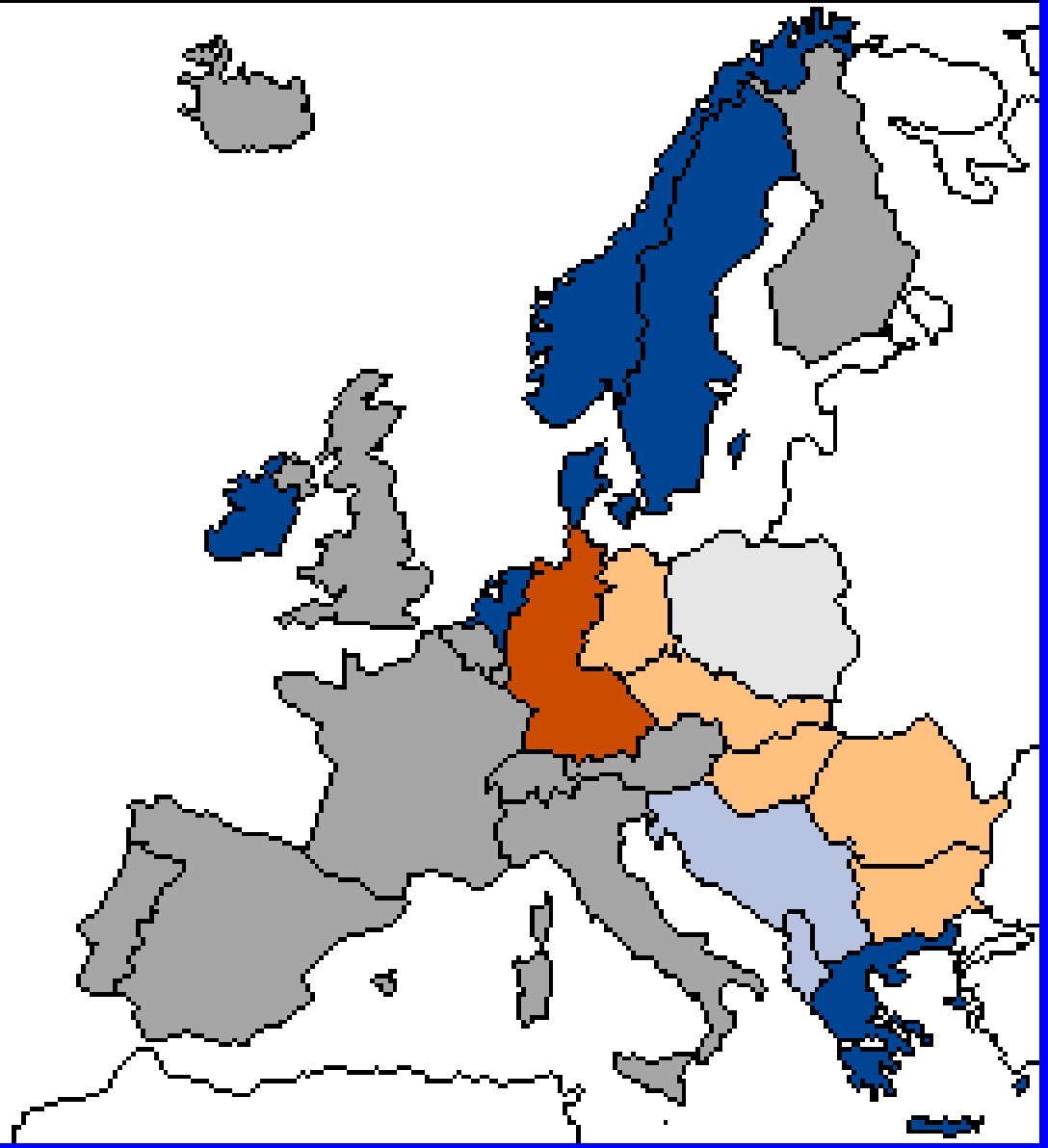


OECD member

non-member

≤-5 -4 to 4 ≥5

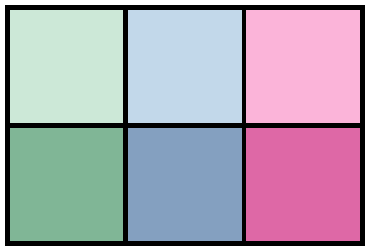
Difference between
percent of **country**
labor force employed
in **industry, 1980**
and
percent of **total European**
labor force employed
in **industry, 1980**



Qualitative / Binary Scheme

Sector employing **smallest** percentage of labor force in **1960**

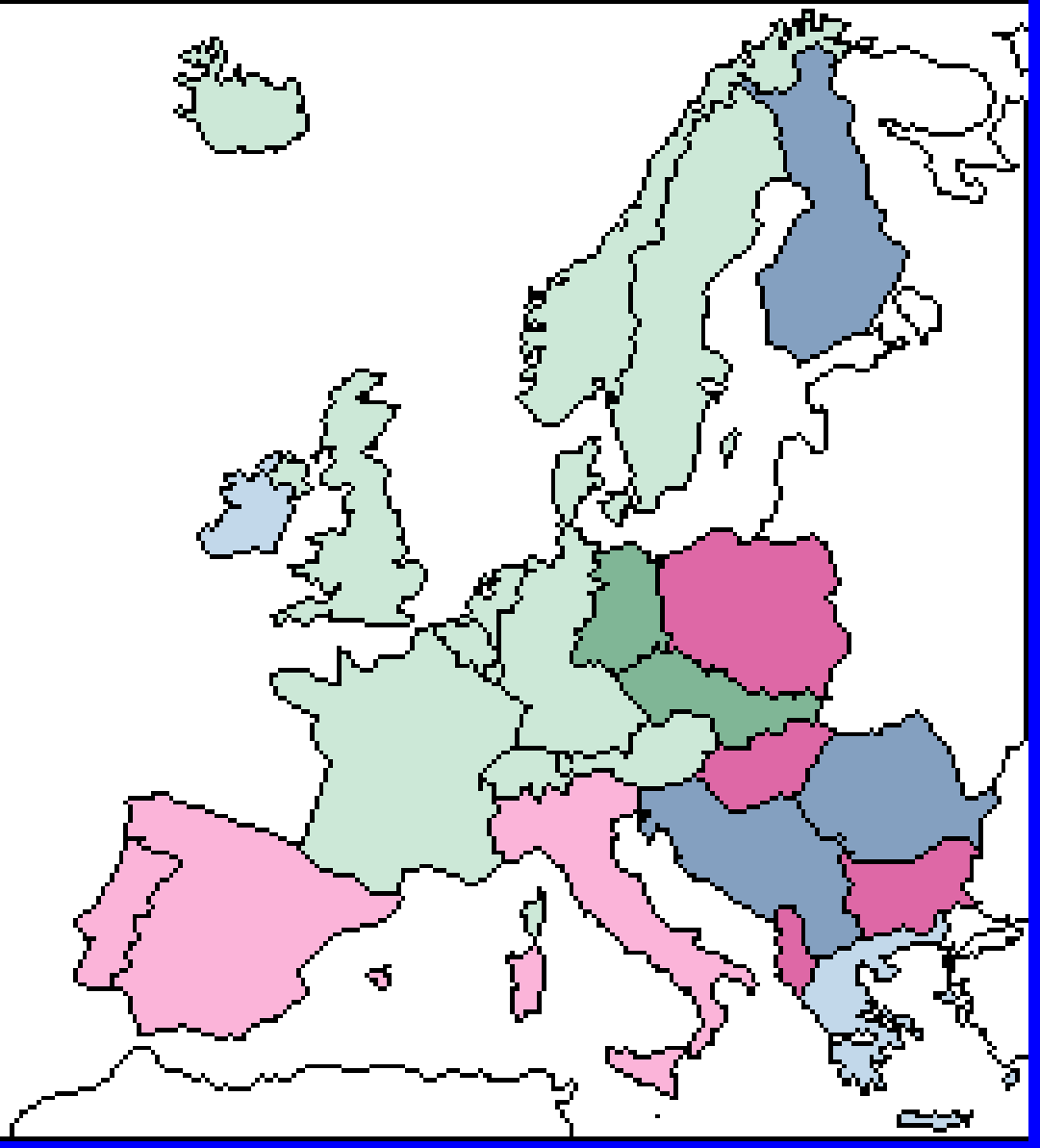
Agric. Ind. Serv.

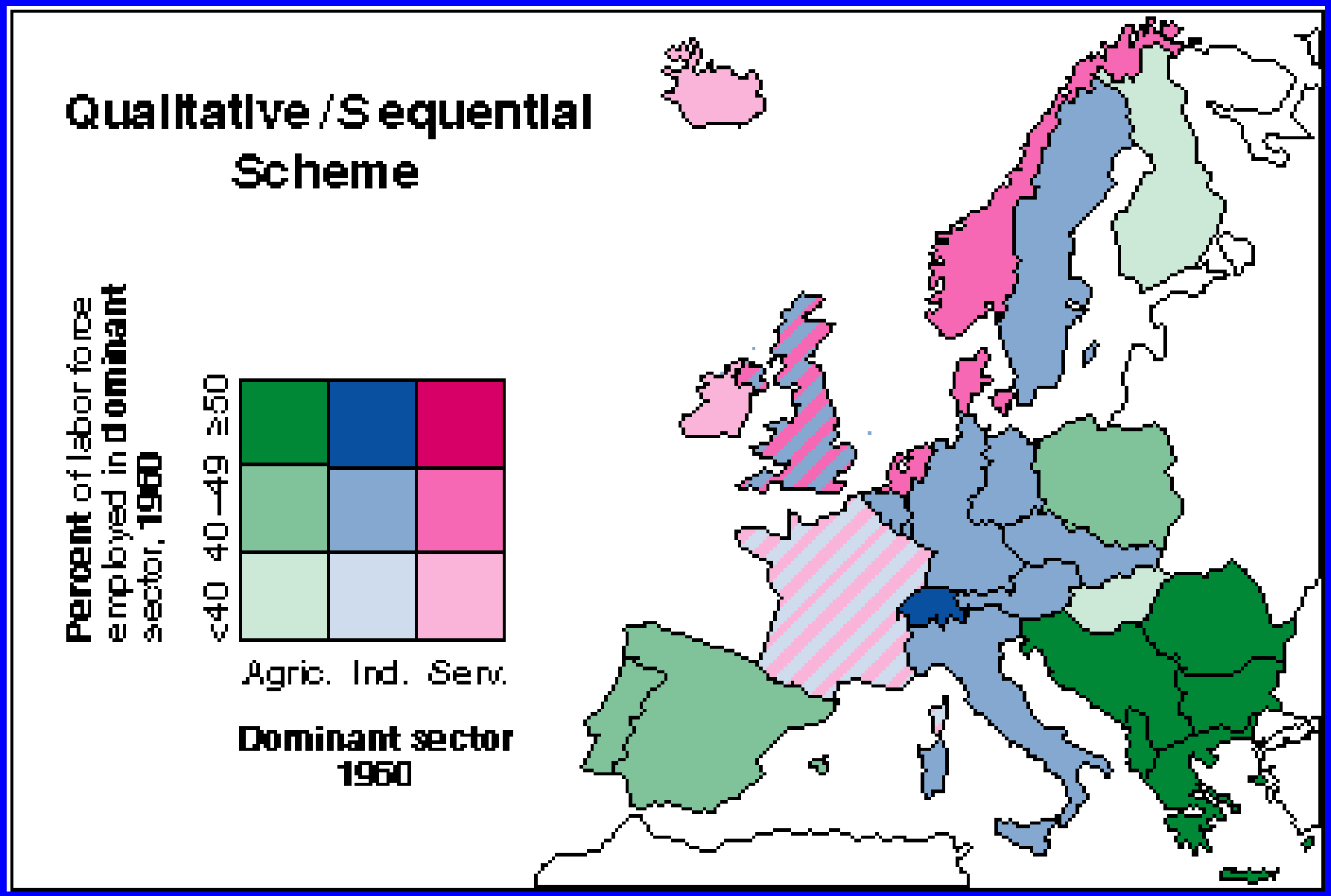


OECD* member

non-member

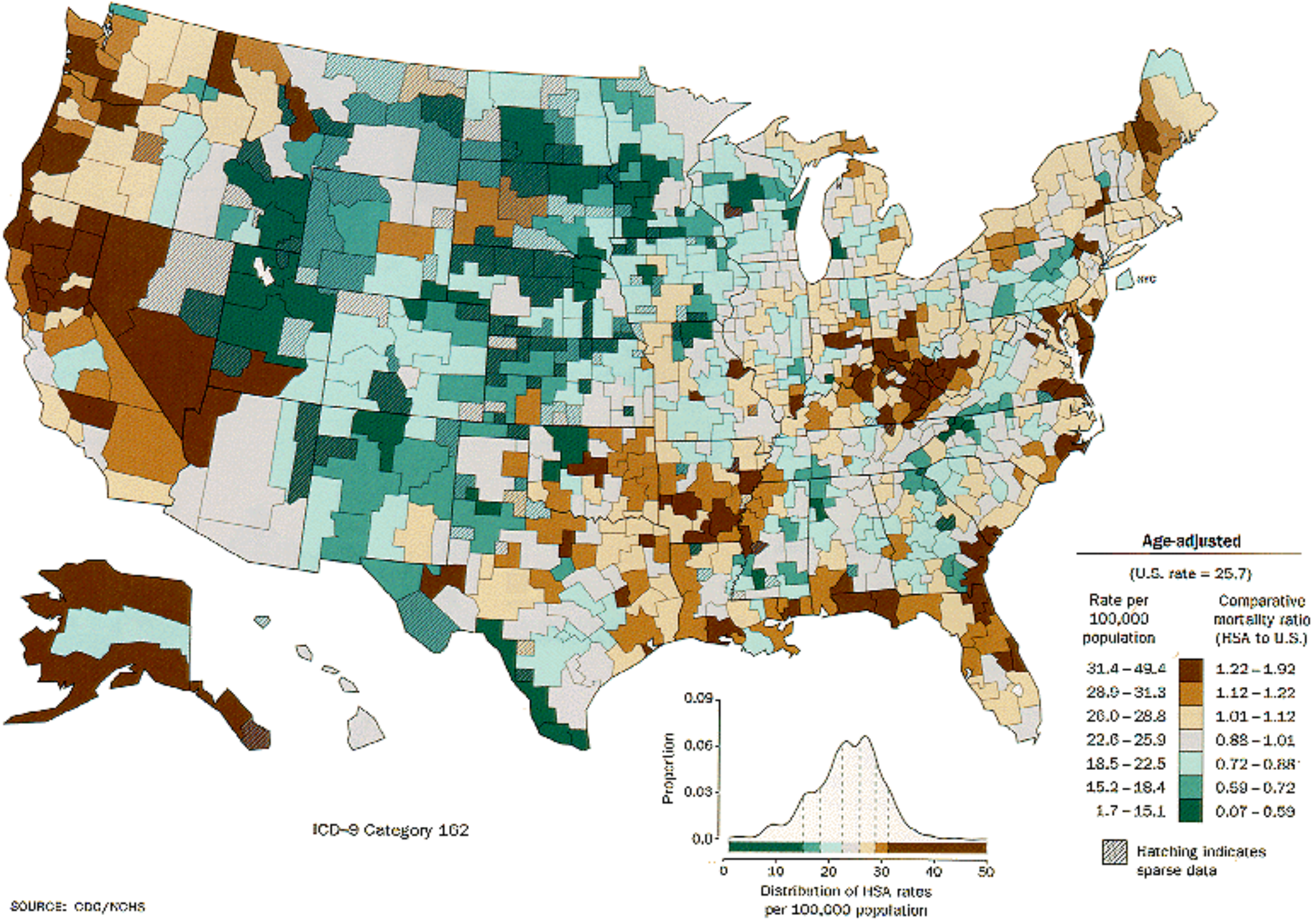
* Organization for Economic Cooperation and Development was established in 1961 (Finland joined in 1969)




Qualitative / Sequential Scheme
Percent of labor force employed in dominant sector, 1960
<40
40–49
≥50
Agric.
Ind.
Serv.
Dominant sector 1960

Map design

- often nice to add additional information
  - scale bar and north arrow
  - histogram or density plot showing data distribution
  - photographs or other images


Age-adjusted
(U.S. rate = 25.7)
Rate per 100,000 population
Comparative mortality ratio (HSA to U.S.)
31.4 – 49.4
28.9 – 31.3
26.0 – 28.8
22.6 – 25.9
18.5 – 22.5
15.2 – 18.4
1.7 – 15.1
1.22 – 1.92
1.12 – 1.22
1.01 – 1.12
0.88 – 1.01
0.72 – 0.88
0.59 – 0.72
0.07 – 0.59
Hatching indicates sparse data
Proportion
0.09
0.06
0.03
0.0
0
10
20
30
40
50
Distribution of HSA rates per 100,000 population
ICD–9 Category 162
SOURCE: CDC/NCHS

Map design

- sometimes it is better to show several small maps, than one complex map
- “small multiples”: several small maps that tell a story
- map showing a cross-tabulation

Map equivalent of a two-way table: two binary variables