

25 YEARS ANNIVERSARY
SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

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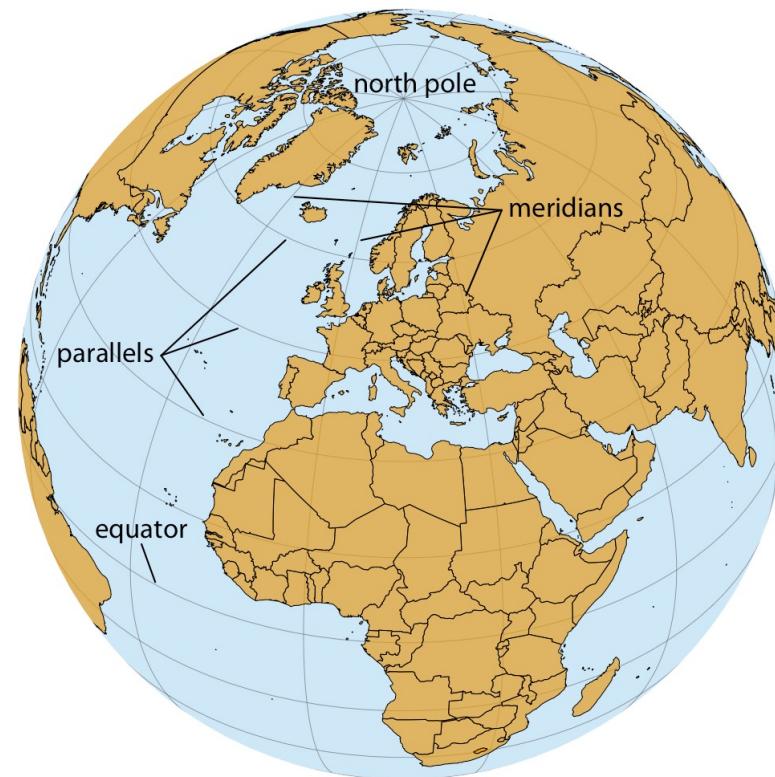
Lecture 15 - Map data visualization

Map data

- Map is a special form of spatial data
- Visualization goals
 - Finding locations
 - Finding the paths
 - Finding attributes
 - Comparison

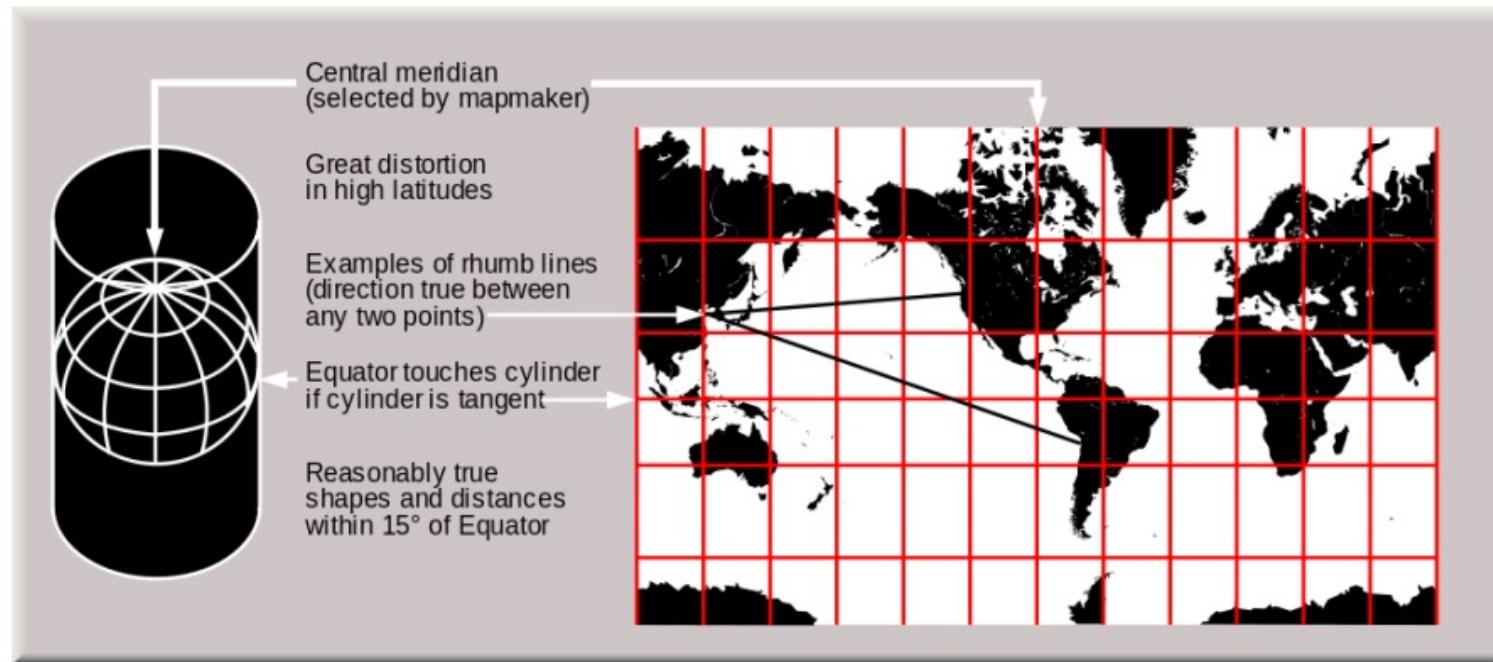
Projection

- Earth is spherical
- Presentation medium: computer screen, paper

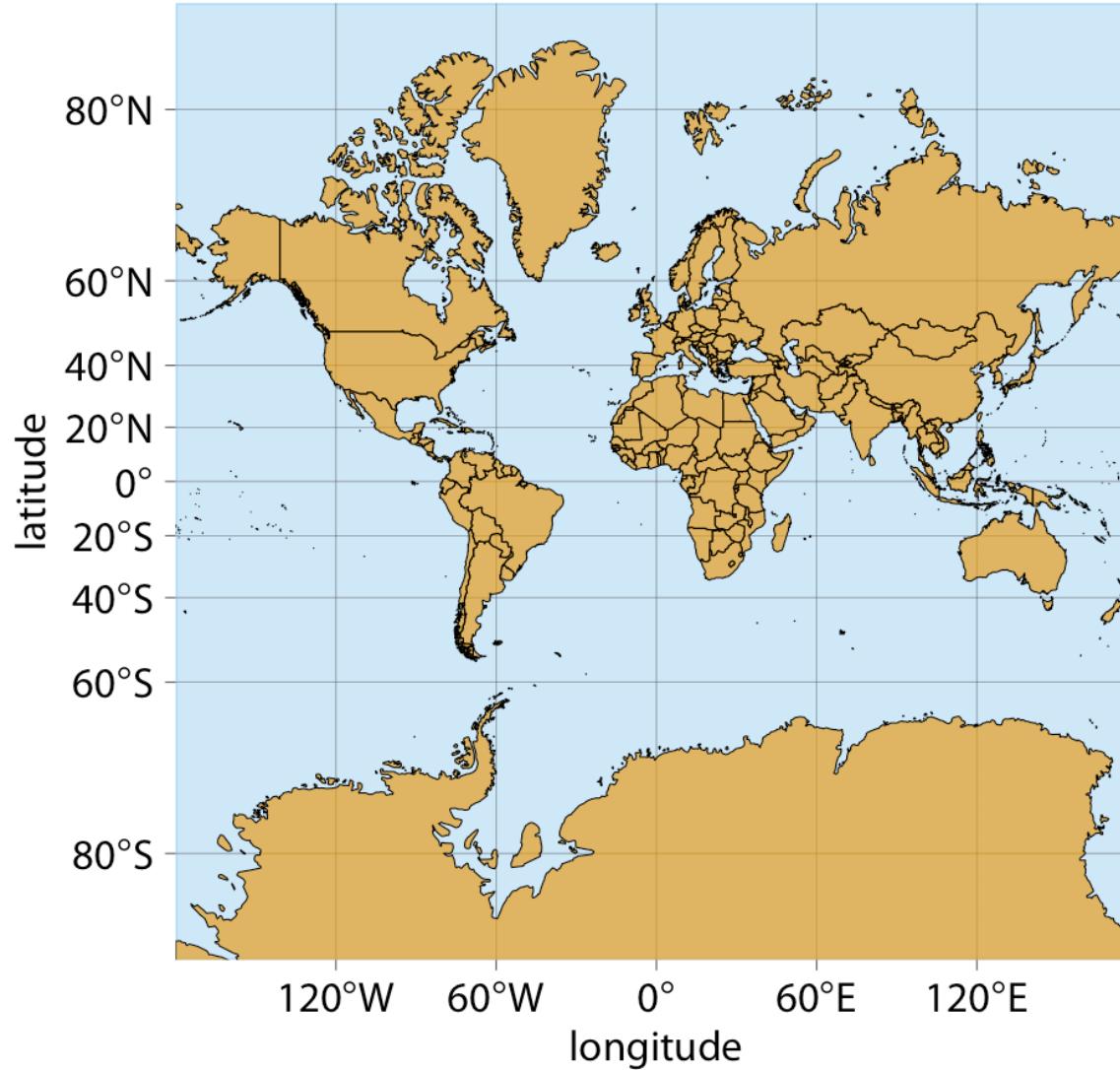


Mercator projection

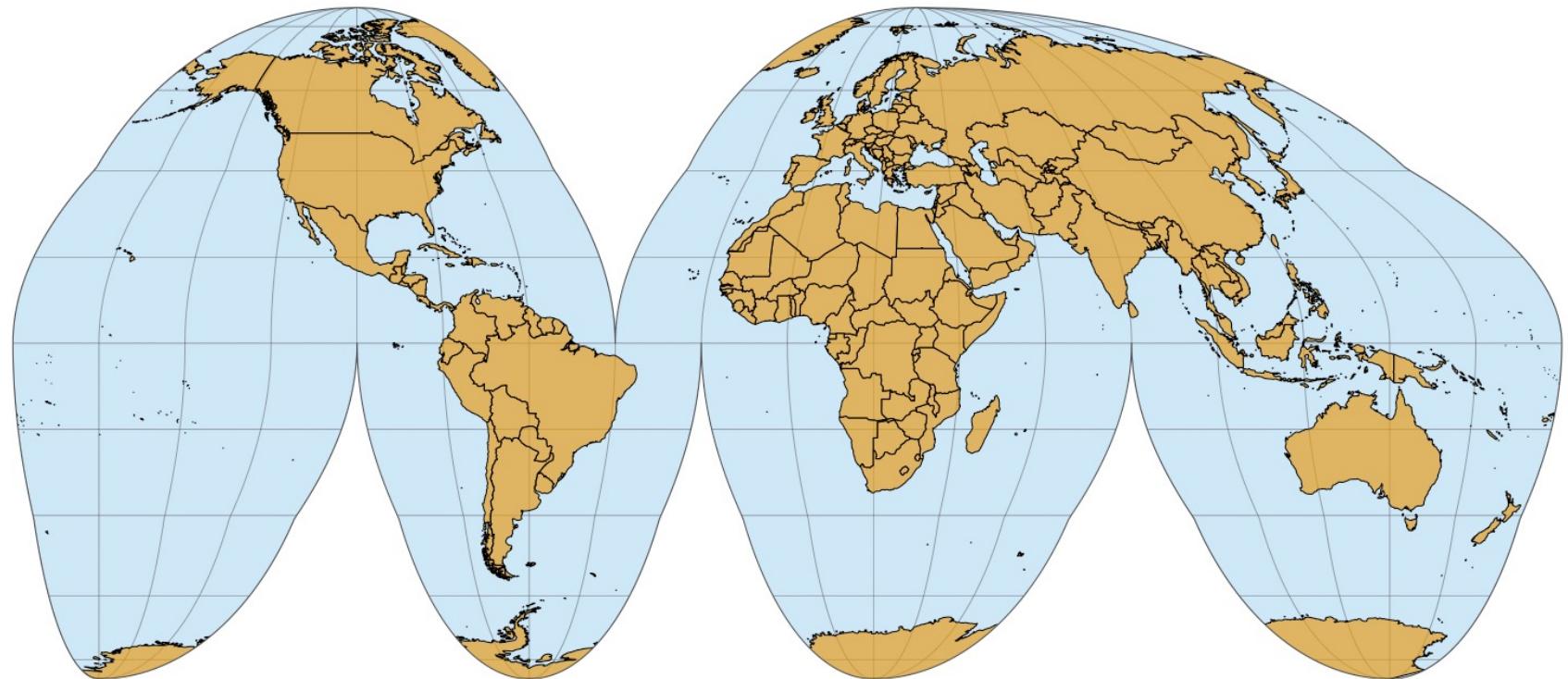
- Gerardus Mercator, 1569
- Project the globe on a tube
 - Relatively accurate for the part near the equator
 - Distortion for regions far from the equator



Example: Mercator projection of the world

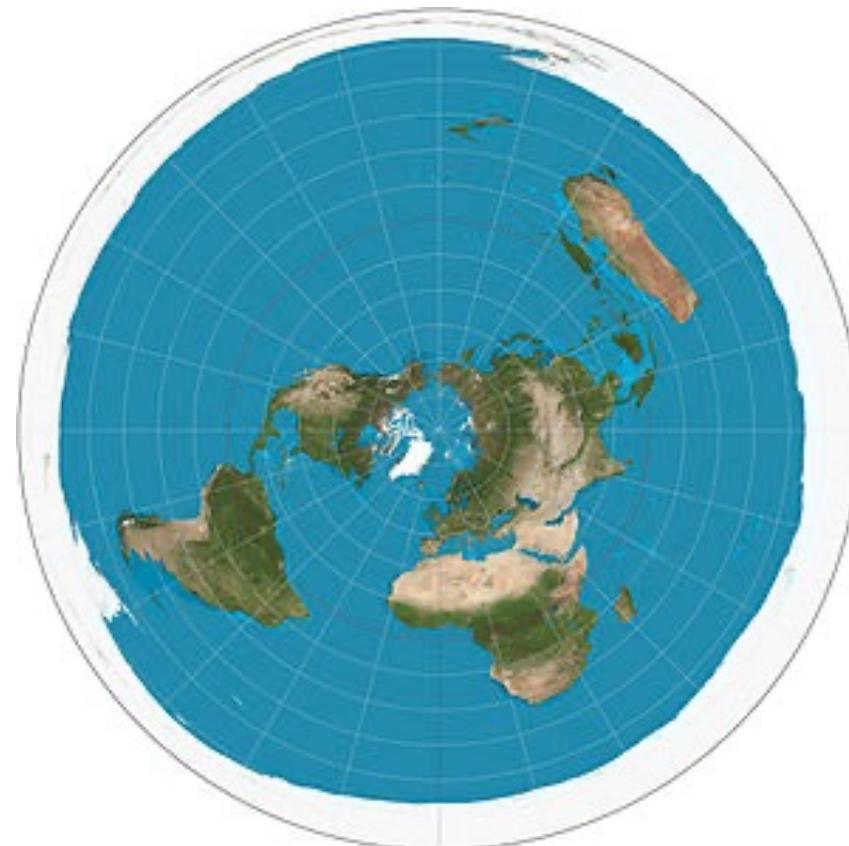


Example: Interrupted Goode homolosine projection of the world



Azimuthal projection

- A map projection in which a globe, as of the Earth, is assumed to rest on a flat surface onto which its features are projected



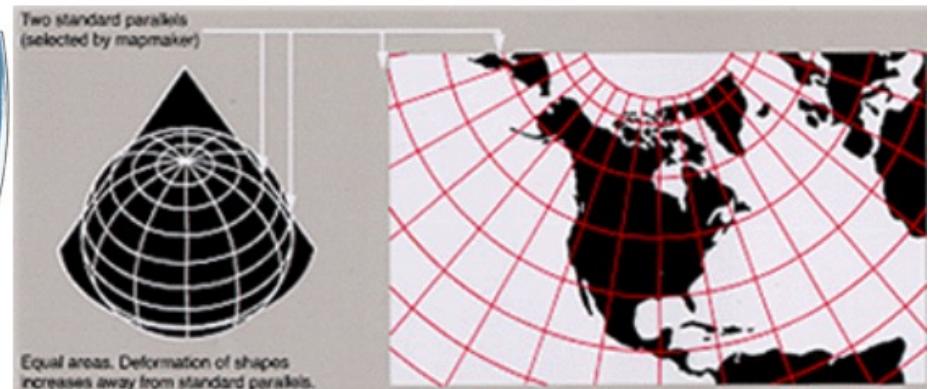
Winkel Tripel projection

- a modified azimuthal map projection
- minimizing three kinds of distortion: area, direction, and distance



Lambert conformal conic projection

- The projection seats a cone over the sphere of the Earth and projects the surface conformally onto the cone



Wikipedia

D3

- <https://github.com/d3/d3/wiki/Geo-Projections>
- <https://github.com/d3/d3-geo-projection/>



Map libs



Open StreetMap



Google Maps

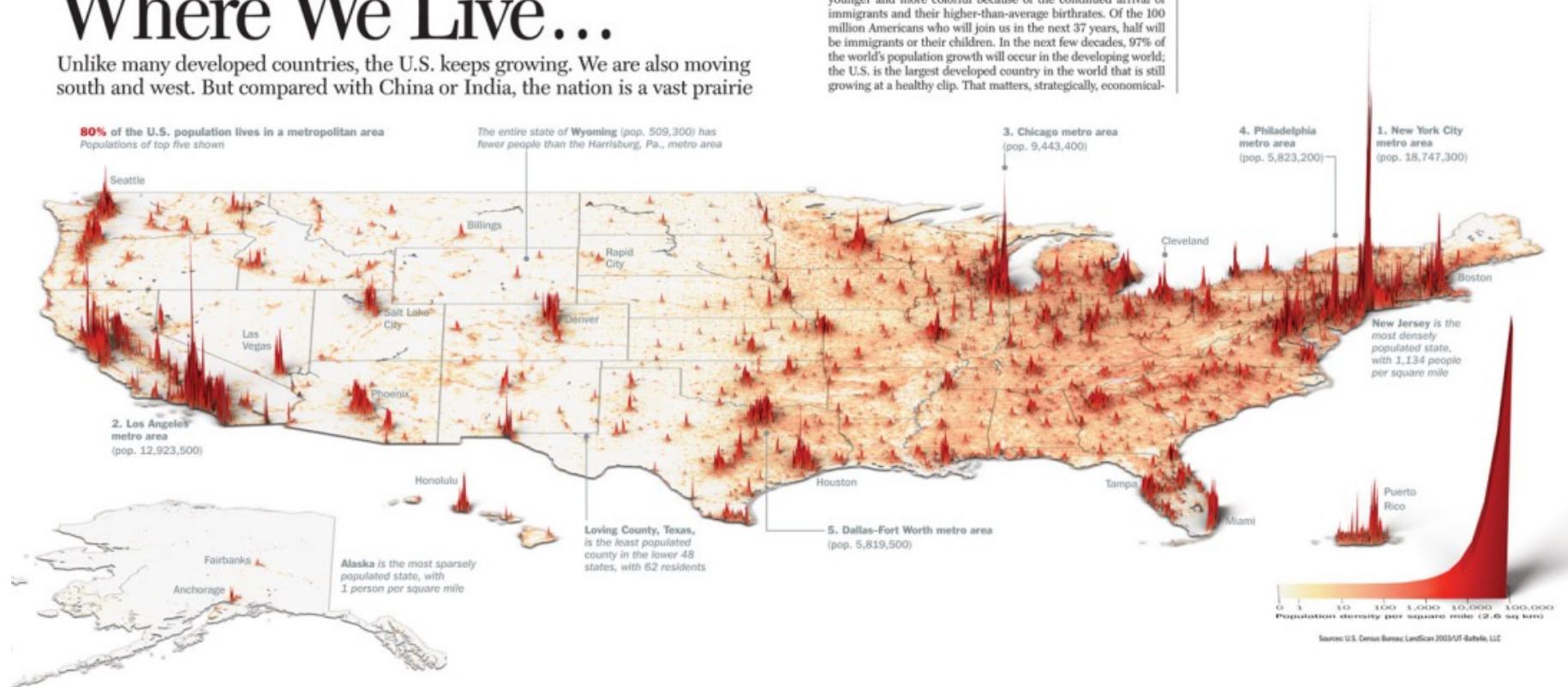
Display information on a map

Where We Live...

Unlike many developed countries, the U.S. keeps growing. We are also moving south and west. But compared with China or India, the nation is a vast prairie

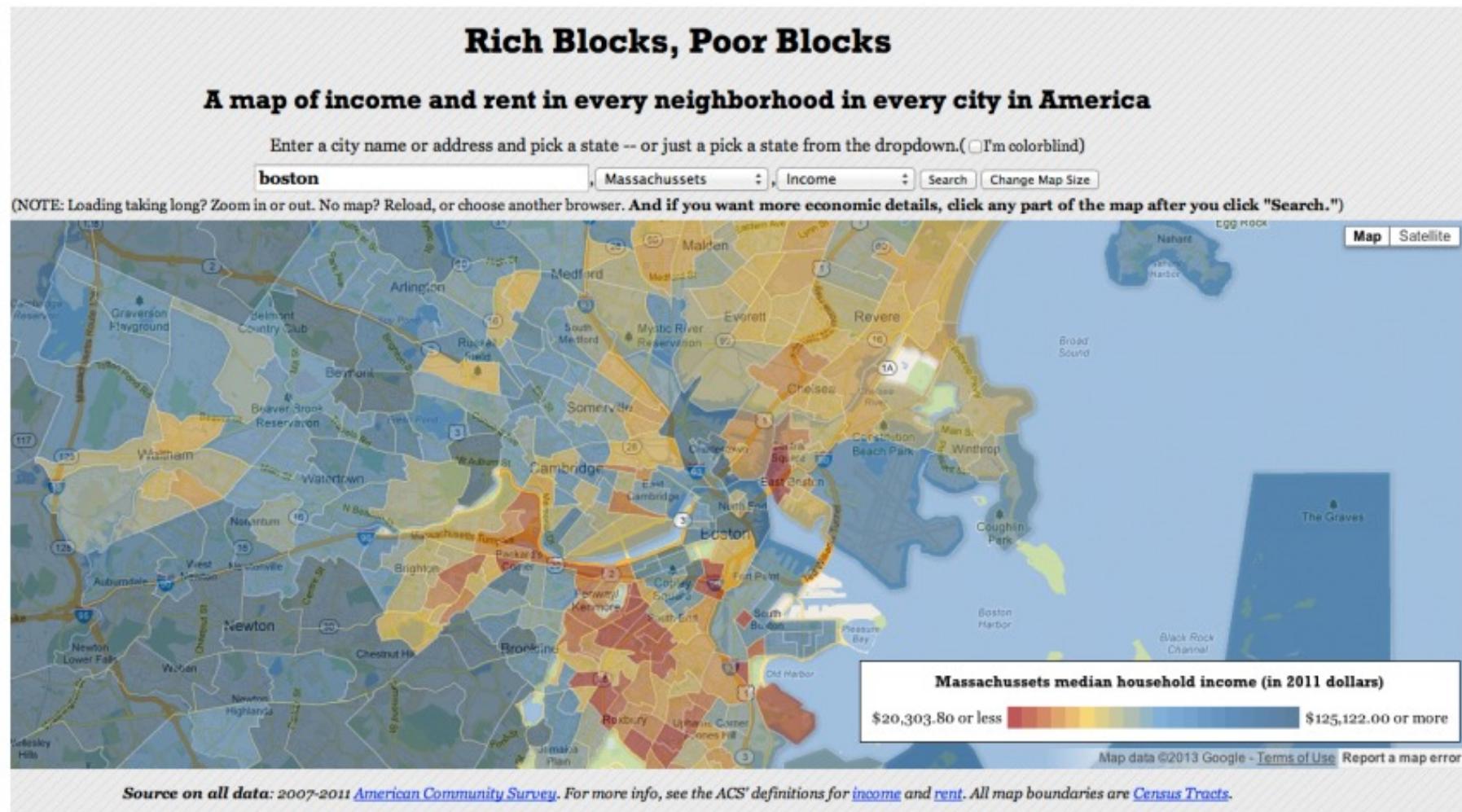
Our families are getting smaller—with one vital exception. Compared with those of Europe and Japan, the U.S. population is younger and more colorful because of the continued arrival of immigrants and their higher-than-average birthrates. Of the 100 million Americans who will join us in the next 37 years, half will be immigrants or their children. In the next few decades, 97% of the world's population growth will occur in the developing world; the U.S. is the largest developed country in the world that is still growing at a healthy clip. That matters, strategically, economical-

Ala.; Possum Trot, Ky.; or Lonelyville, N.Y. But they are all probably close to someone's idea of paradise. —By Nancy Gibbs



Choropleth maps (bản đồ vùng)

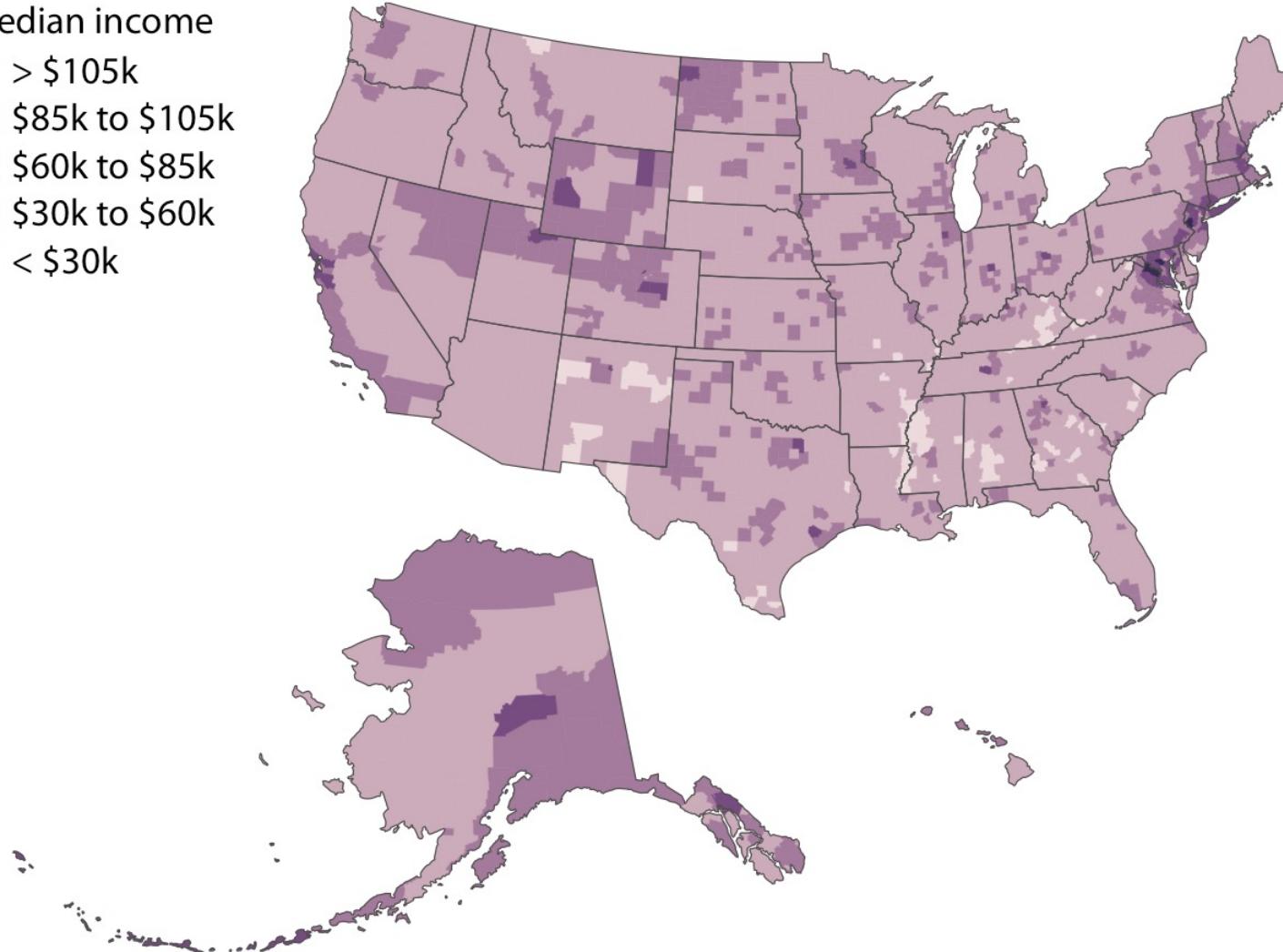
- Areas on the map are colored or drawn to represent information of interest in the area



Example: Median income in every US county, shown as a choropleth map

median income

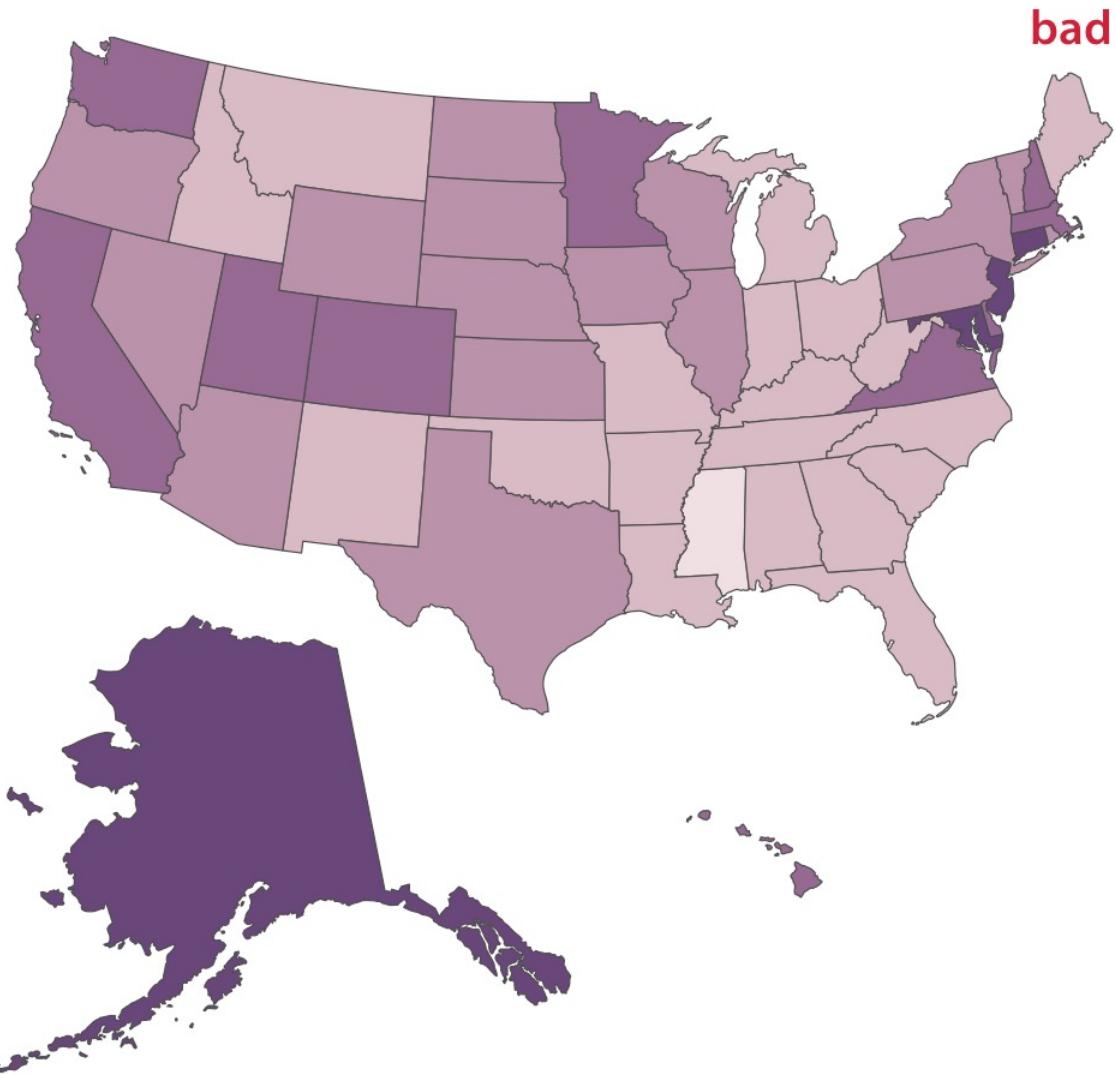
- > \$105k
- \$85k to \$105k
- \$60k to \$85k
- \$30k to \$60k
- < \$30k



Example: Median income in every US state, shown as a choropleth map

median income

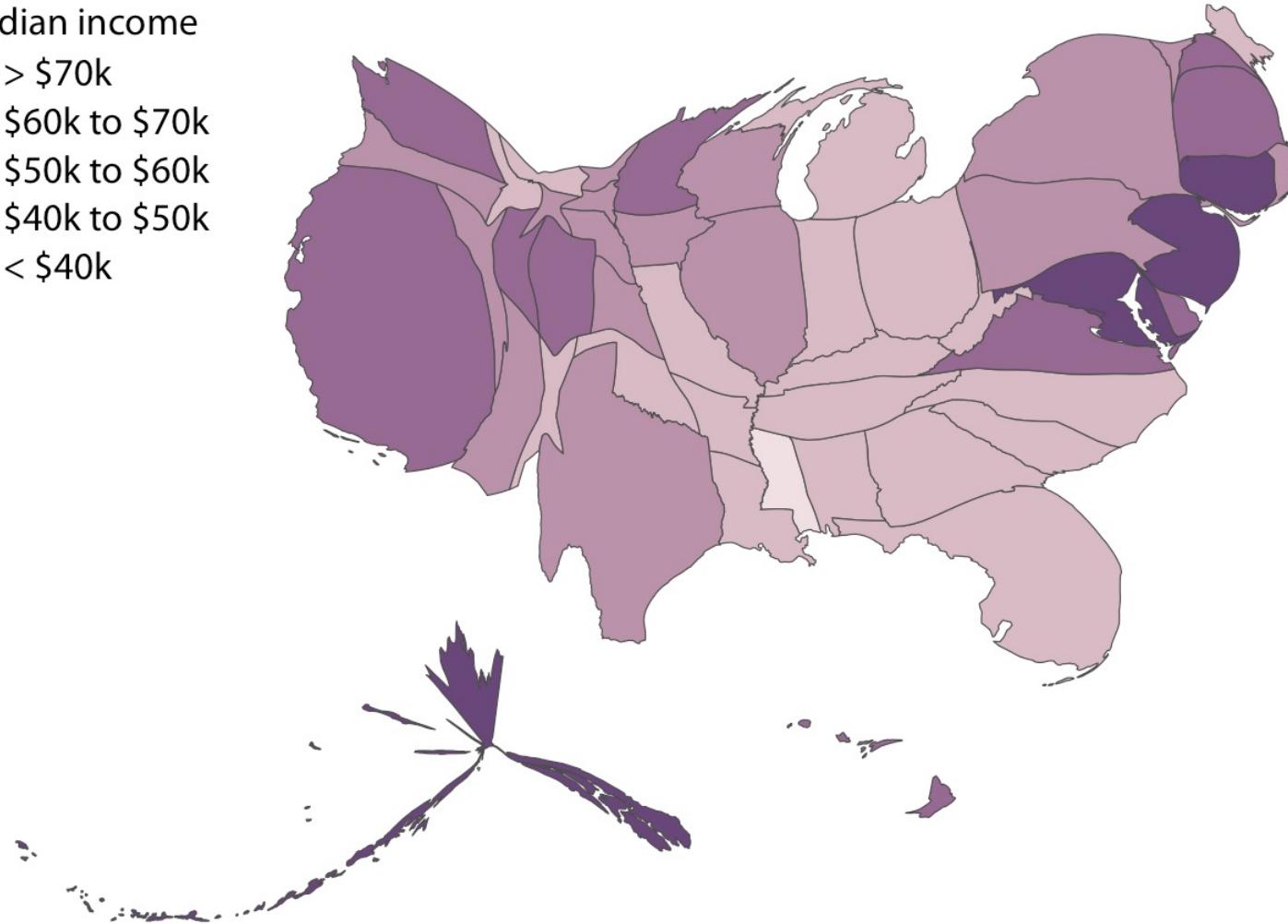
- > \$70k
- \$60k to \$70k
- \$50k to \$60k
- \$40k to \$50k
- < \$40k



Example: Median income in every US state, shown as a cartogram

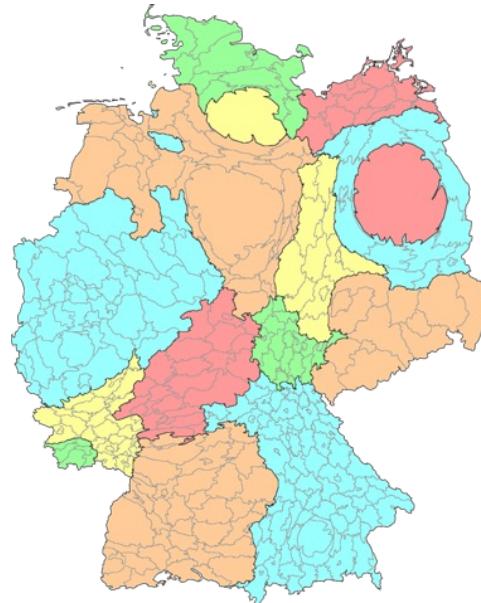
median income

- > \$70k
- \$60k to \$70k
- \$50k to \$60k
- \$40k to \$50k
- < \$40k



Cartogram

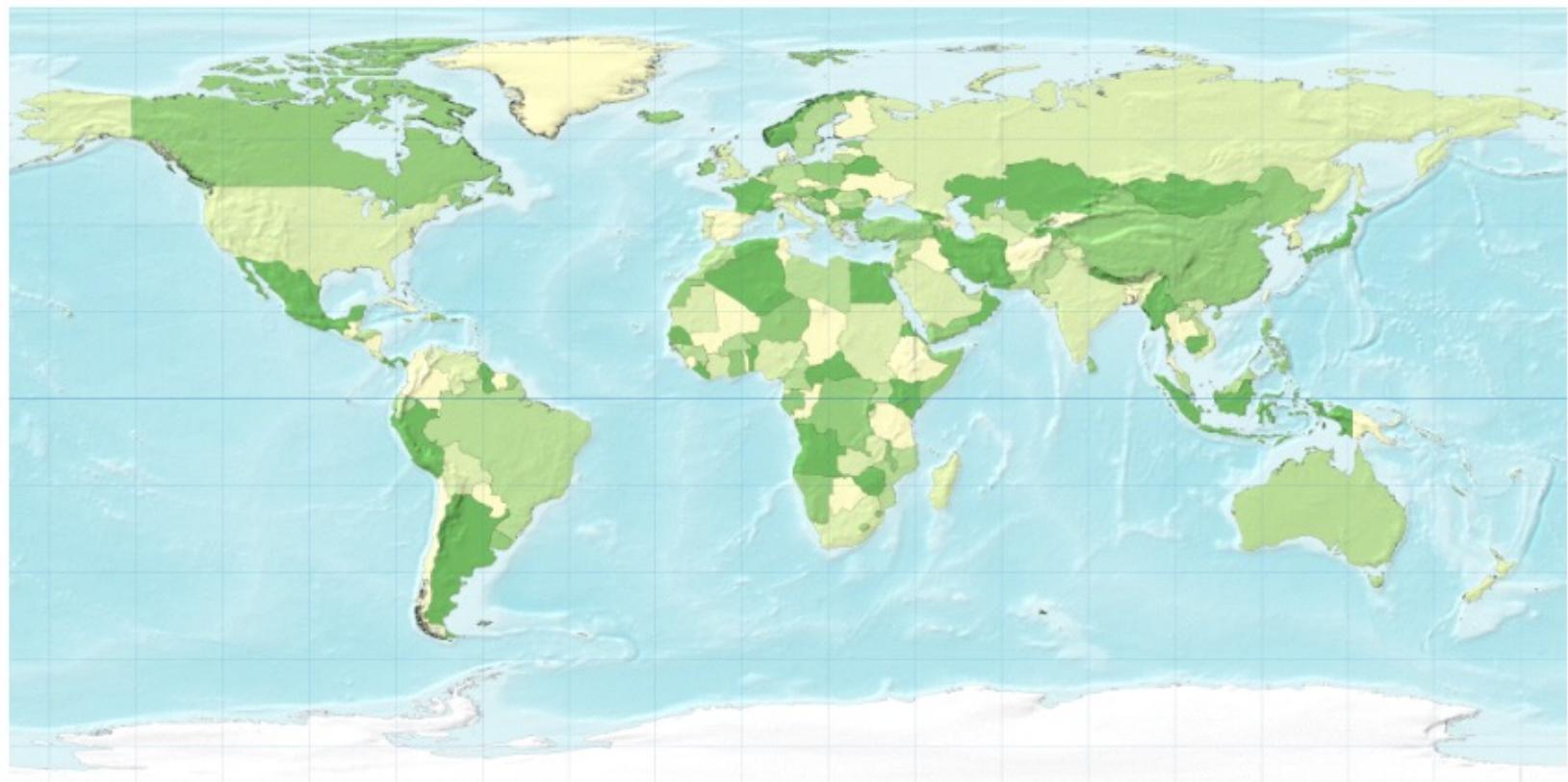
- Map attribute values to regions of the map
- Areas of the map can be transformed according to the value to emphasize the meaning of the value



Map of Germany, regions distorted by population

Cartogram

The World



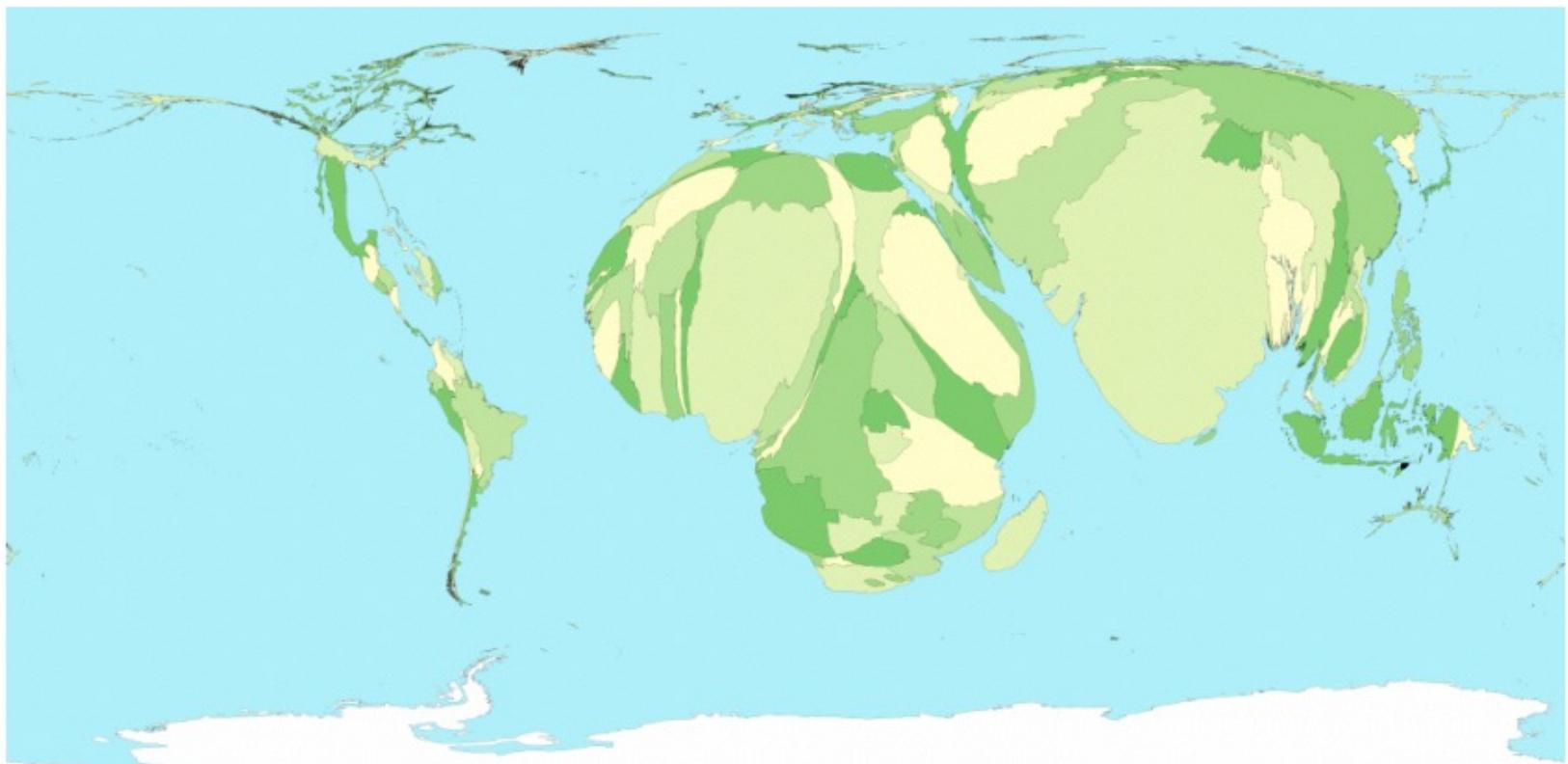
Cartogram

Population



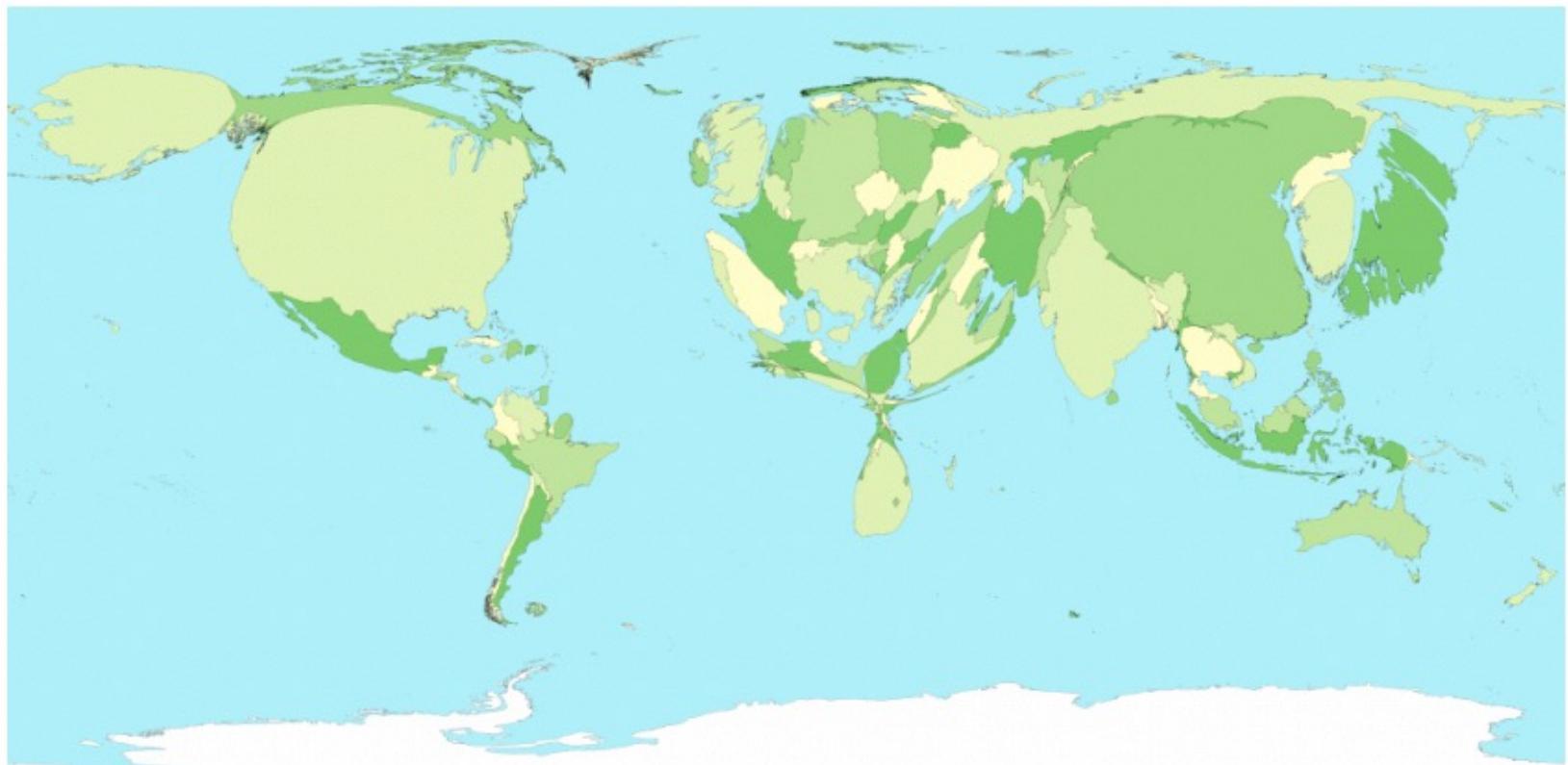
Cartogram

Child Mortality



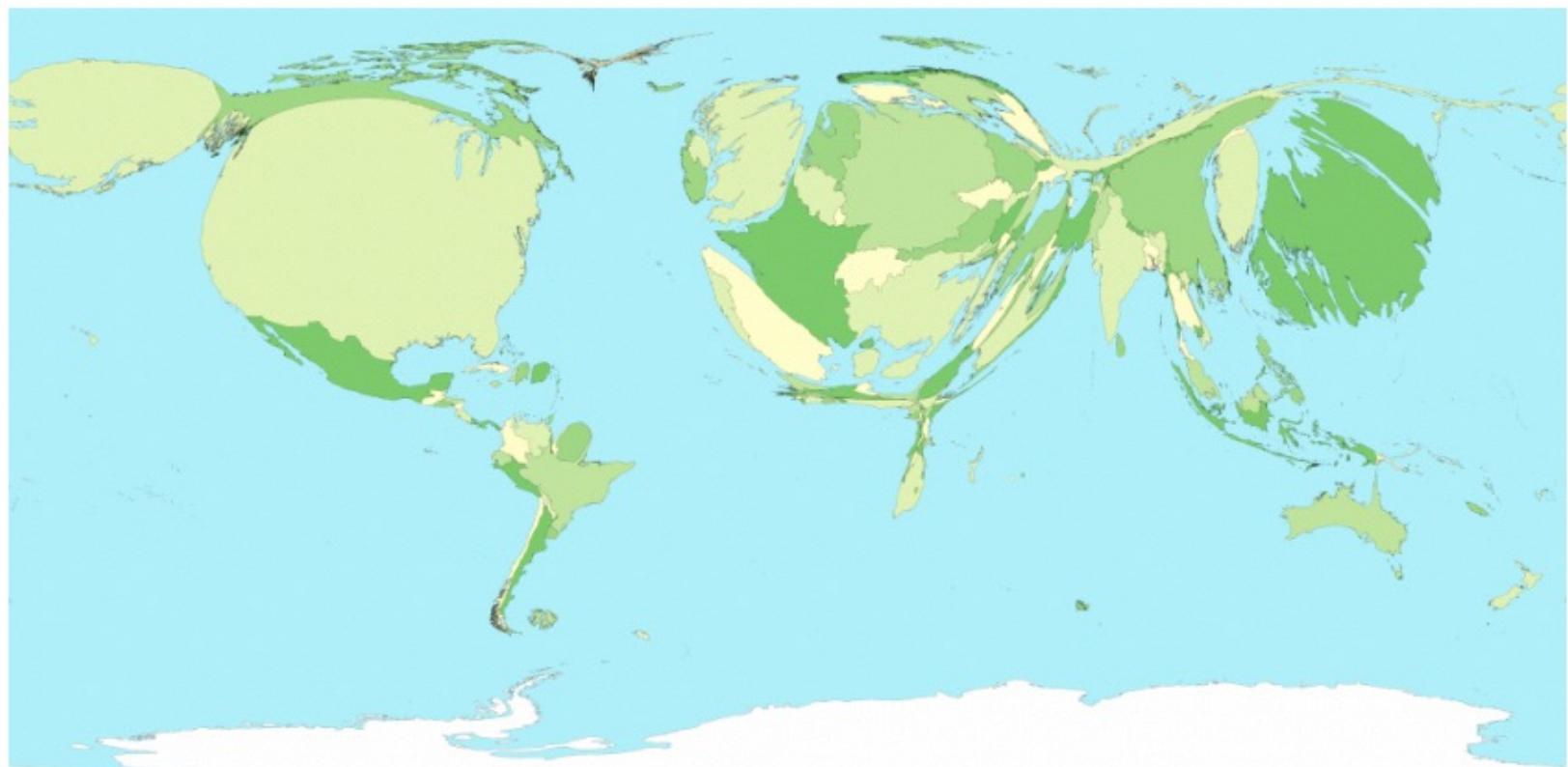
Cartogram

Greenhouse Emissions



Cartogram

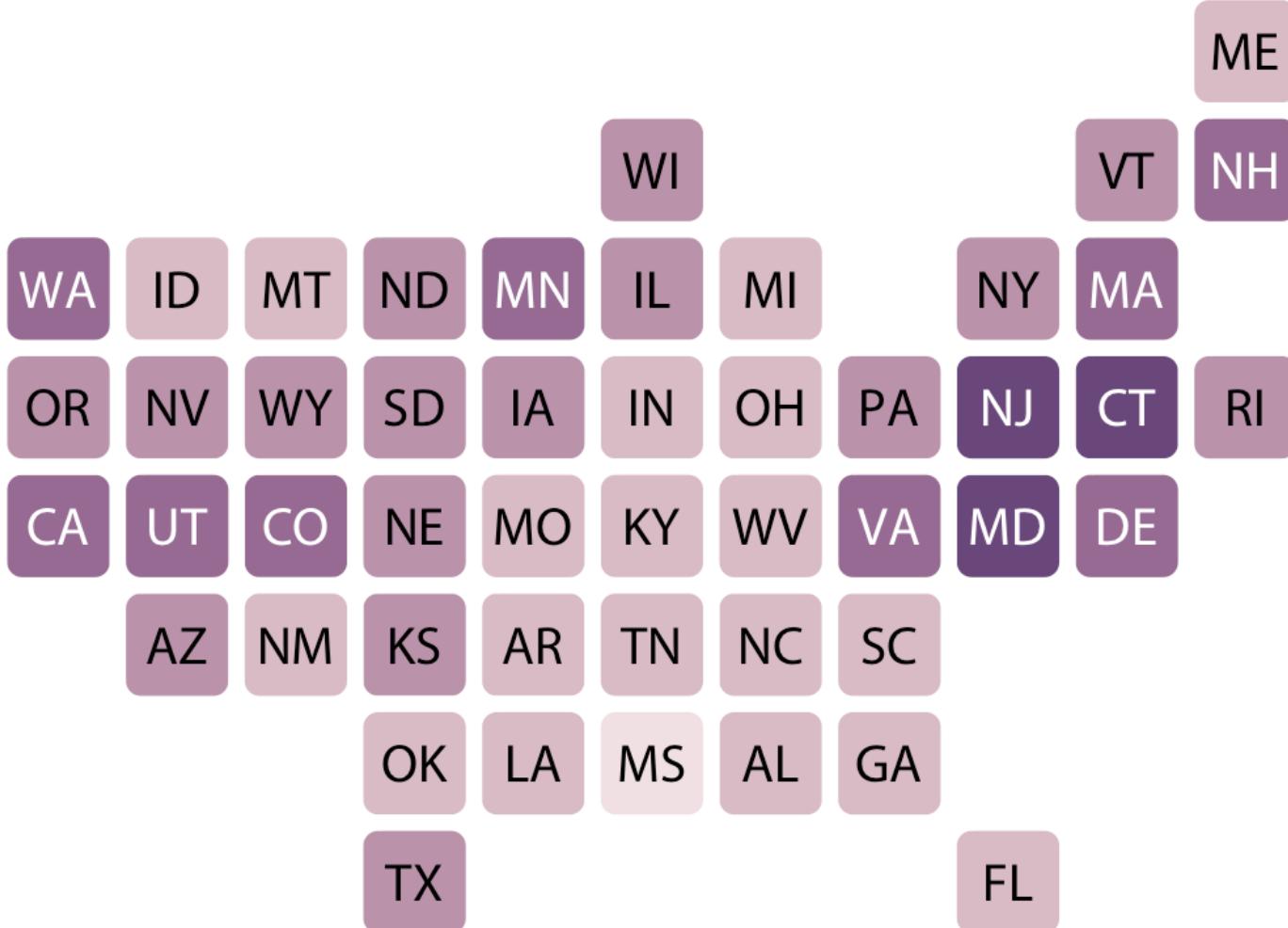
GDP



Example: Median income in every US state, shown as a cartogram heatmap

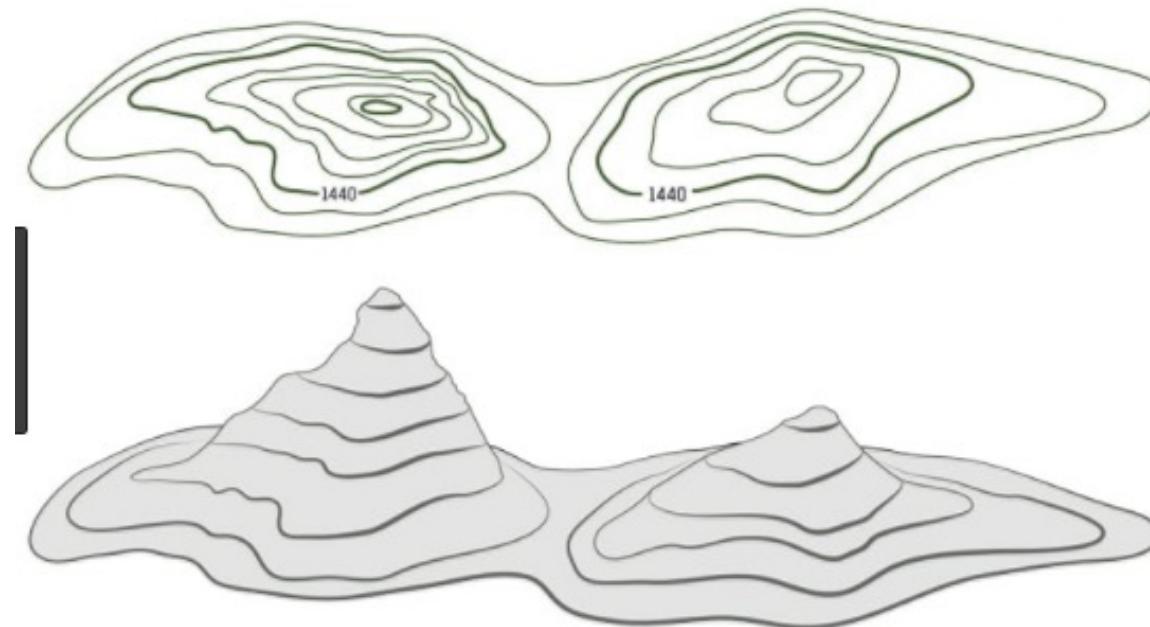
median income

- > \$70k
- \$60k to \$70k
- \$50k to \$60k
- \$40k to \$50k
- < \$40k

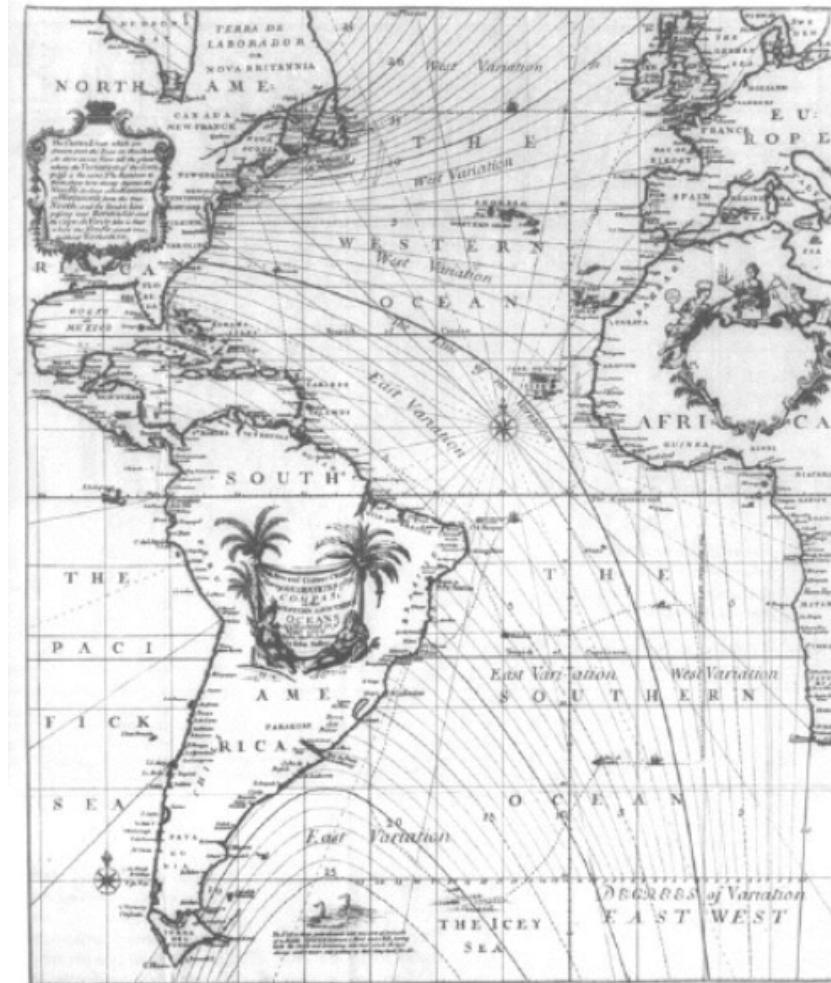


Contour map (bản đồ đường đẳng mức)

- Show the degree of similarity in the values of locations on the map through isometric lines

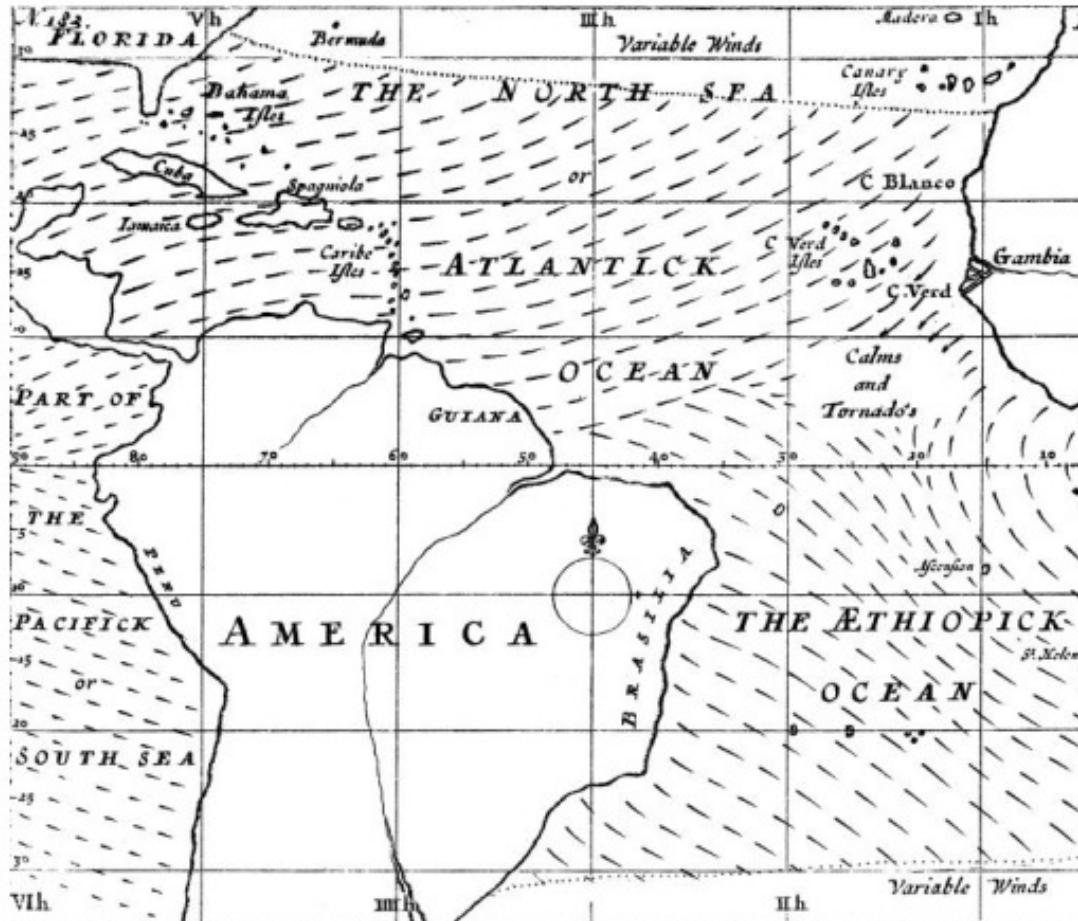


Contour map



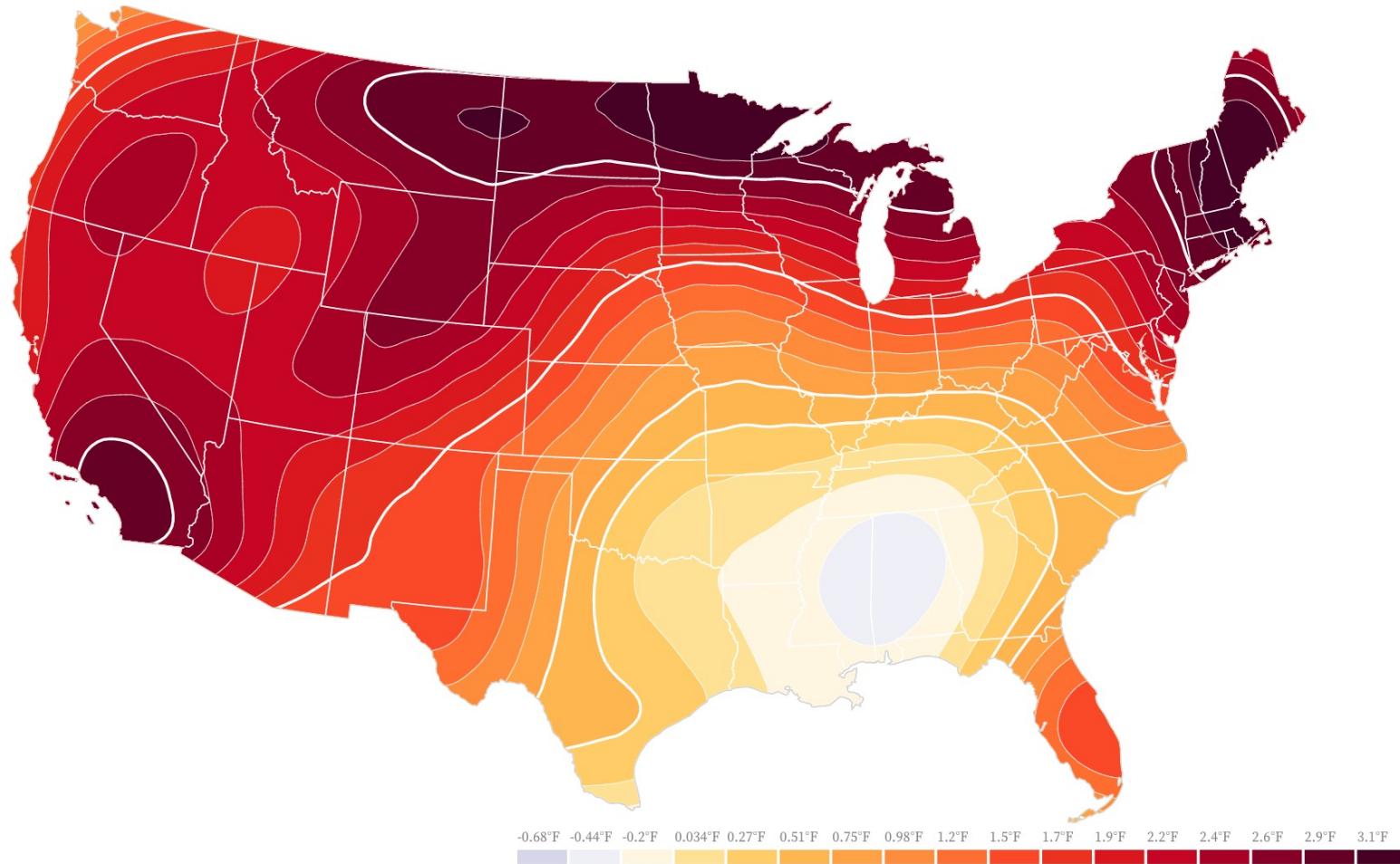
Halley's 1701 map showing isogonic lines of equal magnetic declination in the Atlantic Ocean.

Contour map



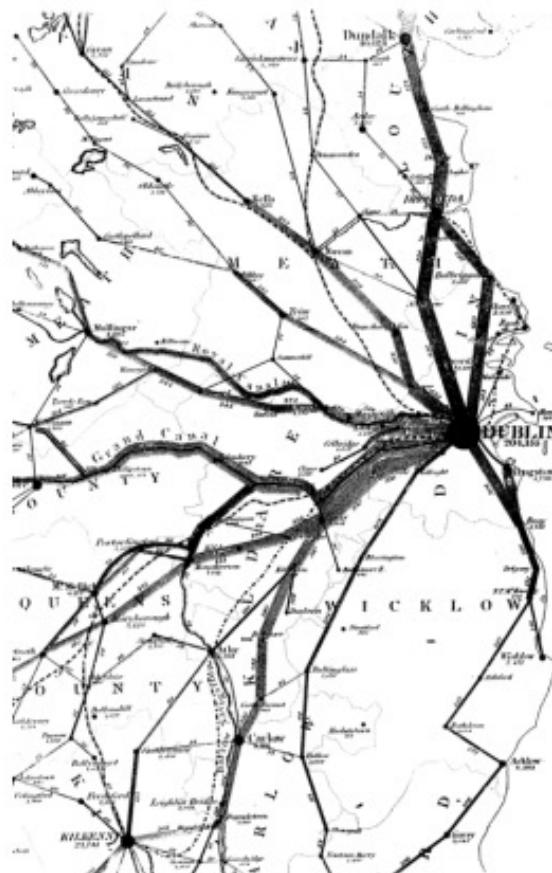
Example: a Contour Density Map from Choropleth Map

- <https://observablehq.com/@efrymire/gridding-map-files>



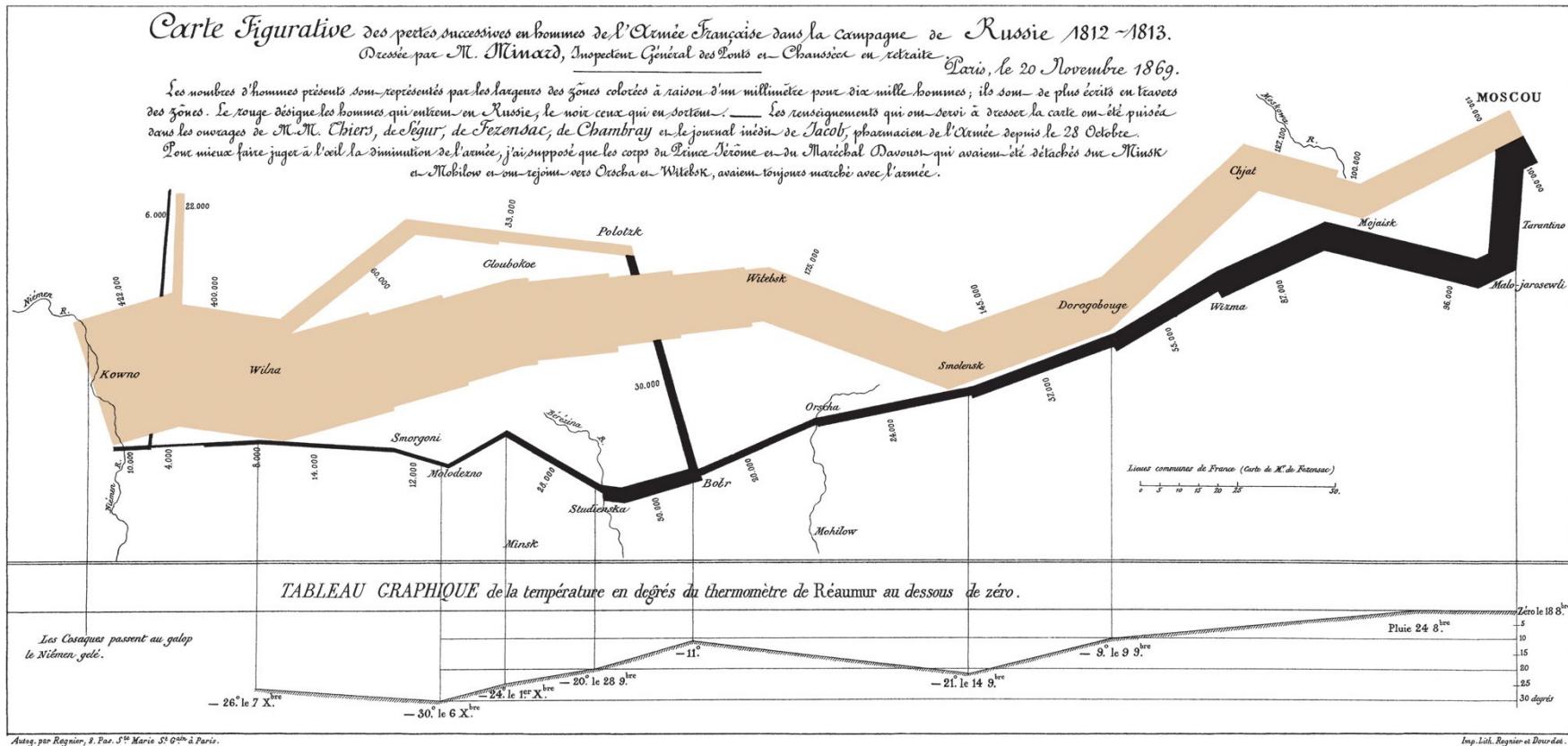
Flow map (bản đồ luồng)

- Combination of map and flow graph to represent the flow of objects from one location to another on the map (eg. Migration, exchange of goods, ...)



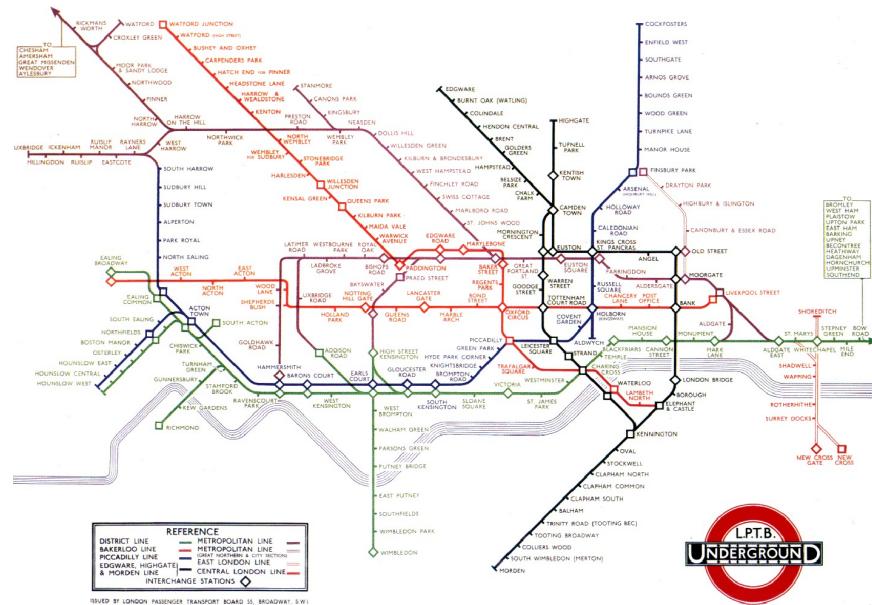
Transportation of Passengers
in Ireland
Henry Drury Harness, 1837

Minard 1869: Napoleon's march

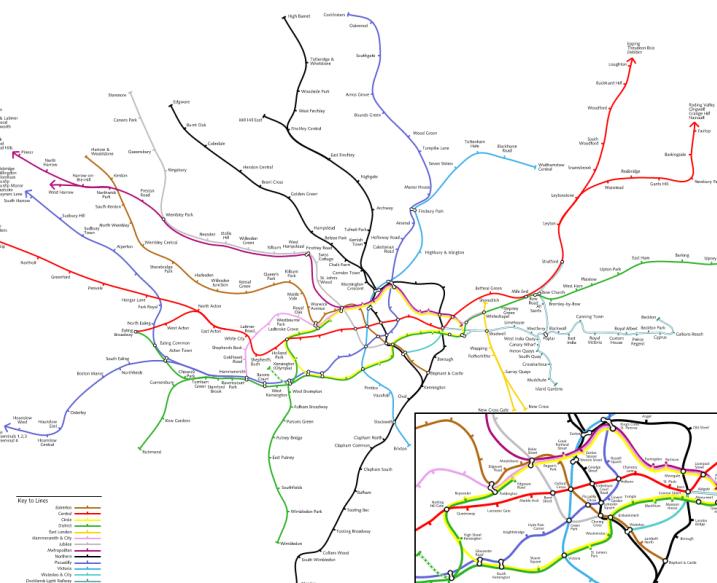


Beck's London tube diagram

London Underground [Beck 33]



Geographic version of map



Principle: Straighten lines to emphasize stop sequence

- <https://observablehq.com/@uwdata/cartographic-visualization>



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Thank you
for your
attention!!!

