Exploring and presenting maps with tmap

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References

- https://github.com/mtennekes/tmap

  Home page (README.md) contains installation instructions (Linux), links to vignettes, presentations, and blogs.

- Tennekes, M. (2017) *tmap: Thematic Maps in R.* Forthcoming in the Journal of Statistical Software

  Paper not available yet, but all example sections are on github.

Grammar of Graphics

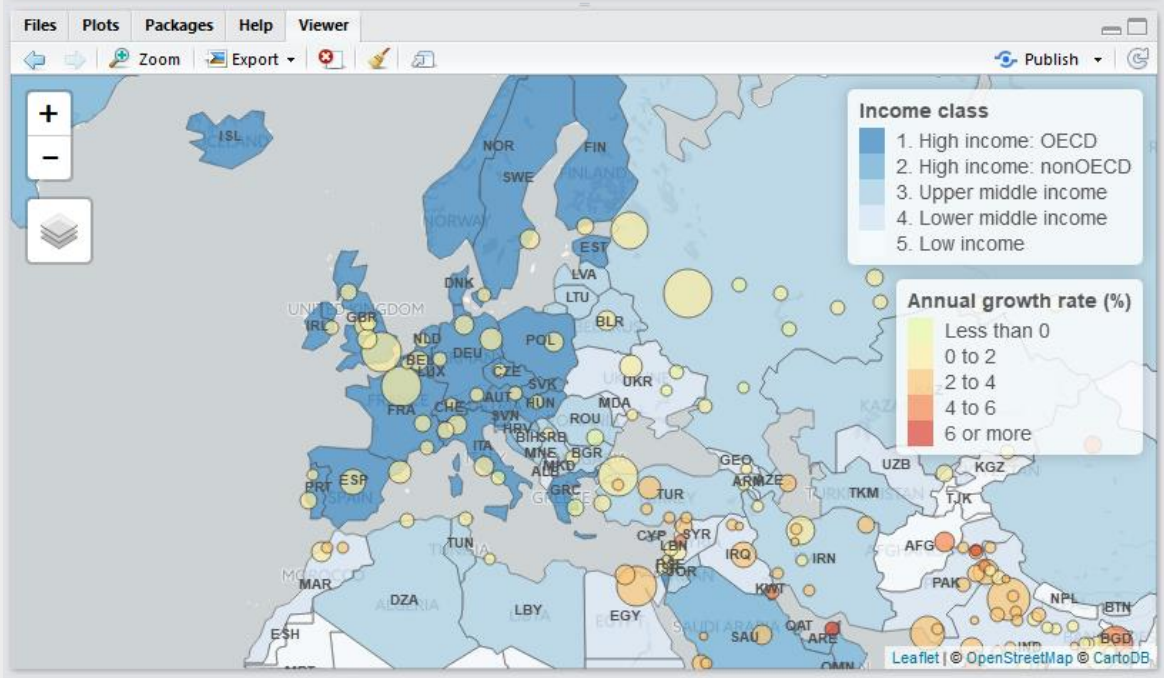
- **Grammar of Graphics** applied to spatial data visualization
- Alternative to ggplot2:
  - \+ Spatial objects (from **sp**, **raster**, and **sf** packages) can be used directly
  - \+ Layout optimized for maps (e.g. legend, map attributes)
  - \- Another package to learn …

	(Spatial) data	Layers (geometry, mapping, and scaling)	Small multiples	Layout	Quick plot
ggplot2	ggplot(…) +	geom_…(…) + scale_…(…) +	facet_wrap(…) +	theme(…)	qplot(…)
tmap	tm_shape(…) +	tm_…(…) +	tm_facets(…) +	tm_layout(…)	qtm(…)

Implemented: tm_polygons, tm_symbols, tm_lines, tm_raster, tm_text, tm_fill, tm_borders, tm_bubbles, tm_squares, tm_dots, tm_rgb, tm_markers, tm_iso

Spatic plot and interactive view

- Switch between **plot** and **view** mode with tmap_mode("plot") or tmap_mode("view")
- Toggle between modes with ttm()



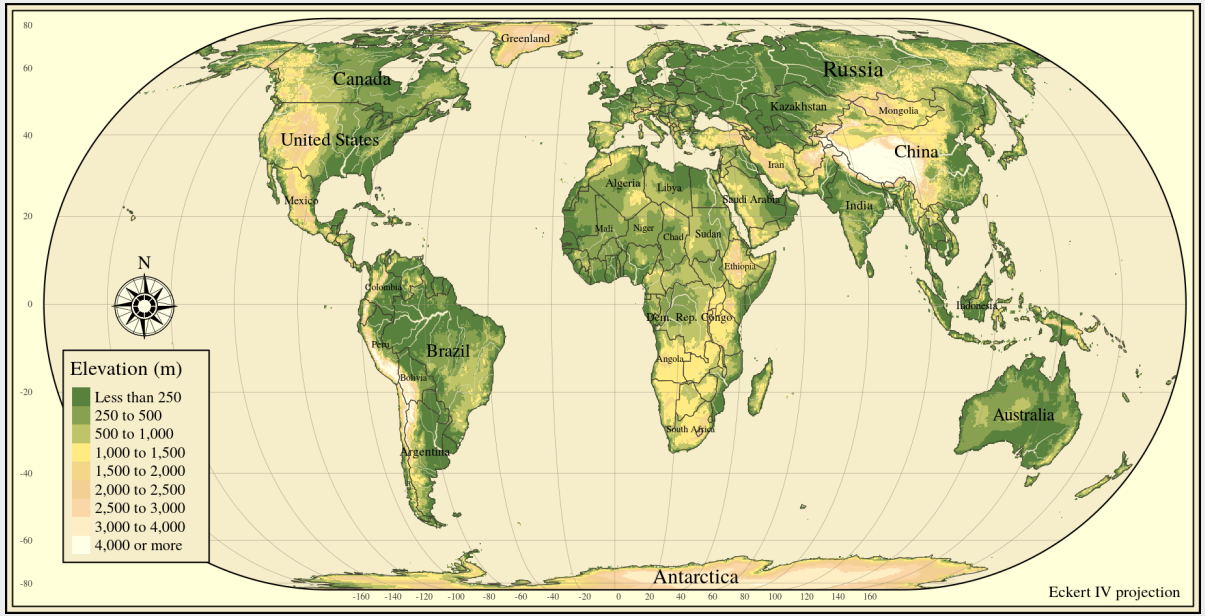

```
tm_shape(World) +
  tm_polygons("income_grp", ....) +
  tm_text("iso_a3", size = "AREA", ....) +
tm_shape(metro) +
  tm_bubbles("pop2010", col = "growth",
....) +
tm_format_World() +
tm_style_gray()
```

```
qtm(World, fill = "income_grp",
  text = "iso_a3",  text.size = "AREA") +
qtm(metro, symbols.size = "pop2010",
  symbols.col = "growth")
```

```
ttm()
last_map()
```

Map layout

- Attributes: compass, contribution text, grid lines, scale bar
- Styles, e.g. tm_style_grey, **tm_style_classic**.

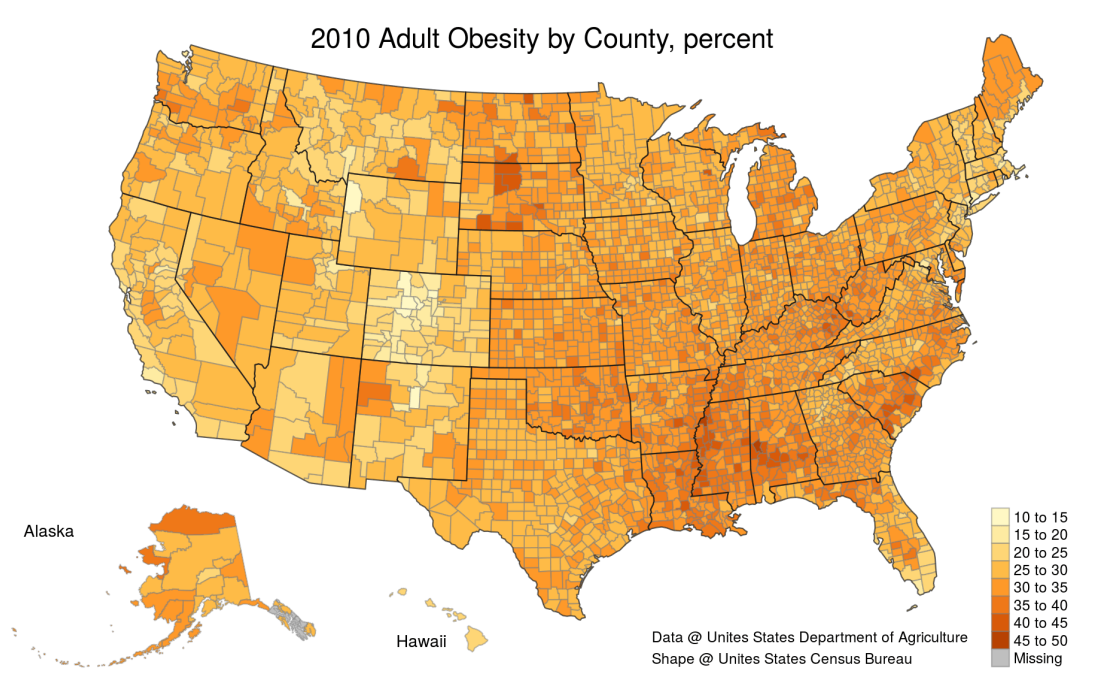



```
tm_shape(land) +
  tm_raster("elevation",  ...) +

tm_shape(rivers) +
  tm_lines("lightblue",
    lwd = "strokelwd", ...) +

tm_shape(World, is.master = TRUE) +
  tm_borders("gray20", lwd = .5) +
  tm_grid(projection = "longlat", ...) +
  tm_text("name", size = "AREA") +

tm_compass(...) +
tm_credits("Eckert IV projection",  ...) +
tm_style_classic()
```

```
qtm(land, raster = "elevation") +
qtm(World, fill=NULL)
```

Map insets

- Map insets are set using the **viewport** function of the **grid** package
- Alaska and Hawaii are plotted as insets:



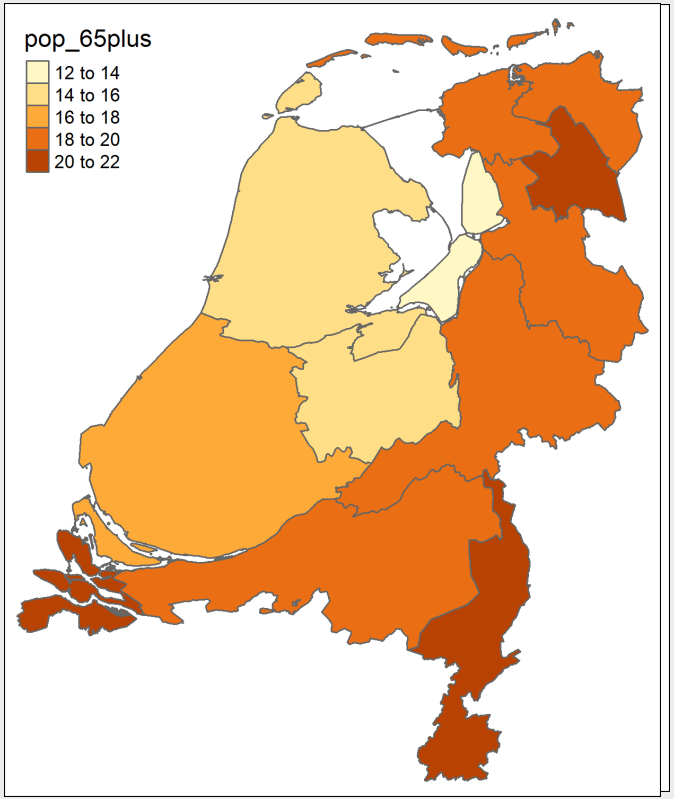
Small multiples

Small multiples can be defined in 3 ways:

1. By assigning multiple variables for one aesthetic
2. By specifying the **by** argument of tm_facets
3. By using tmap_arrange

```
tm_shape(london_osm) +
   tm_rgb() +
tm_shape(crimes_city) +
   tm_dots(size = 0.2) +
tm_facets(by = " Crime.type" )
```

Cartogram




```
# load cartogram package (thanks to  Sebastian Jeworutzki)
library(cartogram)

# load shape of Dutch provinces
data(NLD_prov)

# create cartogram shape
NLD_prov_pop <- cartogram(NLD_prov, "population")

# plot it
qtm(NLD_prov_pop, fill = "pop_65plus")

# export to png
save_tmap(filename = "cartogram.png", height=5)
```

tmaptools: package with helper functions

tmaptools contains useful helper functions, e.g.

- **bb** creates or modifies a bounding box
- **append_data** appends data.frame to spatial object (including feedback on over- and under coverage)
- **geocode_OSM** and **rev_geocode_OSM** query OpenStreetMap nominatim
- **palette_explorer** starts an interactive tool to explore ColorBrewer palettes

Related packages

Used packages:

- **sp**, **raster**, **rgdal**, **rgeos**, **classInt**, **RColorBrewer**
- graphics:
  - **grid** for static plots
  - **leaflet** for interactive plots (and some functions from **mapview**)

Alternatives packages:

Static:

- **sp**, **raster**
- **ggplot** (and **ggmap**),
- **choroplethr**, **GISTools**, **cartography**, **rworldmap**, **maps**

Interactive:

- **leaflet**
- **mapview**
- **plotGoogleMaps**

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