

Quick high quality maps with R

Jan-Philipp Kolb

23 6 2021

Preliminaries

Quick high
quality maps
with R

Jan-Philipp
Kolb

- Usually I have big differences in knowledge and abilities of the participants - please tell, if it is too fast or slow.
- We have lots of hands-on coding **exercises** - later you can only learn on your own
- We have many **examples** - try them
- If there are questions - always ask
- R is more fun together - strong proponent of collaborative work!

What is the purpose of this course

Quick high
quality maps
with R

Jan-Philipp
Kolb

- Quick
- Easy to use

Getting help on packages

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
# provides details regarding contents of a package  
help(package = "osmplotr")  
# list vignettes available for a specific package  
vignette(package="osmplotr")  
# view specific vignette  
vignette("data-maps")
```

The World dataset

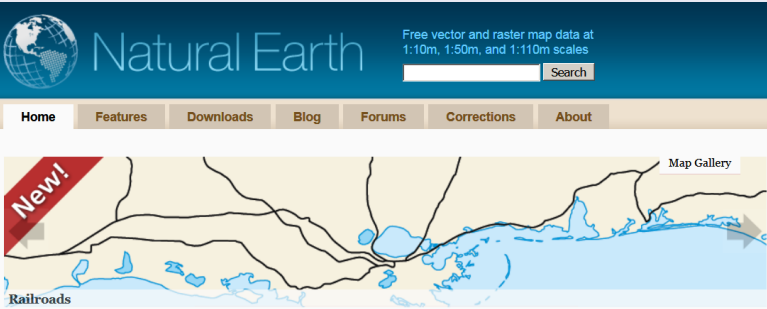
Quick high
quality maps
with R

Jan-Philipp
Kolb

Natural Earth

- Dataset contains information from **Natural Earth**

`data(World)`



The screenshot shows the Natural Earth website. At the top, there is a dark blue header with a globe icon on the left, the text "Natural Earth" in the center, and "Free vector and raster map data at 1:10m, 1:50m, and 1:110m scales" on the right. Below the header is a navigation bar with links: Home, Features, Downloads, Blog, Forums, Corrections, and About. The main content area features a map of the world with a red banner in the top left corner that says "New!". The map is labeled "Railroads" in the bottom left and "Map Gallery" in the top right. Below the map, there is a paragraph of text: "Natural Earth is a public domain map dataset available at 1:10m, 1:50m, and 1:110 million scales. Featuring tightly integrated vector and raster data, with Natural Earth you can make a variety of visually pleasing, well-crafted maps with cartography or GIS software."

Natural Earth

Free vector and raster map data at
1:10m, 1:50m, and 1:110m scales

Search

Home Features Downloads Blog Forums Corrections About

New!

Railroads

Map Gallery

Natural Earth is a public domain map dataset available at 1:10m, 1:50m, and 1:110 million scales. Featuring tightly integrated vector and raster data, with Natural Earth you can make a variety of visually pleasing, well-crafted maps with cartography or GIS software.

The qtm command from the tmap package

Fast thematic map

- With the command **qtm** you can create a fast thematic map
- Example from the **Vignette** for the tmap package

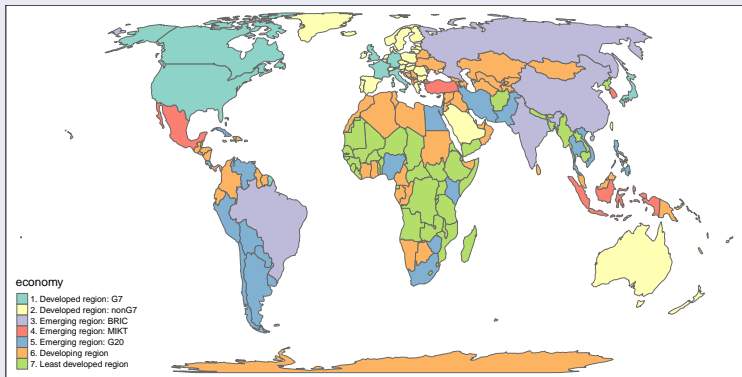
```
library(tmap)  
data(World)  
qtm(World)
```



To get more color in the map

economic development status

```
qtm(World, fill="economy")
```



Quick high
quality maps
with R

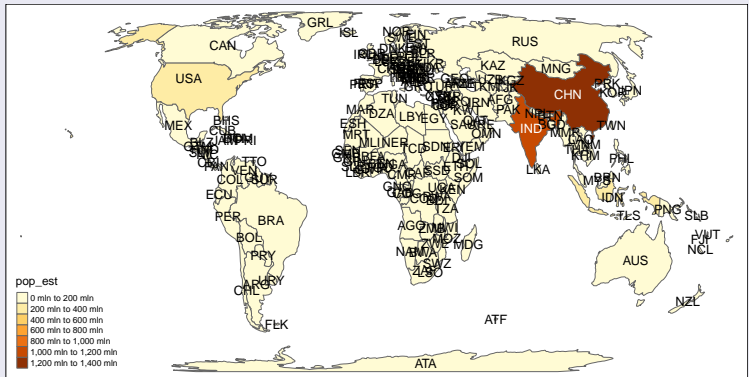
Jan-Philipp
Kolb

A map with text

Quick high
quality maps
with R

Population

```
qtm(World, fill="pop_est", text="iso_a3")
```



This Scheme is better:

GDP

```
qtm(World, fill="gdp_cap_est", text="iso_a3",  
text.size="AREA", root=5, fill.title="GDP per cap",  
fill.textNA="Non-European countries", theme="Euro
```



Quick high
quality maps
with R

Jan-Philipp
Kolb

Topics of the World dataset

Quick high
quality maps
with R

Jan-Philipp
Kolb

Available variables in the data set

- **ISO classification**
- country name
- Area, population, population density,
- **Gross Domestic Product**
- Gross domestic product **at purchasing power parities**
- Economy, income group

The World Dataset - Variables and what's behind

Quick high
quality maps
with R

Jan-Philipp
Kolb

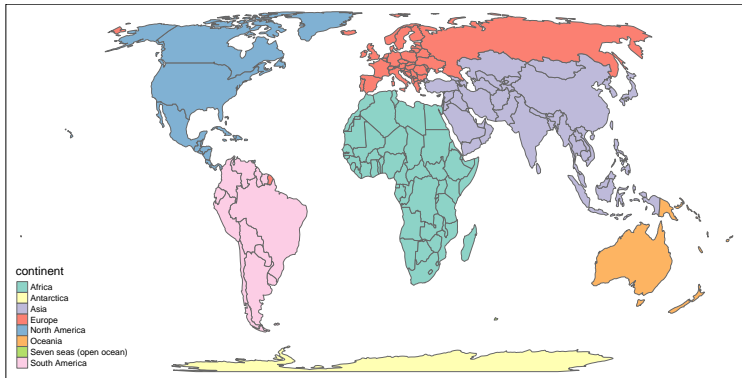
iso_a3	name	sovereight	continent
AFG	Afghanistan	Afghanistan	Asia
AGO	Angola	Angola	Africa
ALB	Albania	Albania	Europe
ARE	United Arab Emirates	United Arab Emirates	Asia
ARG	Argentina	Argentina	South A
ARM	Armenia	Armenia	Asia
ATA	Antarctica	Antarctica	Antarctic
ATF	Fr. S. Antarctic Lands	France	Seven se

The variable continent

```
qtm(World, fill="continent")
```

Quick high
quality maps
with R

Jan-Philipp
Kolb

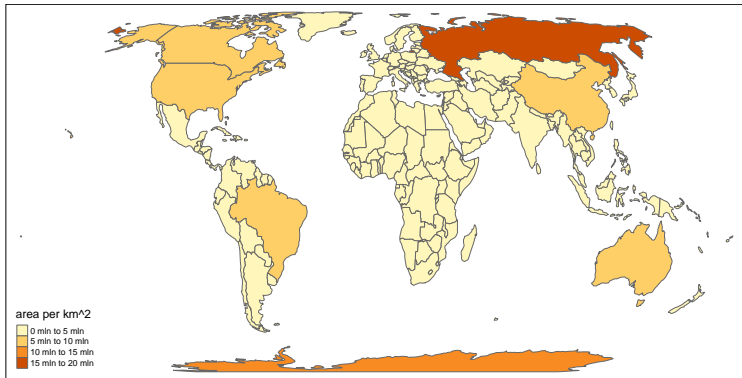


The variable area

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
qtm(World, fill="area") # Russia is huge
```

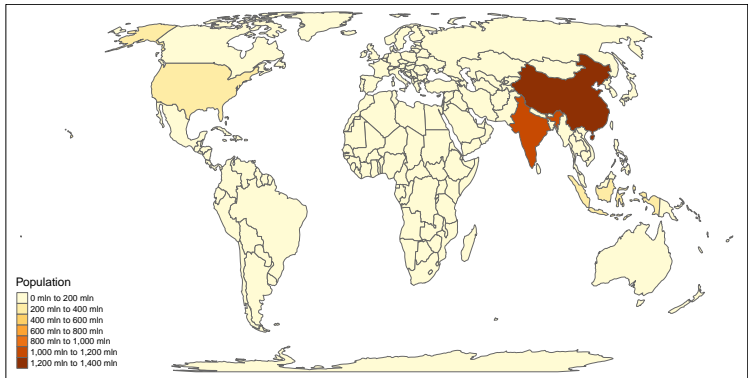


Population

```
qtm(World, fill="pop_est", fill.title="Population")
```

Quick high
quality maps
with R

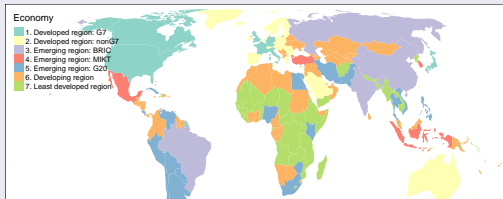
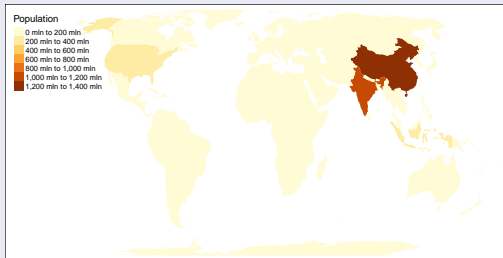
Jan-Philipp
Kolb



Two maps

Population and level of development

```
tm_shape(World) + tm_fill(c("pop_est", "economy"),  
  title=c("Population", "Economy"))
```



Quick high
quality maps
with R

Jan-Philipp
Kolb

Netherlands - Population in the provinces

Quick high
quality maps
with R

Jan-Philipp
Kolb

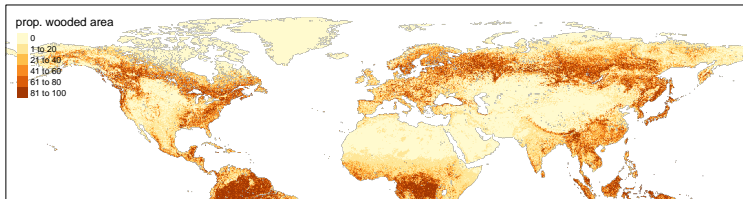
```
qtm(NLD_prov, fill="population", fill.title="population")
```

```
data(land)
```

```
data(World)
```

```
tm_shape(land, relative=FALSE) +  
  tm_raster("trees", title="prop. wooded area")
```

```
## Linking to GEOS 3.8.0, GDAL 3.0.4, PROJ 6.3.1
```

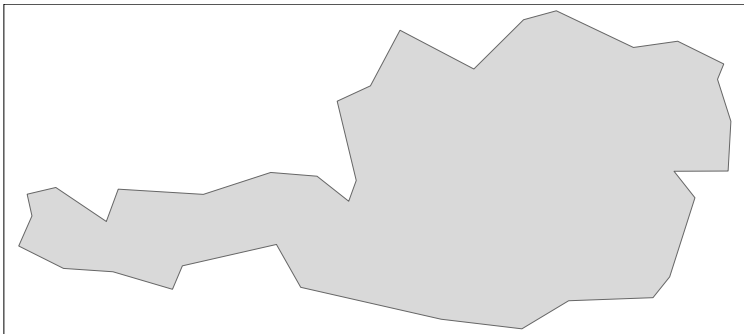


Visualize only one country

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
tm_shape(World[World$name=="Austria", ]) +  
  tm_polygons()
```



Load example data

Quick high
quality maps
with R

Jan-Philipp
Kolb

Data source Eurostat

- Data about unemployment in Europe

```
url <- "https://raw.githubusercontent.com/Japhilko/  
GeoData/master/2015/data/Unemployment07a13.csv"
```

```
Unemp <- read.csv(url)
```

Excursus: the command match

Quick high
quality maps
with R

Jan-Philipp
Kolb

Create two example vectors

```
vec_a <- c("A",2,6,1,"C")  
vec_b <- c(1,"C",2)
```

Bringing the two vectors together

- With the function `match` you can see which element of the first vector matches the second vector.

```
match(vec_a,vec_b)
```

```
## [1] NA 3 NA 1 2
```

Use the package tmap with your data

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
library("tmap")
```

Match the data

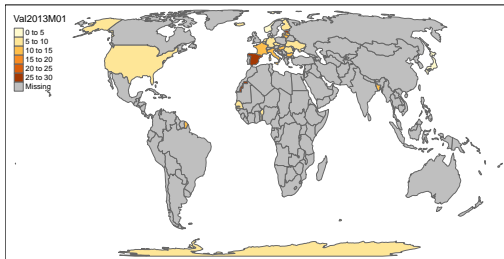
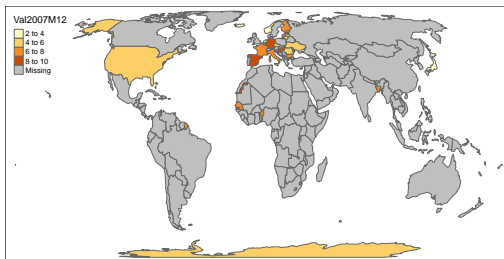
```
iso_a2<- substr(World$iso_a3,1,2)
ind <- match(iso_a2,Unemp$GEO)
World$Val2007M12 <- Unemp$Val2007M12[ind]
World$Val2013M01 <- Unemp$Val2013M01[ind]
```

Plot a map

```
qtm(World, c("Val2007M12", "Val2013M01"))
```

Quick high
quality maps
with R

Jan-Philipp
Kolb



Exercise: Visualisation of Eurostat data

Quick high
quality maps
with R

Jan-Philipp
Kolb

First part - plot a map

- Download and import the data `unemprate_by_sex.csv` from ILIAS.
- Link the data with `map data` .
- Visualise the linked data in a map.

If you have that:

- Search for example **here** for datasets containing the country name and visualize the data with `tmap`.

The World-Dataset

Quick high
quality maps
with R

Jan-Philipp
Kolb

The World Dataset in Package tmap

RPubs brought to you by ElStatdo

Show 10 entries Search:

	iso_a3	name	sovereign	continent	subregion	area	pop_est	pop_est_dens	gdp_md_est	gdp_cap_est	economy	income_grp	life_exp	well_being	HPI
2	AFG	Afghanistan	Afghanistan	Asia	Southern Asia	652860	28400000	43.5009037159575	22270	784.154929577465	7. Least developed region	5. Low income	48.7	4.75838085759722	36.753657778004
3	AGO	Angola	Angola	Africa	Middle Africa	1246700	12799293	10.2665380604797	110300	8617.6634912569	7. Least developed region	3. Upper middle income	51.1	4.20609164016618	33.2014320444336
5	ALB	Albania	Albania	Europe	Southern Europe	27400	3639453	132.826751824818	21810	5992.65878691111	6. Developing region	4. Lower middle income	76.9	5.26893660419411	54.051180970208
8	ARE	United Arab Emirates	United Arab Emirates	Asia	Western Asia	83690	4798491	57.3982177033493	184300	38407.907819554	6. Developing region	2. High income: nonOECD	76.5	7.19680309333638	31.778274185231
9	ARG	Argentina	Argentina	South America	South America	2736690	40913384	14.9500250302373	573900	14027.1260518267	5. Emerging region: G20	3. Upper middle income	75.9	6.44106720496824	54.0550416711541
10	ARM	Armenia	Armenia	Asia	Western Asia	28470	2967004	104.215103617843	18770	6326.24694809983	6. Developing region	4. Lower middle income	74.2	4.36781129220333	46.0031857989857
12	ATA	Antarctica	Antarctica	Antarctica	Antarctica	10866664	4069415	3802	0.000349877373370556		6. Developing region	2. High income: nonOECD			
14	ATF	Fr. S. Antarctic Lands	France	Seven seas (open ocean)	Seven seas (open ocean)	6187.20529564552	140	0.022627340343523	16	114285.714285714	6. Developing region	2. High income: nonOECD			
16	AUS	Australia	Australia	Oceania	Australia and New Zealand	7682300	21262641	2.78774416515887	800200	37634.0831790369	2. Developed region: nonG7	1. High income: OECD	81.9	7.40561614889191	41.9798119494163
17	AUT	Austria	Austria	Europe	Western Europe	82409	8210281	99.6284507766075	329500	40132.6093467446	2. Developed region: nonG7	1. High income: OECD	80.9	7.34603595780621	47.0851352018778

The package tmaptools

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
library(tmaptools)
```

```
citation("tmaptools")
```

```
##
```

```
## To cite package 'tmaptools' in publications use:
```

```
##
```

```
##   Martijn Tennekes (2020). tmaptools: Thematic Map
```

```
##   version 3.1. https://CRAN.R-project.org/package=
```

```
##
```

```
## A BibTeX entry for LaTeX users is
```

```
##
```

```
##   @Manual{,
```

```
##     title = {tmaptools: Thematic Map Tools},
```

```
##     author = {Martijn Tennekes},
```

```
##     year = {2020},
```

```
##     note = {R package version 3.1},
```


Geocoordinates

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
(gc_z <- geocode_OSM("Zürich"))
```

```
## $query
```

```
## [1] "Zürich"
```

```
##
```

```
## $coords
```

```
##           x           y
```

```
##  8.541042 47.374449
```

```
##
```

```
## $bbox
```

```
##      xmin      ymin      xmax      ymax
```

```
##  8.448006 47.320220  8.625441 47.434666
```

Necessary packages

Quick high
quality maps
with R

Jan-Philipp
Kolb

```
library(osmplotr)
```

```
## Data (c) OpenStreetMap contributors, ODbL 1.0. http://
```

```
library(tmap)
```

Buildings within a bounding box

Quick high
quality maps
with R

Jan-Philipp
Kolb

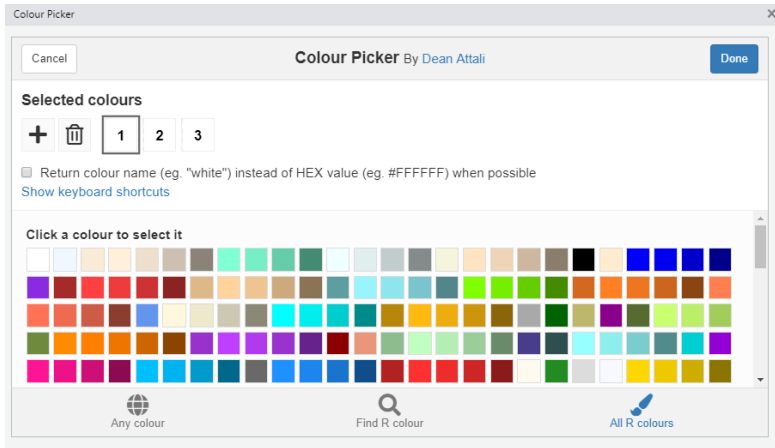
```
bbox <- get_bbox (c(8.4539 , 49.4805 , 8.4774 , 49.4  
dat_M <- extract_osm_objects (key = 'building', bbox  
qtm(dat_M,fill=c("purple"),borders="black")
```



Colour picker

Quick high
quality maps
with R

Jan-Philipp
Kolb



30daymapchallenge

Quick high
quality maps
with R

Jan-Philipp
Kolb