

# A3 - Das R-Paket tmap

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22 Oktober 2018

# Das Paket tmap

- Mit dem Paket **tmap** kann man thematische Karten erzeugen
- Die folgenden Beispiele sind auf der **Vignette** des Paketes basiert.

```
install.packages("tmap")
```

```
library(tmap)
```

# Schnelle thematische Karte

- Mit dem Befehl **qtm** kann man eine schnelle thematische Karte erzeugen
- Beispiel aus der **Vignette** zum Paket tmap

```
data(Europe)  
qtm(Europe)
```



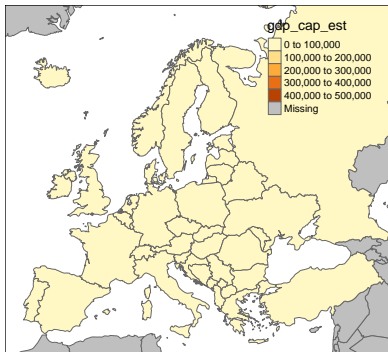
# Der Europa-Datensatz

	iso_a3	name	sovereignty	continent
5	ALB	Albania	Albania	Europe
6	ALA	Aland	Finland	Europe
7	AND	Andorra	Andorra	Europe
10	ARM	Armenia	Armenia	Asia
17	AUT	Austria	Austria	Europe
18	AZE	Azerbaijan	Azerbaijan	Asia
20	BEL	Belgium	Belgium	Europe
24	BGR	Bulgaria	Bulgaria	Europe
27	BIH	Bosnia and Herz.	Bosnia and Herzegovina	Europe
29	BLR	Belarus	Belarus	Europe

# Um mehr Farbe in die Karte zu bekommen

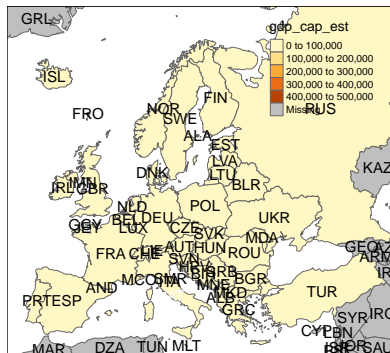
- Visualisierung von **Natural Earth** Daten

```
qtm(Europe, fill="gdp_cap_est")
```



# Eine Karte mit Text

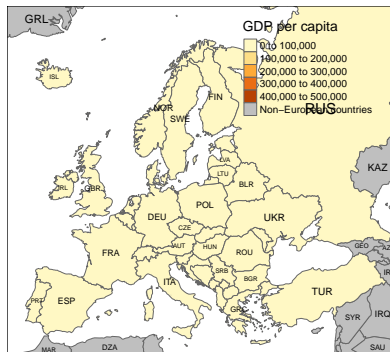
```
qtm(Europe, fill="gdp_cap_est", text="iso_a3")
```



# Dieses Schema passt besser:

## Bevölkerungsdichte

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



# Themen des Europa-Datensatzes

- **ISO Klassifikation**
- Ländername
- Ist das Land Teil Europas?
- Fläche, Bevölkerung, Bevölkerungsdichte,
- **Bruttoinlandsprodukt**
- Bruttoinlandsprodukt **zu Kaufkraftparitäten**
- Ökonomie, Einkommensgruppe

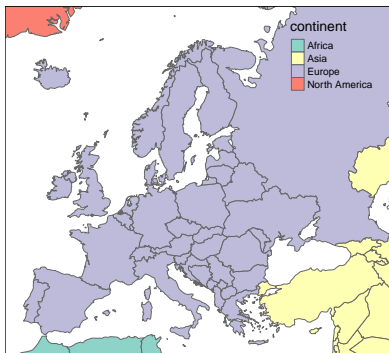


# Der Europa Datensatz - Variablen und was dahinter steckt

	iso_a3	name	sovereight	continent	part
5	ALB	Albania	Albania	Europe	Southern Europe
6	ALA	Aland	Finland	Europe	Northern Europe
7	AND	Andorra	Andorra	Europe	Southern Europe
10	ARM	Armenia	Armenia	Asia	NA
17	AUT	Austria	Austria	Europe	Western Europe
18	AZE	Azerbaijan	Azerbaijan	Asia	NA
20	BEL	Belgium	Belgium	Europe	Western Europe
24	BGR	Bulgaria	Bulgaria	Europe	Eastern Europe

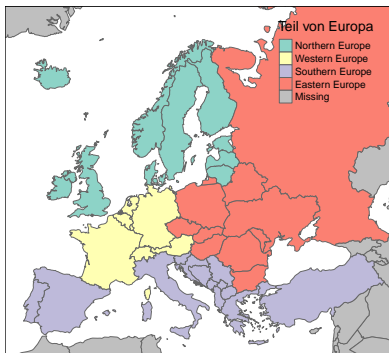
# Die Variable continent

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



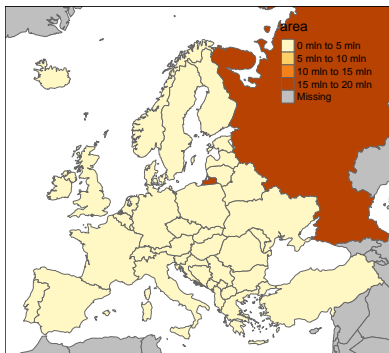
# Die Variable part

```
qtm(Europe, fill="part",fill.title="Teil von Europa")
```



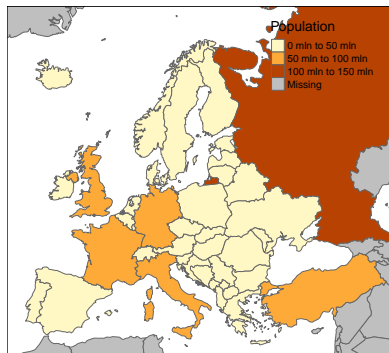
# Die Variable area

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



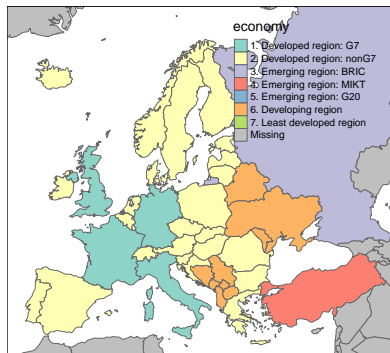
# Bevölkerung

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



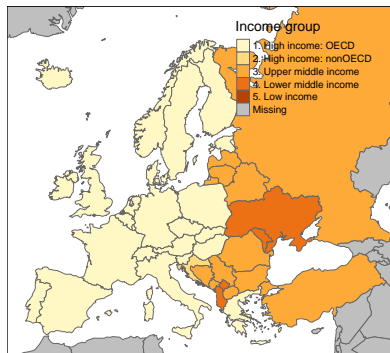
# Ökonomie

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



# Einkommensgruppe

```
qtm(Europe, fill="income_grp",fill.title="Income group")
```



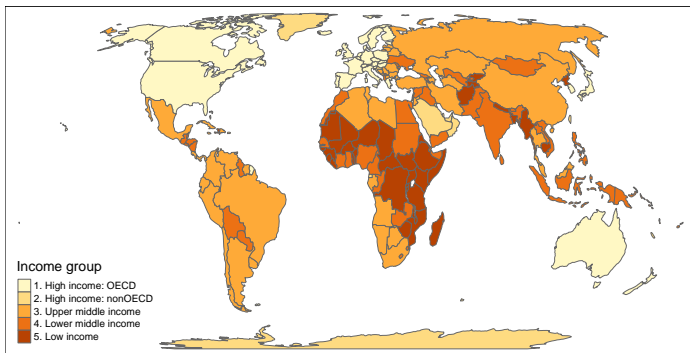
## Der Welt-Datensatz im Paket tmap

	iso_a3	name	sovereignty	continent
2	AFG	Afghanistan	Afghanistan	Asia
3	AGO	Angola	Angola	Africa
5	ALB	Albania	Albania	Europe
8	ARE	United Arab Emirates	United Arab Emirates	Asia
9	ARG	Argentina	Argentina	South America
10	ARM	Armenia	Armenia	Asia
12	ATA	Antarctica	Antarctica	Antarctica
14	ATF	Fr. S. Antarctic Lands	France	Seven seas (o)
16	AUS	Australia	Australia	Oceania
17	AUT	Austria	Austria	Europe
18	AZE	Azerbaijan	Azerbaijan	Asia
19	BDI	Burundi	Burundi	Africa
20	BEL	Belgium	Belgium	Europe
21	BEN	Benin	Benin	Africa
22	BEA	Burkina Faso	Burkina Faso	Africa



# Welt - Länder nach Einkommensgruppe

```
qtm(World, fill="income_grp",fill.title="Income group")
```

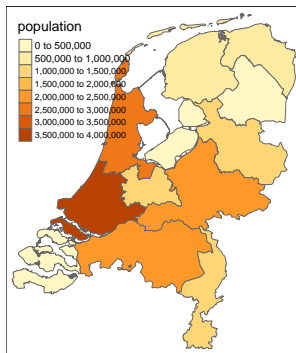


## Ein Datensatz zu den Provinzen in den Niederlanden (R-Paket tmap)

	code	name	population	pop_men	pop_women	pop_0_14
0	20	Groningen	582705	289795	292875	15
1	21	Friesland	646290	323215	323055	17
2	22	Drenthe	488970	242225	246755	17
3	23	Overijssel	1139680	570185	569465	18
4	24	Flevoland	399885	199940	199940	20
5	25	Gelderland	2019635	997805	1021790	17

# Niederlande - Bevölkerung in den Provinzen

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



## Anteile berechnen

```
pop <- NLD_prov@data$population
pop
```

```
## [1] 582705 646290 488970 1139680 399885 2019635 125364
## [9] 3576960 380610 2479220 1119980
```

```
popmen <- NLD_prov@data$pop_men
popmen
```

```
## [1] 289795 323215 242225 570185 199940 997805 61364
## [9] 1764855 188655 1238600 555450
```

```
prop <- popmen/pop
prop
```

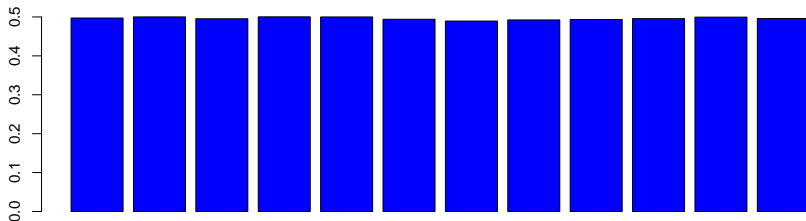
```
## [1] 0.4973271 0.5001083 0.4953780 0.5003027 0.4999937 0.49
```

# Exkurs: Barplot vom Männeranteil

```
barplot(prop)
```

## Barplot mit Farbe

```
barplot(prop,col="blue")
```

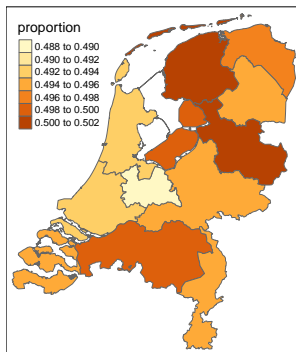


# Niederlnade - Anteil Männer

Information in Datensatz einspeisen

```
NLD_prov@data$proportion <- prop
```

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



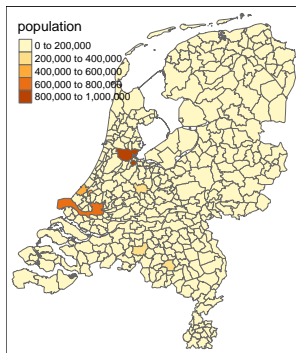
# Ein Datensatz zu den Gemeinden in den Niederlanden

```
data(NLD_muni)
```

	name	province	population
0	Appingedam	Groningen	12065
1	Bedum	Groningen	10495
2	Bellingwedde	Groningen	8920
3	Ten Boer	Groningen	7480
4	Delfzijl	Groningen	25695
5	Groningen	Groningen	198315
6	Grootegeest	Groningen	12165
7	Haren	Groningen	18780
8	Hoogezand-Sappemeer	Groningen	34305
9	Leek	Groningen	19595
10	Loppersum	Groningen	10195

# Bevölkerung der Gemeinden in den Niederlanden

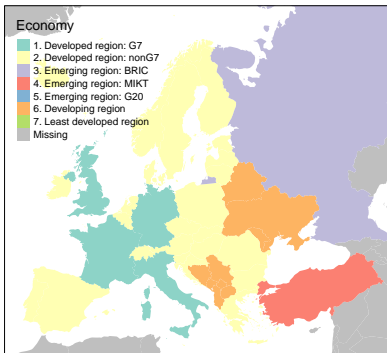
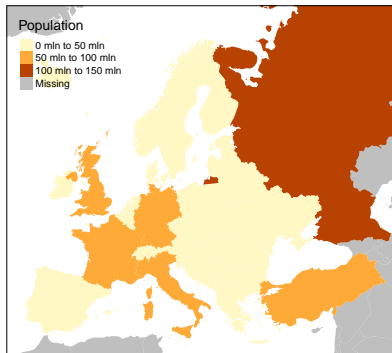
```
qtm(NLD_muni, fill="population")
```





# Zwei Karten

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



# Räumliche Daten zur Flächennutzung

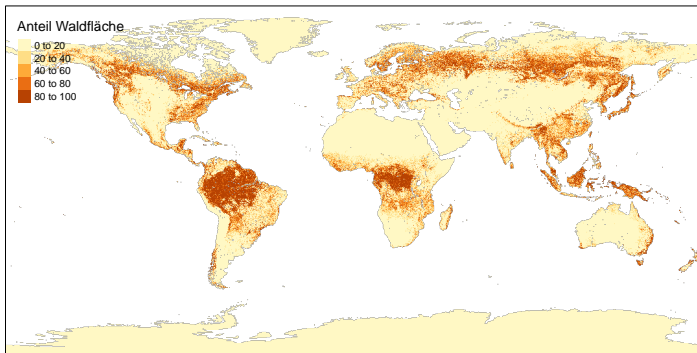
```
data(land)
```

```
data(World)
```

	cover_cls	trees
215556	Bare area/Sparse vegetation	0
137686	Water	NA
44785	Water	NA
88234	Other natural vegetation	1
286270	Water	NA
146833	Water	NA
307784	Water	NA
458432	Water	NA
211482	Forest	96
493482	Water	NA

# Weltweite Flächennutzung

```
tm_shape(land, relative=FALSE) +  
  tm_raster("trees", title="Anteil Waldfläche")
```



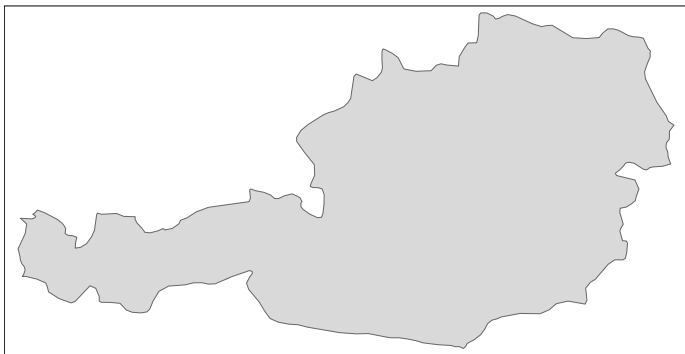
# Räumliche Daten zu Metropolregionen

```
data(metro)
```

	name	name_long	iso_a3	pop1950	pop1960	pop
2	Kabul	Kabul	AFG	170784	285352	47
8	Algiers	El Djazair (Algiers)	DZA	516450	871636	128
13	Luanda	Luanda	AGO	138413	219427	45
16	Buenos Aires	Buenos Aires	ARG	5097612	6597634	810
17	Cordoba	Cordoba	ARG	429249	605309	80
25	Rosario	Rosario	ARG	554483	671349	81
32	Yerevan	Yerevan	ARM	341432	537759	77
33	Adelaide	Adelaide	AUS	429277	571822	85
34	Brisbane	Brisbane	AUS	441718	602999	90
37	Melbourne	Melbourne	AUS	1331966	1851220	249

# Nur ein Land visualisieren

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



# Beispieldaten laden

## Datenquelle Eurostat

- Daten zur Arbeitslosigkeit in Europa

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

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

# Überblick über die Daten

X	GEO	Val2007M12	Val2013M01
9316	EU28	6.9	10.9
9325	EU27	6.9	10.9
9334	EU25	6.9	11.0
9343	EU15	6.9	11.1
9352	EA	7.3	12.0
9361	EA19	7.3	12.0
9370	EA18	7.4	12.0
9379	EA17	7.4	12.0
9388	EA16	7.4	12.0
9397	EA15	7.3	12.0

# Nutzung des Paketes tmap mit eigenen Daten

```
library("tmap")  
data(Europe)
```

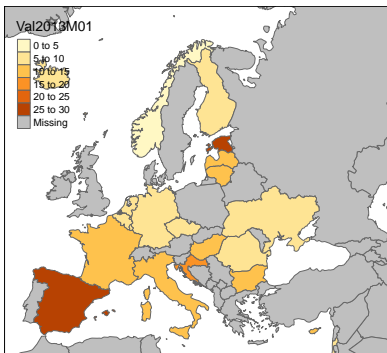
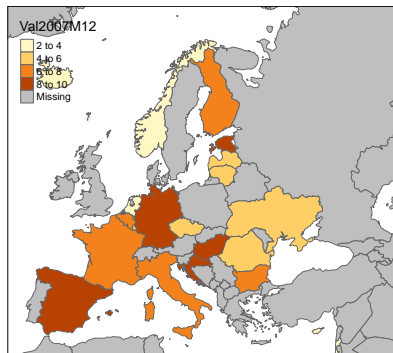
## Die Daten matchen

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



# Eine Karte erzeugen

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



# Kleine und viele Karten

```
tm_shape(Europe[Europe$continent=="Europe",]) +  
  tm_fill("part", thres.poly = 0) +  
  tm_facets("name", free.coords=TRUE)
```



# tmap zitieren

```
citation("tmap")
```

```
##  
## To cite tmap/tmaptools in publications use:  
##  
## Tennekes M (2018). "tmap: Thematic Maps in R." _Journal of  
## Statistical Software_, *84*(6), 1-39. doi: 10.18637/jss.v084.i06  
## (URL: http://doi.org/10.18637/jss.v084.i06).  
##  
## A BibTeX entry for LaTeX users is  
##  
## @Article{,  
##   title = {{tmap}: Thematic Maps in {R}},  
##   author = {Martijn Tennekes},  
##   journal = {Journal of Statistical Software},  
##   year = {2018}
```