# tmap: get started!

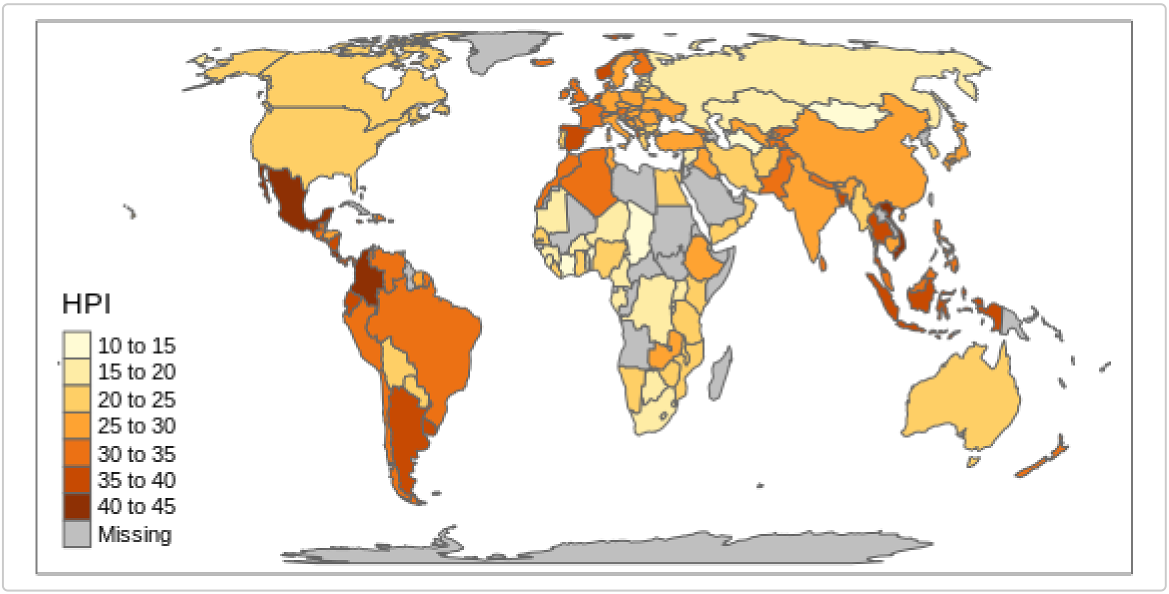
With the tmap package, thematic maps can be generated with great flexibility. The syntax for creating plots is similar to that of `ggplot2`, but tailored to maps. This vignette is for those who want to get started with tmap within a couple of minutes. A more detailed description of tmap can be found in an article published in the Journal of Statistical Software (JSS), which describes tmap version 1.11-2. The changes in version 2.0 are described in `vignette("tmap-changes")`.

For more context on R’s geographic capabilities there are a number of online resources including the vignettes of the `sf` package, the website rspatial.org and the online version of the book Geocomputation with R. The Making maps with R chapter of the book provides many more context and abundant code examples of map making with `tmap` and other packages.

## Hello World!

A good place to start is to create a map of the world. After installing tmap, the following lines of code should create the map shown below:

```
library(tmap)
data("World")

tm_shape(World) +
    tm_polygons("HPI")
```

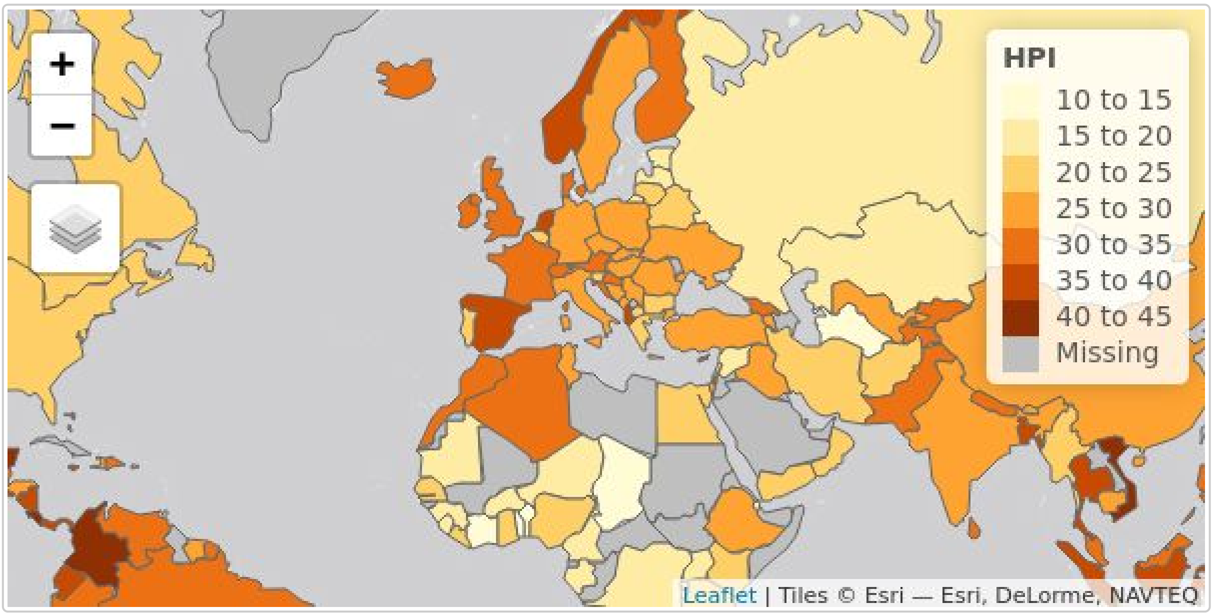


The object `World` is a spatial object of class `sf` from the sf package; it is a `data.frame` with a special column that contains a geometry for each row, in this case polygons. In order to plot it in tmap, you first need to specify it with `tm_shape`. Plotting layers can be added with the `+` operator, in this case `tm_polygons`. There are many layer functions in tmap, which can easily be found in the documentation by their `tm_` prefix. See also `?'tmap-element'`.

## Interactive maps

Each map can be plotted as a static image or viewed interactively using `"plot"` and `"view"` modes, respectively. The mode can be set with the function `tmap_mode`, and toggling between the modes can be done with the 'switch' `ttm()`.

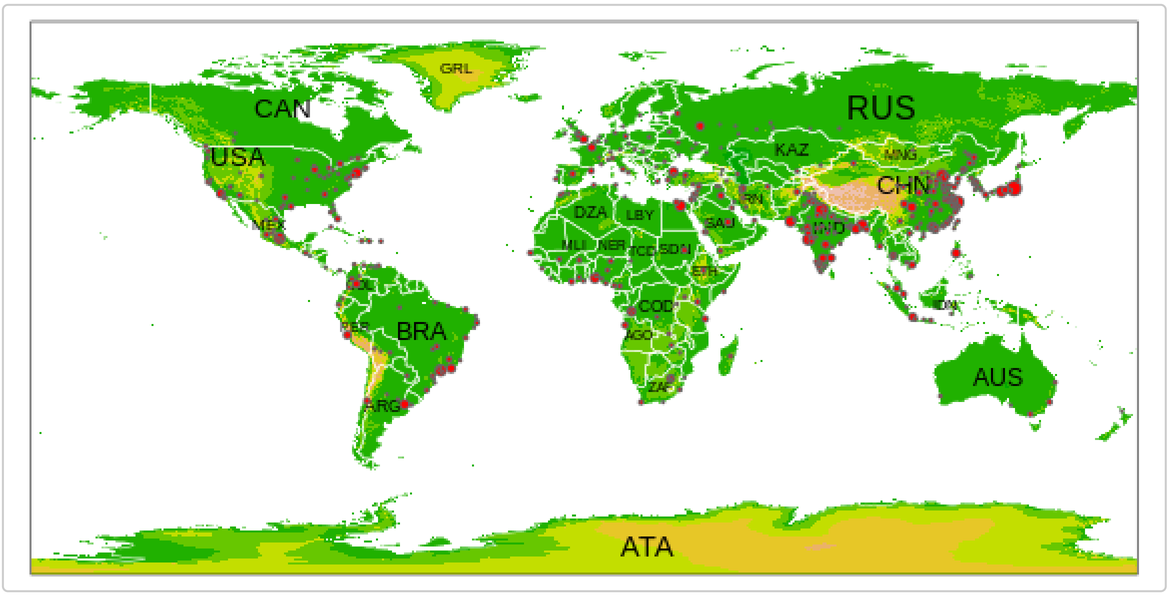
```
tmap_mode("view")

tm_shape(World) +
    tm_polygons("HPI")
```



## Multiple shapes and layers

A shape is a spatial object (with a class from `sf`, `sp stars`, or `raster`). Multiple shapes and also multiple layers per shape can be plotted:

```
data(World, metro, rivers, land)

tmap_mode("plot")
## tmap mode set to plotting
tm_shape(land) +
    tm_raster("elevation", palette = terrain.colors(10)) +
tm_shape(World) +
    tm_borders("white", lwd = .5) +
    tm_text("iso_a3", size = "AREA") +
tm_shape(metro) +
    tm_symbols(col = "red", size = "pop2020", scale = .5) +
tm_legend(show = FALSE)
```

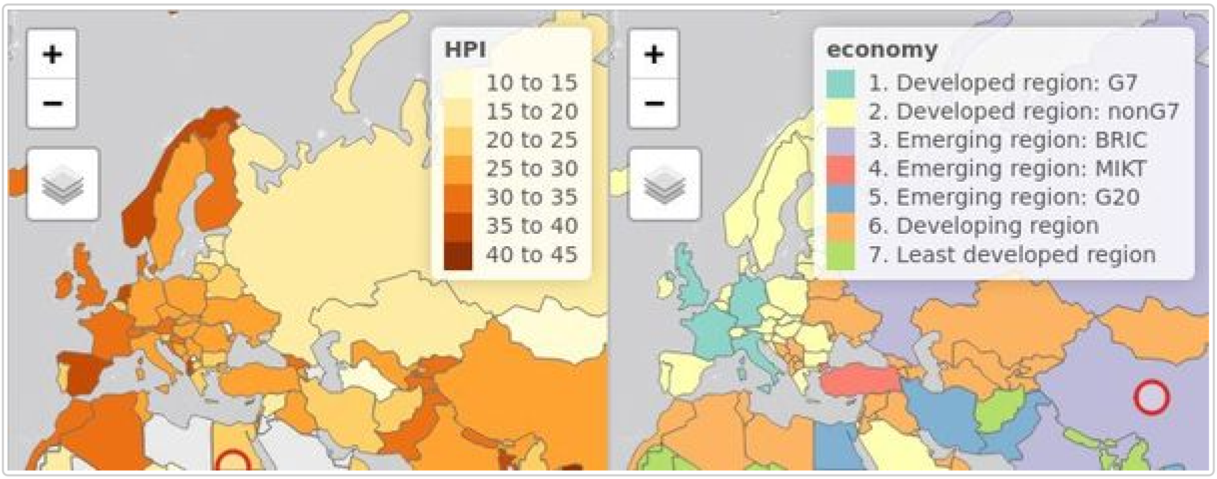


## Facets

Facets can be created in three ways:

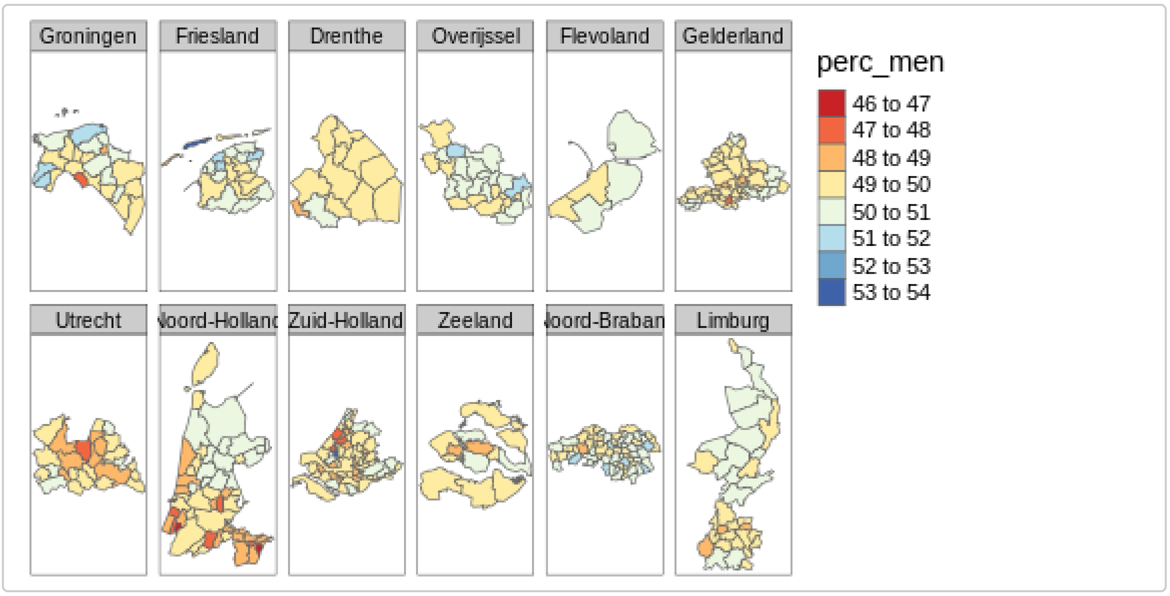
1. By assigning multiple variable names to one aesthetic:

```
tmap_mode("view")
tm_shape(World) +
    tm_polygons(c("HPI", "economy")) +
    tm_facets(sync = TRUE, ncol = 2)
```



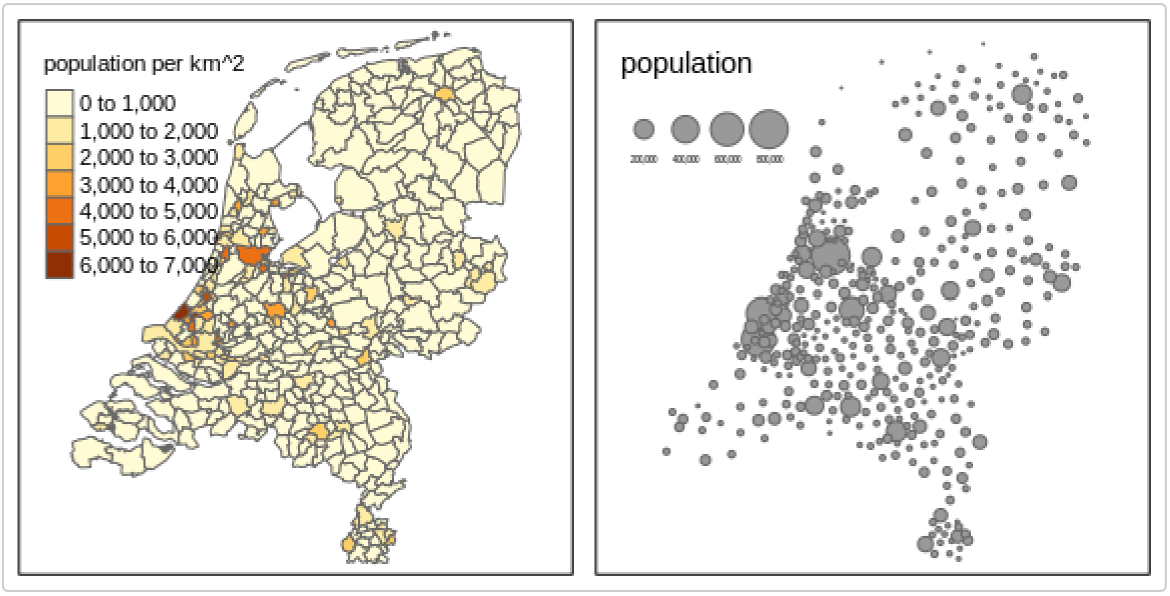
2. By splitting the spatial data with the `by` argument of `tm_facets`:

```
tmap_mode("plot")
## tmap mode set to plotting

data(NLD_muni)

NLD_muni$perc_men <- NLD_muni$pop_men / NLD_muni$population * 100

tm_shape(NLD_muni) +
    tm_polygons("perc_men", palette = "RdYlBu") +
    tm_facets(by = "province")
```



3. By using the `tmap_arrange` function:

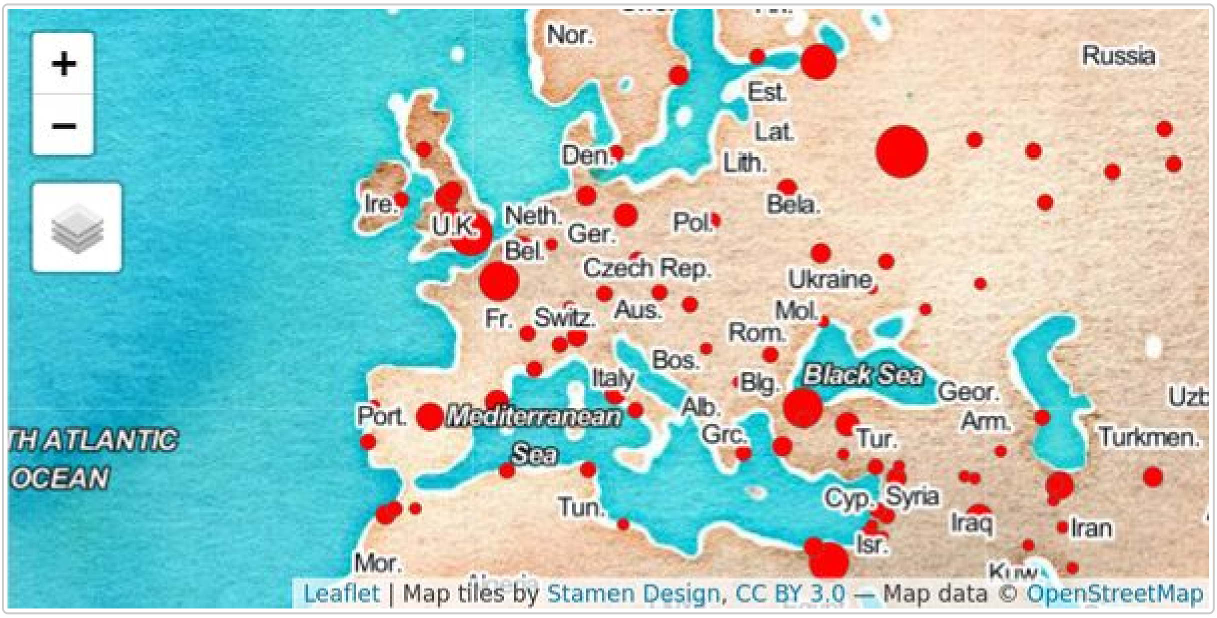
```
tmap_mode("plot")
## tmap mode set to plotting

data(NLD_muni)
tm1 <- tm_shape(NLD_muni) + tm_polygons("population", convert2density = TRUE)
tm2 <- tm_shape(NLD_muni) + tm_bubbles(size = "population")

tmap_arrange(tm1, tm2)
## Legend labels were too wide. Therefore, legend.text.size has been set to 0.27. Increase
  legend.width (argument of tm_layout) to make the legend wider and therefore the labels larger.
## The legend is too narrow to place all symbol sizes.
```



## Basemaps and overlay tile maps

Tiled basemaps can be added with the layer function `tm_basemap`. Semi-transparent overlay maps (for example annotation labels) can be added with `tm_tiles`.

```
tmap_mode("view")
tm_basemap("Stamen.Watercolor") +
tm_shape(metro) + tm_bubbles(size = "pop2020", col = "red") +
tm_tiles("Stamen.TonerLabels")
```

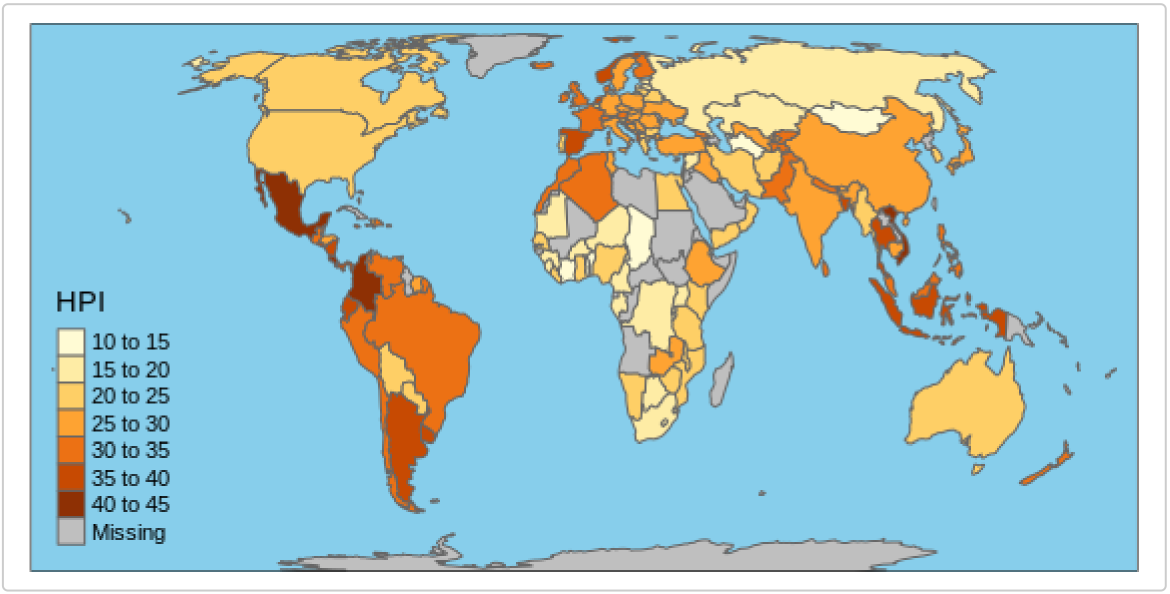


See a preview of the available tilemaps. This list is also accessible in R: `leaflet::providers`.

## Options and styles

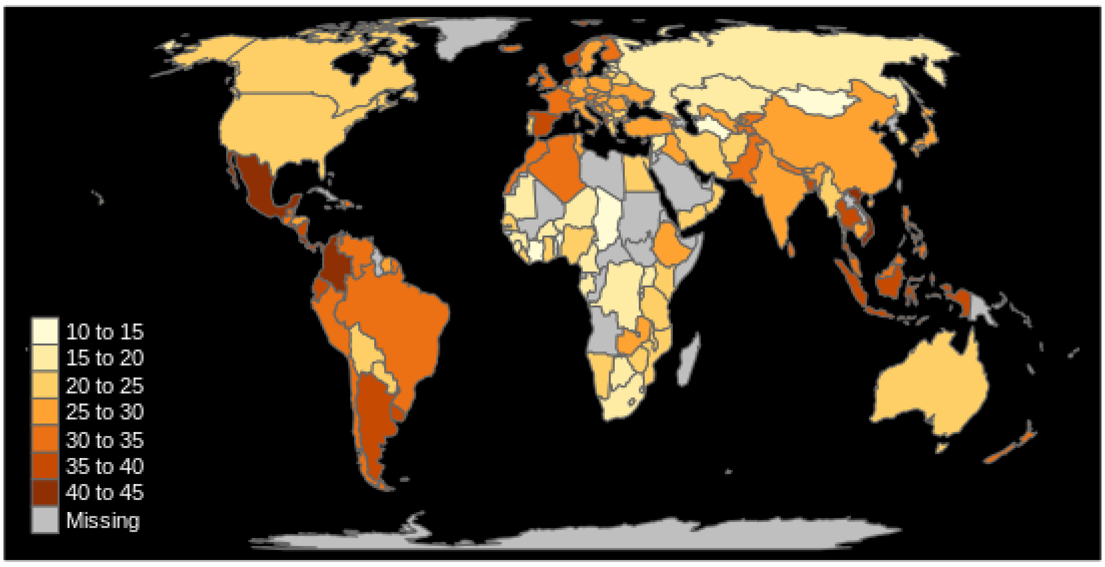
The functions `tm_layout` and `tm_view` are used to specify the map layout and the interactive aspects respectively. These functions can be used in the same way as the layer functions, e.g.

```
tmap_mode("plot")
## tmap mode set to plotting

tm_shape(World) +
    tm_polygons("HPI") +
tm_layout(bg.color = "skyblue", inner.margins = c(0, .02, .02, .02))
```



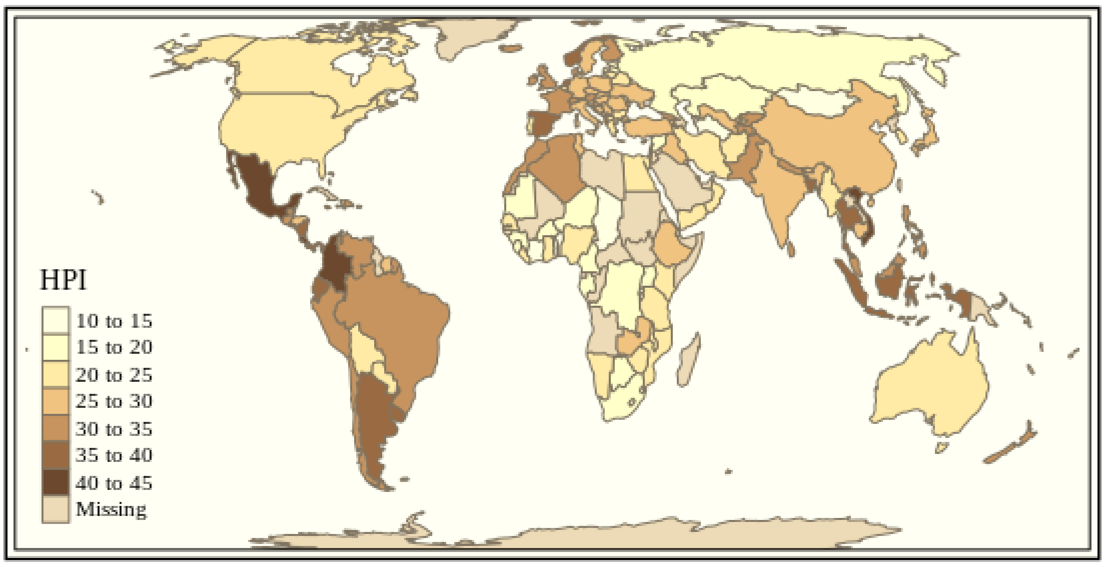
These options, as well as a couple of others, can also be set within with `tmap_options`, which works in the same way as the base R function `options`. The main advantage is that these options are set globally, so they do not have to be specified in each map, for the duration of the session.

```
tmap_options(bg.color = "black", legend.text.color = "white")

tm_shape(World) +
    tm_polygons("HPI", legend.title = "Happy Planet Index")
```



A style is a certain configuration of the tmap options.

```
tmap_style("classic")
## tmap style set to "classic"
## other available styles are: "white", "gray", "natural", "cobalt", "col_blind", "albatross",
  "beaver", "bw", "watercolor"

tm_shape(World) +
    tm_polygons("HPI", legend.title = "Happy Planet Index")
```



```
# see what options have been changed
tmap_options_diff()
## current tmap options (style "classic") that are different from default tmap options (style
  "white"):
## $sepia.intensity
## [1] 0.7
##
```

```
## $frame.double.line
## [1] TRUE
##
## $fontfamily
## [1] "serif"
##
## $compass.type
## [1] "rose"
##
## $basemaps
## [1] "Esri.WorldTopoMap"
##
## $basemaps.alpha
## [1] 0.5

# reset the options to the default values
tmap_options_reset()
## tmap options successfully reset
```

New styles can be created; see `?tmap_options`.

## Exporting maps

```
tm <- tm_shape(World) +
    tm_polygons("HPI", legend.title = "Happy Planet Index")

## save an image ("plot" mode)
tmap_save(tm, filename = "world_map.png")

## save as stand-alone HTML file ("view" mode)
tmap_save(tm, filename = "world_map.html")
```

## leaflet and shiny integration

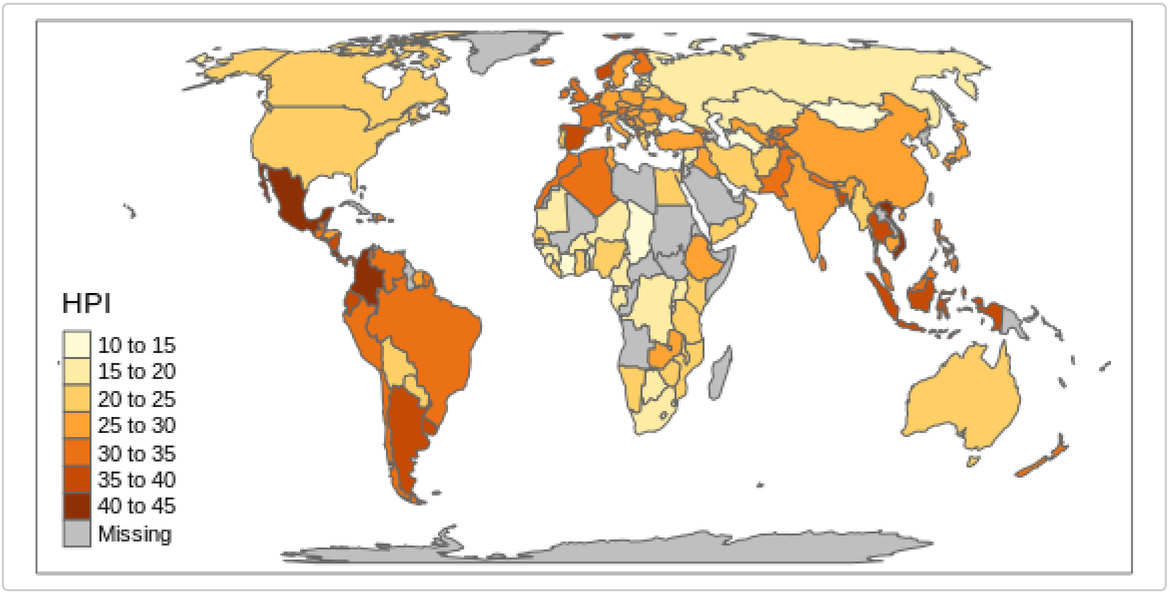
Maps made with tmap can be exported to leaflet with the function `tmap_leaflet`. Hence, it is possible to make use of leaflet own functionalities. This function is also needed when using tmap in shiny:

```
# in UI part:
leafletOutput("my_tmap")

# in server part
output$my_tmap = renderLeaflet({
    tm <- tm_shape(World) + tm_polygons("HPI", legend.title = "Happy Planet Index")
    tmap_leaflet(tm)
})
```

## Quick thematic map

Maps can also be made with one function call. This function is `qtm`:

```
qtm(World, fill = "HPI", fill.pallete = "RdYlGn")
```



## Tips 'n Tricks

Run:

```
tmap_tip()
```