

# Geomedizin mit R

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## Gründe R zu nutzen...

- ▶ ... R ist eine **quelloffene Sprache**
- ▶ ... hervorragende **Grafiken, Grafiken, Grafiken**
- ▶ ... **R kann in Kombination mit anderen Programmen verwendet werden** - z.B. zur **Verknüpfung von Daten**
- ▶ ... R kann **zur Automatisierung** verwendet werden
- ▶ ... Breite und aktive Community - **Man kann die Intelligenz anderer Leute nutzen ;)**

R kann in Kombination mit anderen Programmen genutzt werden . . .

The image displays five separate software interfaces related to R integration:

- SASmixed**: A screenshot showing the SASmixed logo.
- R-Forge**: A screenshot showing the R-Forge logo.
- rPython R package**: A screenshot showing the rPython R package logo.
- R for Stata Users**: A screenshot showing the title "R for Stata Users" on a yellow background.
- IBM SPSS Statistics Essentials for R**: A screenshot of the project's website. It features a red header with "Use R!" and a yellow body with the title "R Through Excel". The sidebar on the left includes links for "Users", "Download IBM SPSS Statistics Essentials for R files", "Donate money", "Project detail and discuss", and "Get support".

Figure 1: Schnittstellen zu R

# Die Beliebtheit von R-Paketen

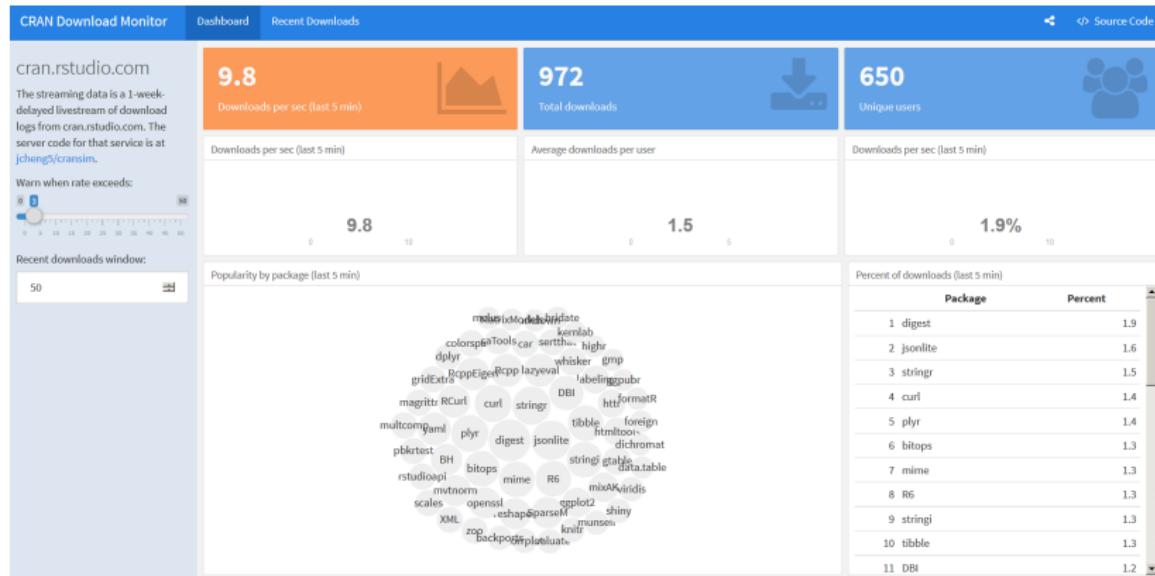


Figure 2: Downloads vom CRAN Server

# Download R:

<http://www.r-project.org/>

The screenshot shows the left sidebar of the CRAN website. It features the CRAN logo at the top, followed by a vertical list of links:  
CRAN  
[Mirrors](#)  
[What's new?](#)  
[Task Views](#)  
[Search](#)  
  
[About R](#)  
[R Homepage](#)  
[The R Journal](#)  
  
[Software](#)  
[R Sources](#)  
[R Binaries](#)  
[Packages](#)  
[Other](#)

The Comprehensive R Archive Network

### Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows** and **Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

### Source Code for all Platforms

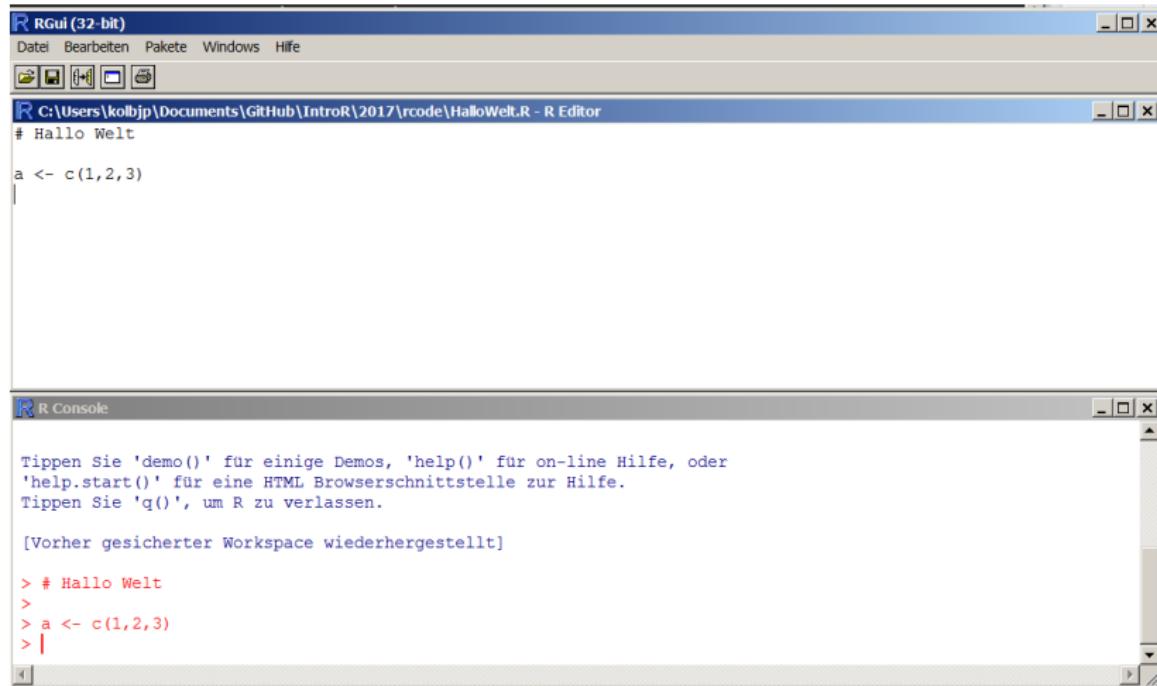
Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

- The latest release (Friday 2017-04-21, You Stupid Darkness)  
[R-3.4.0.tar.gz](#), read [what's new](#) in the latest version.

Figure 3: The CRAN website

# Open Source Programm R

Das ist das Basis-R:



The screenshot shows the R GUI interface. At the top is the R GUI (32-bit) window title bar. Below it is a menu bar with 'Datei', 'Bearbeiten', 'Pakete', 'Windows', and 'Hilfe'. A toolbar with various icons follows. The main area contains two panes: the R Editor on the left and the R Console on the right.

**R Editor:** The title bar says 'R C:\Users\kolbjp\Documents\GitHub\IntroR\2017\r code\HalloWelt.R - R Editor'. The code in the editor is:

```
# Hallo Welt  
  
a <- c(1,2,3)
```

**R Console:** The title bar says 'R Console'. The console output is:

```
Tippen Sie 'demo()' für einige Demos, 'help()' für on-line Hilfe, oder  
'help.start()' für eine HTML Browserschnittstelle zur Hilfe.  
Tippen Sie 'q()', um R zu verlassen.  
  
[Vorher gesicherter Workspace wiederhergestellt]  
  
> # Hallo Welt  
>  
> a <- c(1,2,3)  
> |
```

Figure 4

# Graphical user interface

Viele Leute nutzen ein **Graphical User Interface** (GUI) oder ein **Integrated Development Interface** (IDE).

Aus den folgenden Gründen:

- ▶ Syntax-Hervorhebung
- ▶ Auto-Vervollständigung
- ▶ Bessere Übersicht über Graphiken, Pakete, Dateien, ...

# RStudio

The screenshot shows the RStudio interface with the following components:

- Code Editor:** Displays R code for generating presentation slides. The code includes sections for "Getting started", "How to get help", "Data import", "The GESIS panel data export", "Basic data analysis", "The survey package", "Graphics", "Linear regression", "Logistic regression", "Understanding error messages", and "Hierarchical/Multilevel models". It also includes code for reading a schedule from an Excel file and creating a table.
- File Browser:** Shows the project structure and files. The structure includes "A1 Getting Started" and "A2 How to get help" subfolders. Inside "A1 Getting Started" are files like "GettingStarted.html", "GettingStarted.pdf", and "GettingStarted.Rnw". Inside "A2 How to get help" are files like "How2gethelp.html", "How2gethelp.pdf", and "How2gethelp.Rnw".
- Terminal:** Shows the command used to generate the PDF output: "D:/Programme/RStudio/bin/pandoc/pandoc" +RTS -K512m -RTS A2\_How2gethelp.utf8.md --to beamer --from markdown+autolink\_bare\_uris+ascii\_identifiers+tex\_math\_single\_backslash+implicit\_figures --output A2\_How2gethelp.pdf --table-theme=cambridgeUS --variable colortheme=beaver --variable fonttheme=structurebold --highlight-style tango --pdf-engine pdflatex --self-contained output file: A2\_How2gethelp.pdf".
- Status Bar:** Shows the message "Output created: A2\_How2gethelp.pdf".

Figure 5

## Übung - Vorbereitung

- ▶ Schaue, ob R auf dem Computer installiert ist
- ▶ Wenn nicht, lade **R** herunter und installiere es.
- ▶ Prüfe ob Rstudio installiert ist.
- ▶ Wenn nicht - **installiere** Rstudio.
- ▶ Starte RStudio. Gehe in die Konsole (meistens Fenster unten links) und tippe
- ▶ Wenn noch kein Skript geöffnet im oberen linken Teil von Rstudio geöffnet ist, gehe zum Menü und öffne ein neues Skript. Checks das Datum mit `date()` und die R version mit `sessionInfo()`.

## Beispiel zu Campingplätzen

- ▶ Die Daten stammen von:

<http://www.openstreetmap.de/>

- ▶ Dabei wird die Overpass API genutzt:

[http://wiki.openstreetmap.org/wiki/Overpass\\_API](http://wiki.openstreetmap.org/wiki/Overpass_API)

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

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

## Überblick über Daten zu Campingplätzen

X	name	tourism	website
1	Campingplatz Winkelbachtal	camp_site	<a href="http://www.gru">http://www.gru</a>
2	Radler-Zeltplatz	camp_site	NA
3	Campingplatz des Naturfreundehauses	camp_site	NA
4	Campingplatz Am Aichstruter Stausee	camp_site	NA
5	NA	camp_site	NA
6	Kandern	camp_site	NA
7	Campingplatz Baiersbronn-Obertal	camp_site	NA
8	Campingplatz SchwabenmÃ¼hle	camp_site	NA

## Notwendige Pakete

**magrittr** - für den Pipe Operator in R:

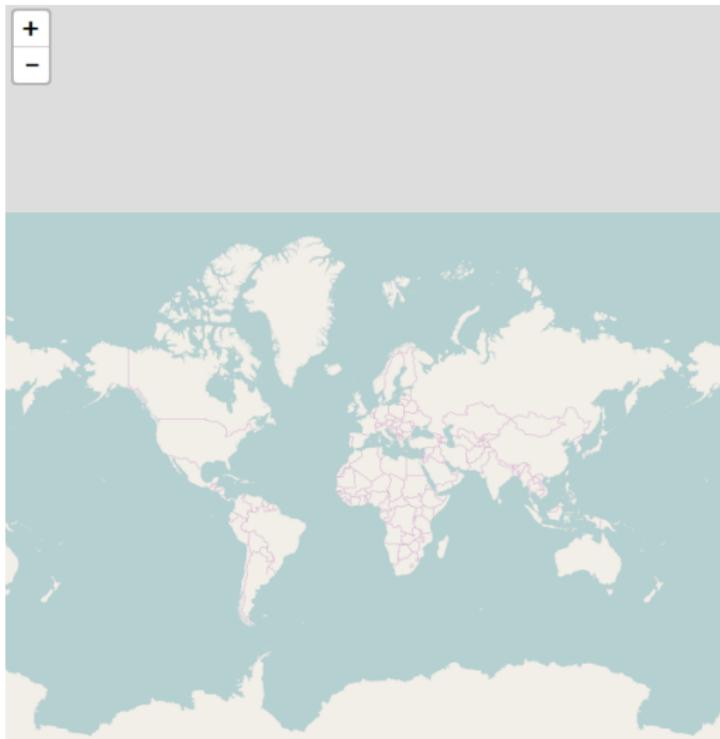
```
library("magrittr")
```

**leaflet** - um interaktive Karten mit der JavaScript Bibliothek  
'Leaflet' zu erzeugen

```
library("leaflet")
```

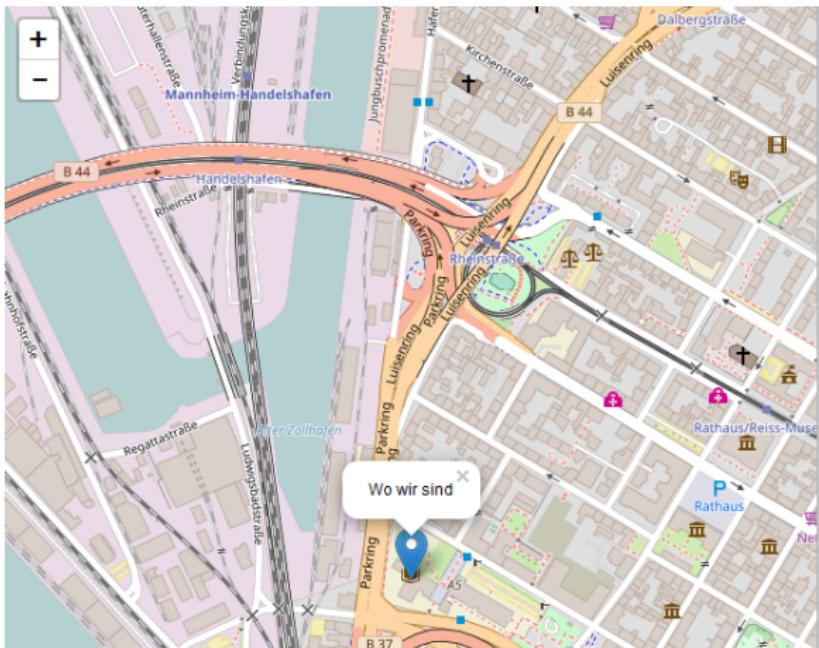
# Eine erste interaktive Karte

```
leaflet()%>%  
  addTiles()
```



# Auf eine Stadt zoomen

```
leaflet() %>%
  addTiles() %>%
  addMarkers(lng=8.456597, lat=49.48738,
            popup="Wo wir sind")
```



## Eine interaktive Karte

```
m <- leaflet() %>%
  addTiles() %>%
  addMarkers(lng=CampSites$lon,
             lat=CampSites$lat,
             popup=CampSites$name)
```

```
m
```

# Das Paket leaflet - Visualisierung von Geokodierung

```
library("tmaptools")
gc_tma <- geocode_OSM("Mannheim, GESIS")
```

```
library(leaflet)
library(magrittr)
m <- leaflet() %>%
  addTiles() %>%
  addMarkers(lng=8.463061 , lat=49.485736 ,
             popup="GESIS Mannheim")
m
```

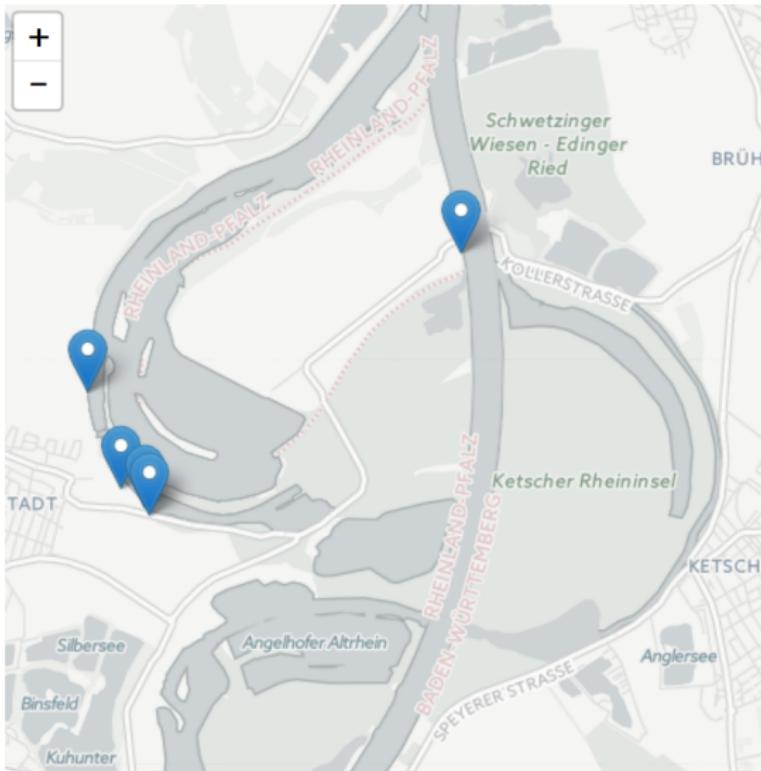
# Stamen als Hintergrundkarte

```
m %>% addProviderTiles("Stamen.Toner")
```



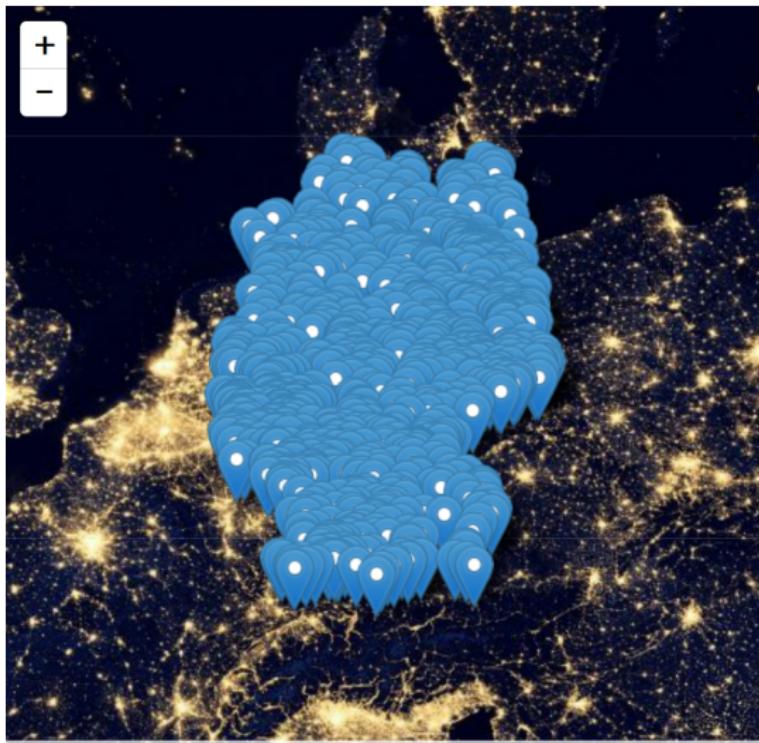
# CartoDB als Hintergrund

```
m %>% addProviderTiles("CartoDB.Positron")
```



# Mehr Hintergründe

```
m %>% addProviderTiles("NASAGIBS.ViirsEarthAtNight2012")
```



Leaflet | © OpenStreetMap contributors, CC-BY-SA. Imagery provided by services from the Global Imagery Browse Services (GIBS), operated by the NASA/GSFC/Earth Science Data and Information System (ESDIS) in collaboration with the NASA Worldview team.

## Mehr Informationen hinzufügen

```
popupInfo <- paste(CampSites$name, "\n", CampSites$website)

m <- leaflet() %>%
  addTiles() %>% # Add default OpenStreetMap map tiles
  addMarkers(lng=CampSites$lon,
             lat=CampSites$lat,
             popup=popupInfo)

m
```

Das Ergebnis ist hier:

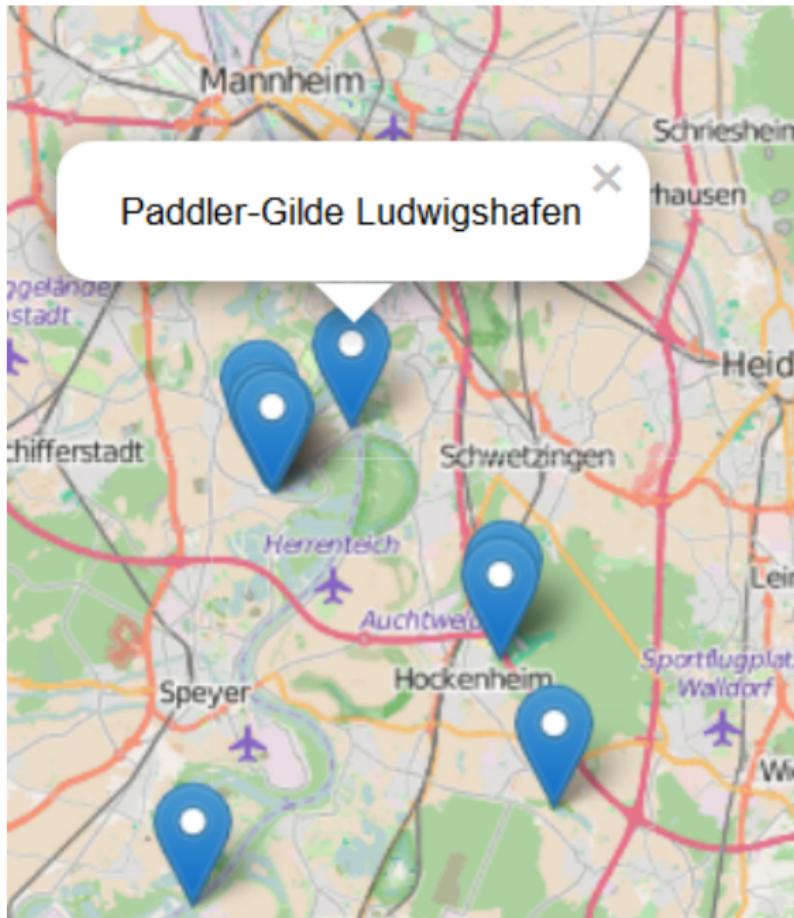
<http://rpubs.com/Japhilko82/CampSitesHL>

# Die resultierende Karte



Figure 11: Campingplätze in Deutschland

# Popups in einer interactiven Karte



# Wie man auf Rpubs publizieren kann

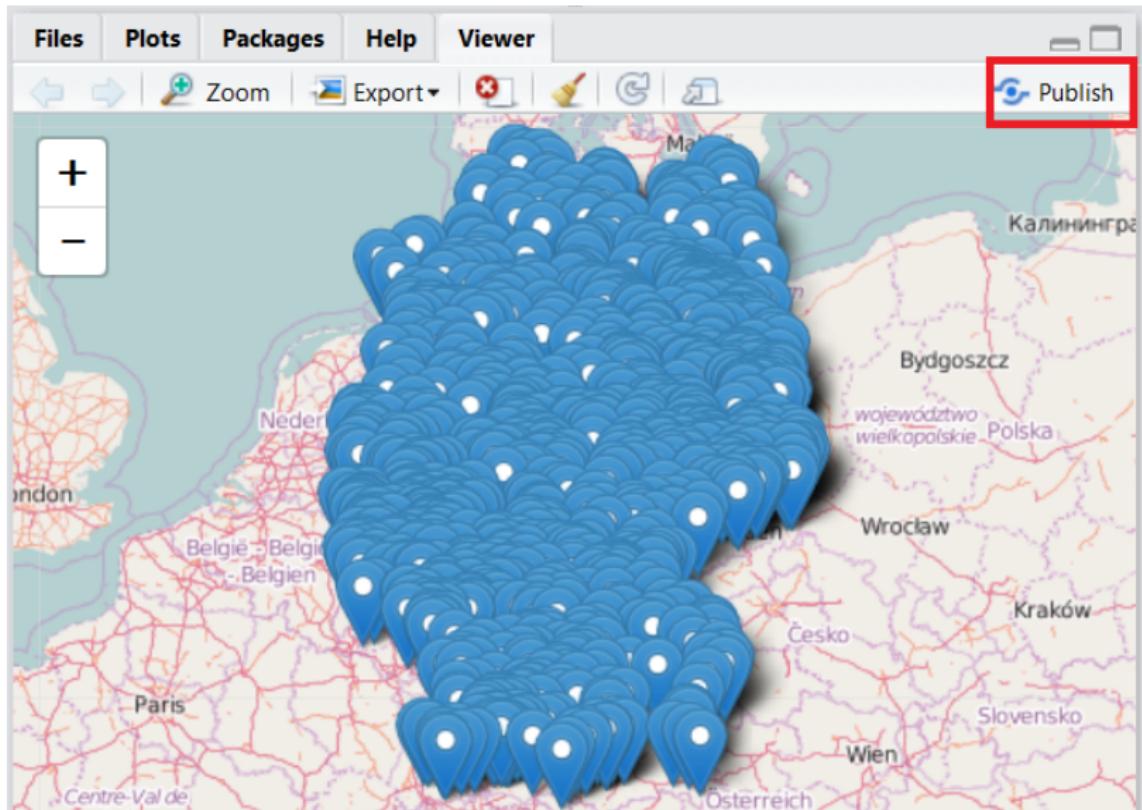


Figure 13: Publizieren auf Rpubs

## Ein weiteres Beispiel - Weltkulturerbe

```
url <- "https://raw.githubusercontent.com/Japhilko/  
GeoData/master/2015/data/whcSites.csv"  
  
whcSites <- read.csv(url)
```

## Eine interaktive Karte erstellen

```
m <- leaflet() %>%
  addTiles() %>% # Add default OpenStreetMap map tiles
  addMarkers(lng=whcSites$lon,
             lat=whcSites$lat,
             popup=whcSites$name_en)
m
```

Die Karte zeigen



Figure 14: Weltkulturerbestätten

## Farbe hinzufügen

```
whcSites$color <- "red"  
whcSites$color[whcSites$category=="Cultural"] <- "blue"  
whcSites$color[whcSites$category=="Mixed"] <- "orange"
```

## Eine Karte mit Farbe erzeugen

```
m1 <- leaflet() %>%
  addTiles() %>%
  addCircles(lng=whcSites$lon,
             lat=whcSites$lat,
             popup=whcSites$name_en,
             color=whcSites$color)

m1
```

# Die Karte zeigen

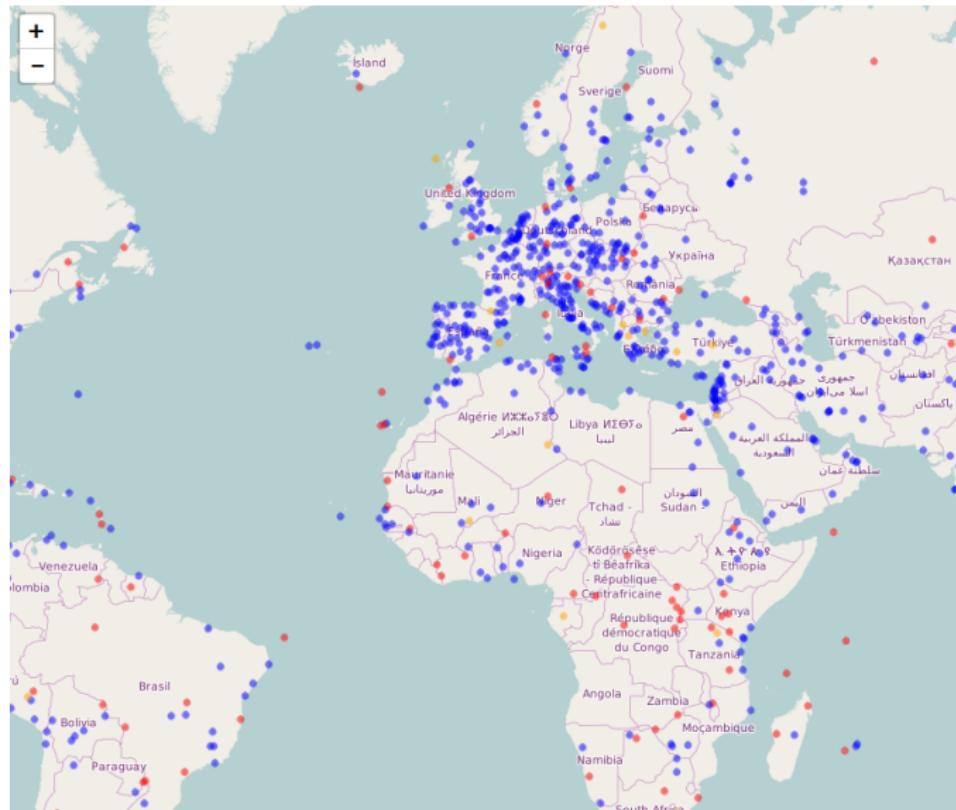


Figure 15: Karte Weltkulturerbe

## Die Karte abspeichern

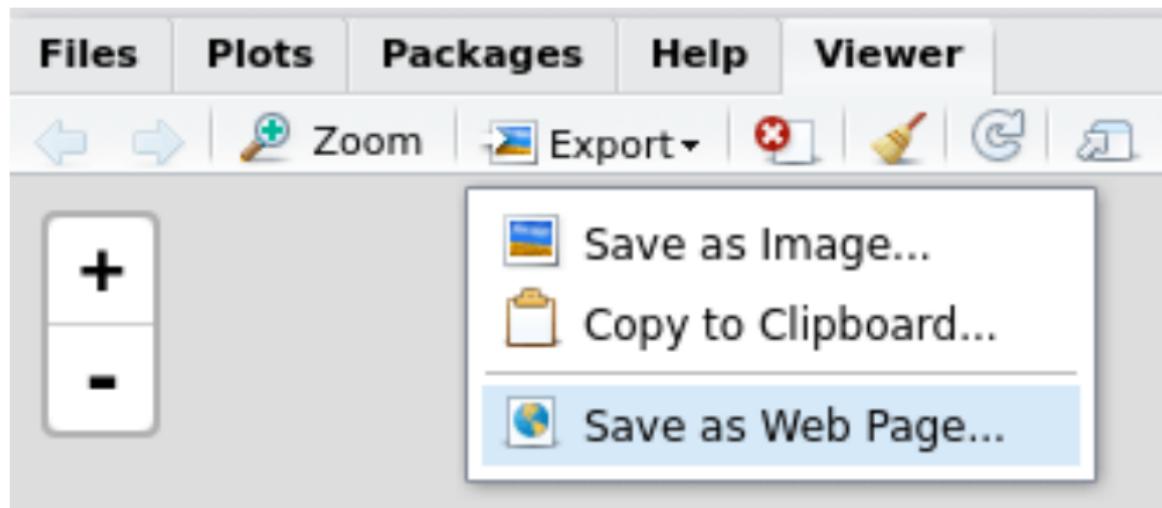


Figure 16: Als Website speichern