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Lab 6.2: Mapping with R

In this Lab we will learn how to:

- Import packages useful for spatial analysis: maps, sp,…
- Download administrative boundaries data from http://gadm.org/country
- Generate a map

R 4.0.3 version has been used to run the following scripts but see comment in red below. As usual we will start by defining our working directory and installing and loading the required packages

```
# establishing the working directory

setwd("C:/datosR/GIS")

# installing different useful packages
install.packages(c("ggplot2", "devtools", "dplyr", "stringr"))

install.packages(c("maps", "mapdata", "ggmap", "mapproj"))

install.packages(c("sp", "raster", "rgdal", "rgeos", "spdep"))

# requiring the packages
library(ggplot2)
library(ggmap)
library(maps)
library(mapdata)
library(sp)
library(mapproj)

library(sp)  # vector data
library(raster)  # raster data
library(rgdal)  # input/output, projections
library(rgeos)  # geometry ops
library(spdep)  # spatial dependence
```

Creating basics maps of Europe and Spain

This section was developed in 2017 but in 2018 became 'deprecated' when Google established a barrier to access its API and since them a google account and a credit card number is needed to access these functions. Trainees can decide by themselves to get such account or not.

We will generate a couple of maps (Europe and Spain) using the feature of two libraries: ggmap and mapproj. Let' see how we can draw this maps:

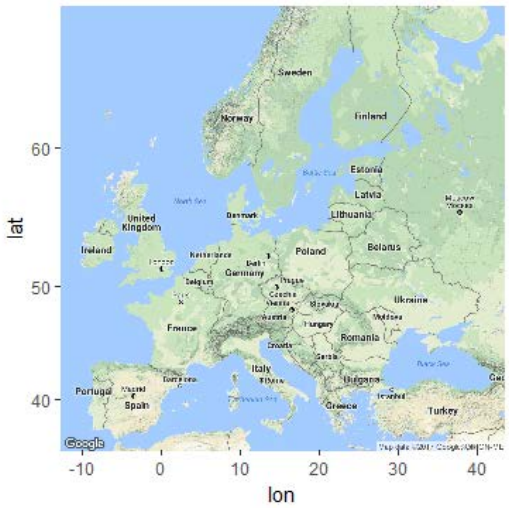
```
# Making a map of Europecalculating the distance to the nearest trees

map1 <- get_map(location = 'Europe', zoom = 4)
ggmap(map1)

# The zoom value has to be defined by trial and error process.
```

```
# the maximum and minimum values for zoom are 21 (very detailed map) and
# 0 that means a map of the whole world
```

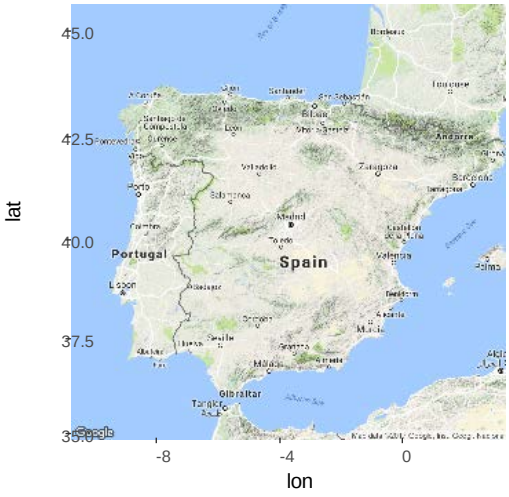
With this two line script (after installing and loading the required libraries) we obtain the following map:



Now we can draw the map of Spain by using this code

```
# a map of Spain
map2 <- get_map(location = 'Spain', zoom = 6)
ggmap(map2)
```

We should obtain the following map:



Generating maps with administrative boundaries

First we should obtain spatial data with administrative boundaries from the Global Administrative Areas webpage (http://gadm.org/download) If we check the Spanish administrative boundaries we will see four .rds files named ESP_adm#.rds where # is a integer number from 0 (the whole country) to 4 (the map with the municipality limits). We will download the file ESP_adm1.rds that correspond with the regional boundaries

```
# creating a map of Spain with the regions boundaries

Spain <- readRDS("ESP_adm1.rds", refhook = NULL)
map(Spain)
```

We should obtain the following map:

If we check the Enviroment area of RStudio we can see the type of object call 'Spain' is *SpatialPolygonsDataFrame*. We should insight on the type of spatial data in R.