Beautiful world maps in R with rworldmap

Andy South
southandy@gmail.com
andysouth.co.uk

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rworldmap

- Released 2010
- Aims improve visualisation of global data
  easy to start, flexible to extend
  publication quality outputs
  aid interdisciplinary work
- 4842 downloads via RStudio in 2013 (so far…)
- Contains up-to-date country boundaries
- RJournal article

The R Journal Vol. 3/1, June 2011

rworldmap: A New R package for Mapping Global Data

by Andy South

Abstract **rworldmap** is a relatively new package available on CRAN for the mapping and visualisation of global data. The vision is to make the display of global data easier, to facilitate understanding and communication. The initial focus is on data referenced by country or grid due to the frequency of use of such data in global assessments. Tools to link data referenced by country (either name or code) to a map, and then to display the map are provided as are functions to map global gridded data. Country and gridded functions accept the same arguments to specify the nature of categories and colour and how legends are formatted. This package builds on the functionality of existing packages, particularly **sp**, **maptools** and **fields**. Example code is provided to produce maps, to link with the packages **classInt**, **RColorBrewer** and **ncdf**, and to plot examples of publicly available country and gridded data.

There appears to be a gap in the market for free software tools that can be used across disciplinary boundaries to produce innovative, publication quality global visualisations. Within R there are great building blocks (particularly **sp**, **maptools** and **fields**) for spatial data but users previously had to go through a number of steps if they wanted to produce world maps of their own data. Experience has shown that difficulties with linking data and creating classifications, colour schemes and legends, currently constrains researchers' ability to view and display global data. We aim to reduce that constraint to allow researchers to spend more time on the more important issue of what they want to display. The vision for **rworldmap** is to produce a package to facilitate the visualisation and mapping of global data. Because the focus is on global data, the package can be more specialised than existing packages, making world mapping easier, partly because it doesn't have to deal with detailed local maps. Through **rworldmap** we aim to make it easy for R users to explore their global data and also to produce publication quality figures from their outputs.

http://journal.r-project.org/archive/2011-1/RJournal_2011-1_South.pdf

sp : what rworldmap is built on

- spatial classes
- Spatial Polygons Dataframe (sPDF)

	Sovereign country	Algeria	DZA
	Sovereign country	Ecuador	ECU
	Sovereign country	Egypt	EGY
	Sovereign country	Eritrea	ERI
	Sovereign country	Spain	ESP
	Sovereign country	Estonia	EST
	Sovereign country	Ethiopia	ETH
	County	Finland	FIN
	Sovereign country	Fiji	FJI
	Dependency	Falkland Islands	FLK
	Country	France	FRA

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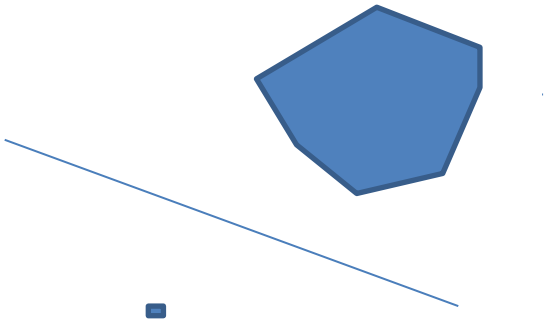
	Sovereign country	Ethiopia	ETH
	County	Finland	FIN
	Sovereign country	Fiji	FJI
	Dependency	Falkland Islands	FLK
	Country	France	FRA

@data

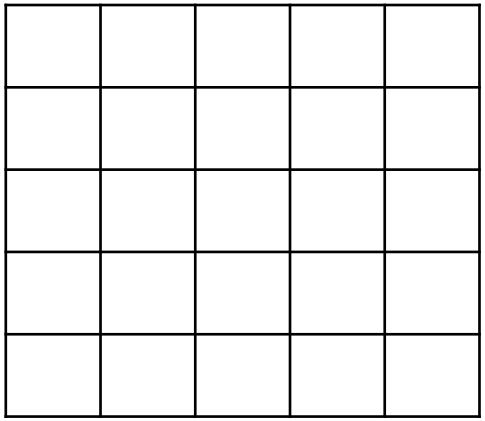
maps in rworldmap are spatial polygons dataframes

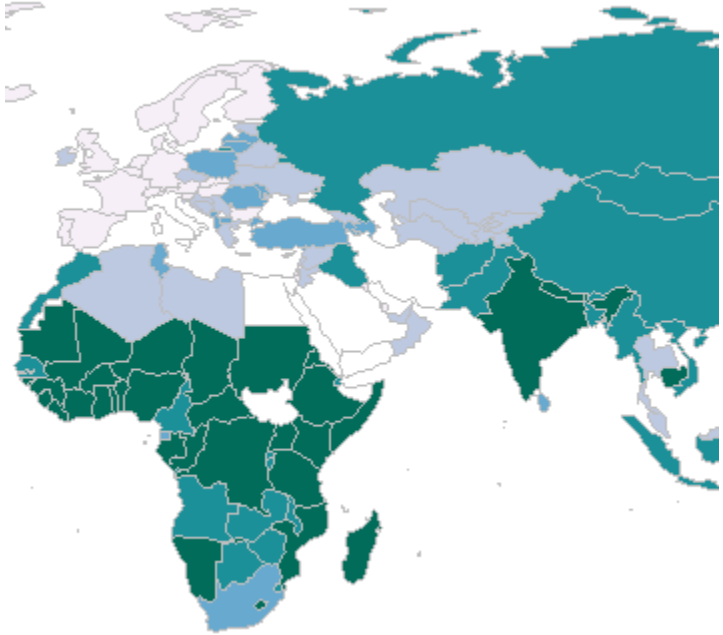
```
sPDF <- getMap()

class(sPDF)
plot(sPDF)

#to get at the dataframe
dF <-  sPDF@data
str(dF)
```

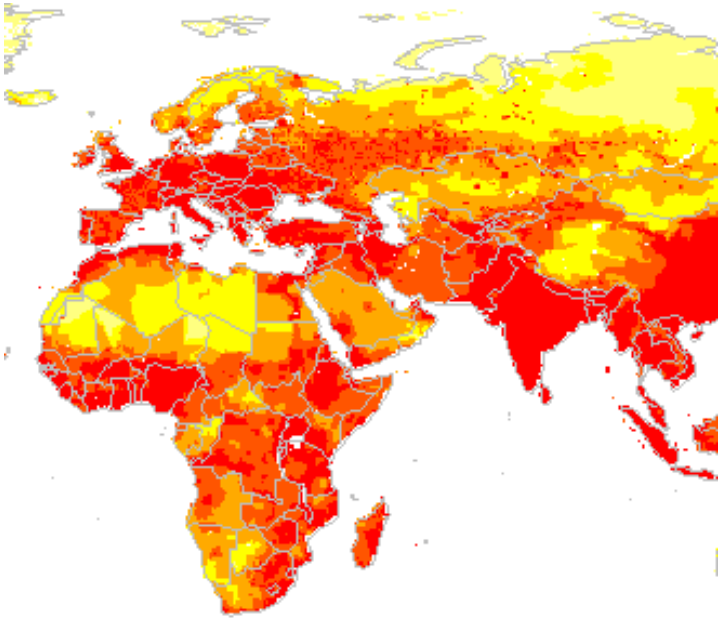
vector



raster







Joining 1

Your data

country	temperature
UK	cold
Spain	hot

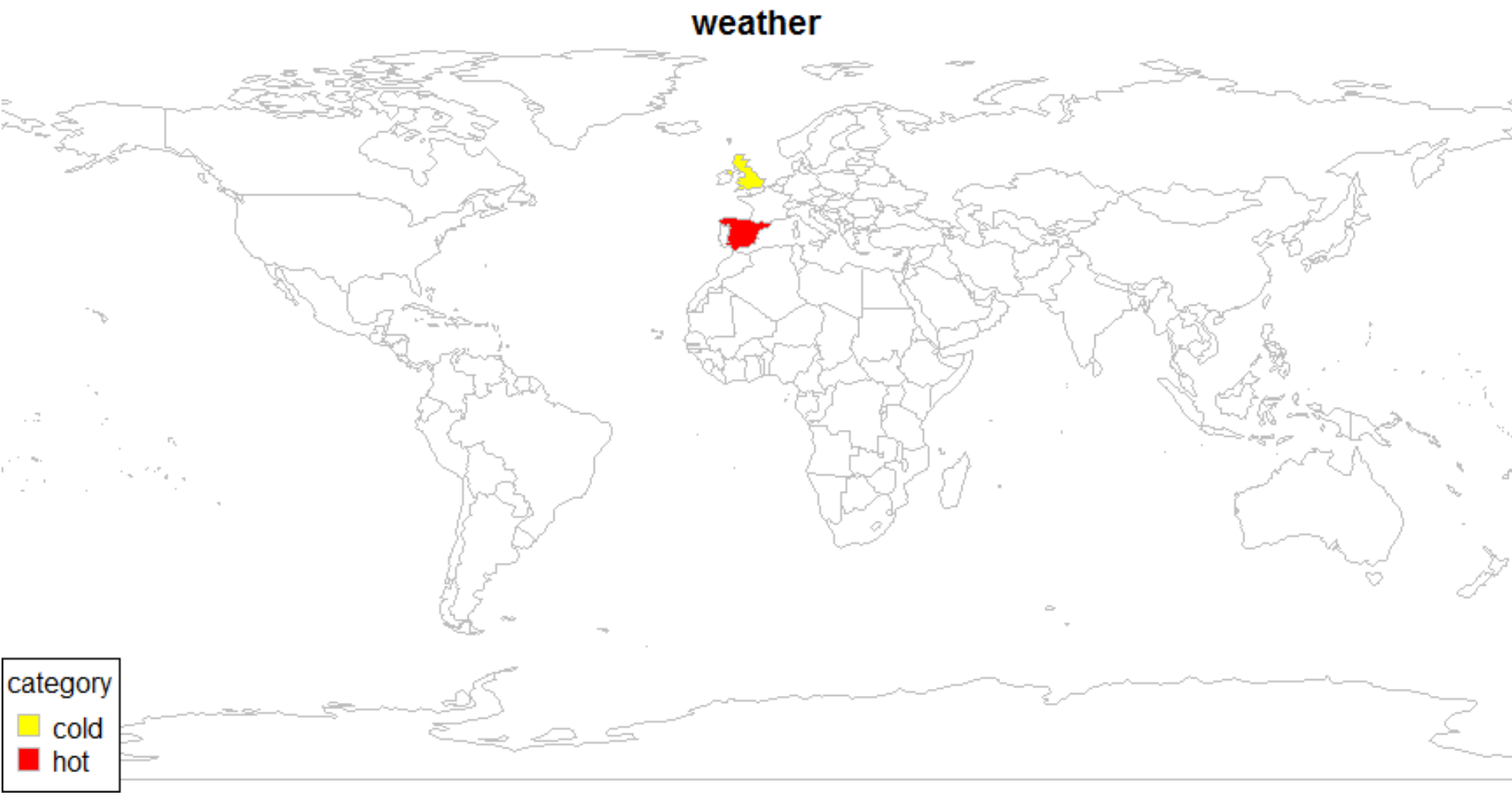
Map data

Algeria	DZA
Ecuador	ECU
Egypt	EGY
Eritrea	ERI
Spain	ESP
Estonia	EST
Ethiopia	ETH
Finland	FIN
Fiji	FJI
Falkland Islands	FLK
France	FRA

Columns in common

Joining 2

```
dF <- data.frame( country=c("spain", "uk")
                , weather=c("hot", "cold") )

sPDF <-
joinCountryData2Map( dF
                   ,joinCode = "NAME"
                   ,nameJoinColumn = "country")

mapCountryData(sPDF,nameColumnToPlot='weather')
```



Note that these data are categorical & rworldmap copes.

HOWEVER …

You should join using country codes instead of names if at all possible.

LONDON2012

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HOT TOPICS: Paralympic magic moments | Paralympic medal map | Classifications explained | 50 best im

London 2012 Olympics: North Koreans furious as organisers blunder by displaying South Korean flag

The opening day of competition in the 2012 Games ended with the first diplomatic incident of the Games as organisers were forced to apologise to North Korea for displaying the flag of bitter enemies South Korea before their women's football match against Colombia.

- North Korea
  - Korea, Democratic People's Republic of
  - Democratic People's Republic of Korea
  - Korea, Dem. Rep.
- South Korea
  - Korea, Republic of
  - Republic of Korea
  - Korea

Country Codes - ISO 3166

What is ISO 3166?

ISO 3166 is the International Standard for country codes and codes for their subdivisions. The purpose of ISO 3166 is to establish internationally recognised codes for the representation of names of countries, territories or areas of geographical interest, and their subdivisions. However, ISO 3166 does not establish the names of countries, only the codes that represent them.

The country names in ISO 3166 come from United Nations sources. New names and codes are added automatically when the United Nations publishes new names in either the Terminology Bulletin Country Names or in the Country and Region Codes for Statistical Use maintained by the United Nations Statistics Divisions. Names for subdivisions are taken from relevant official national information sources.

ISO 3166 was first published in 1974 as a single standard to establish the country codes. It was expanded into three parts in 1997 to include the codes for subdivisions and the codes for names of countries that are no longer in use. Of the three parts, Part 1, ISO 3166-1 is generally used the most often.

Joining data using country codes

```
#example data in rworldmap
data(countryExData)

sPDF <- joinCountryData2Map(countryExData
                            , joinCode = "ISO3"
                             , nameJoinColumn = "ISO3V10")

mapParams <- mapCountryData(sPDF
                             , nameColumnToPlot="EPI")
```

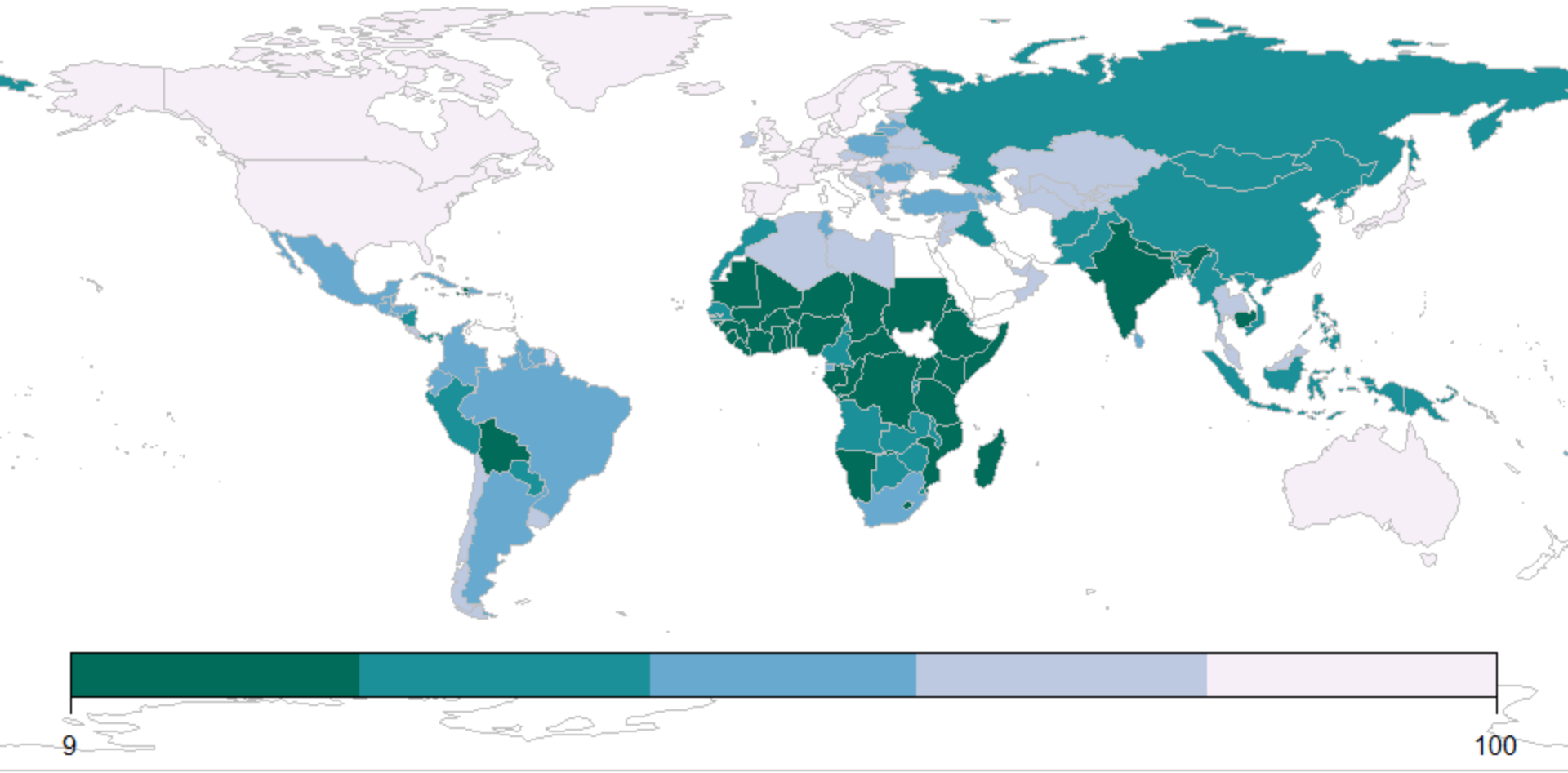
Examples with world bank indicators

```
library(WDI)

# http://data.worldbank.org/indicator/
# Improved sanitation facilities (% of popn)

indicator <- "SH.STA.ACSN"

dFsanitation <- WDI( indicator=indicator
                   , start=2005
                   , end=2005 )
```

i. choropleth map

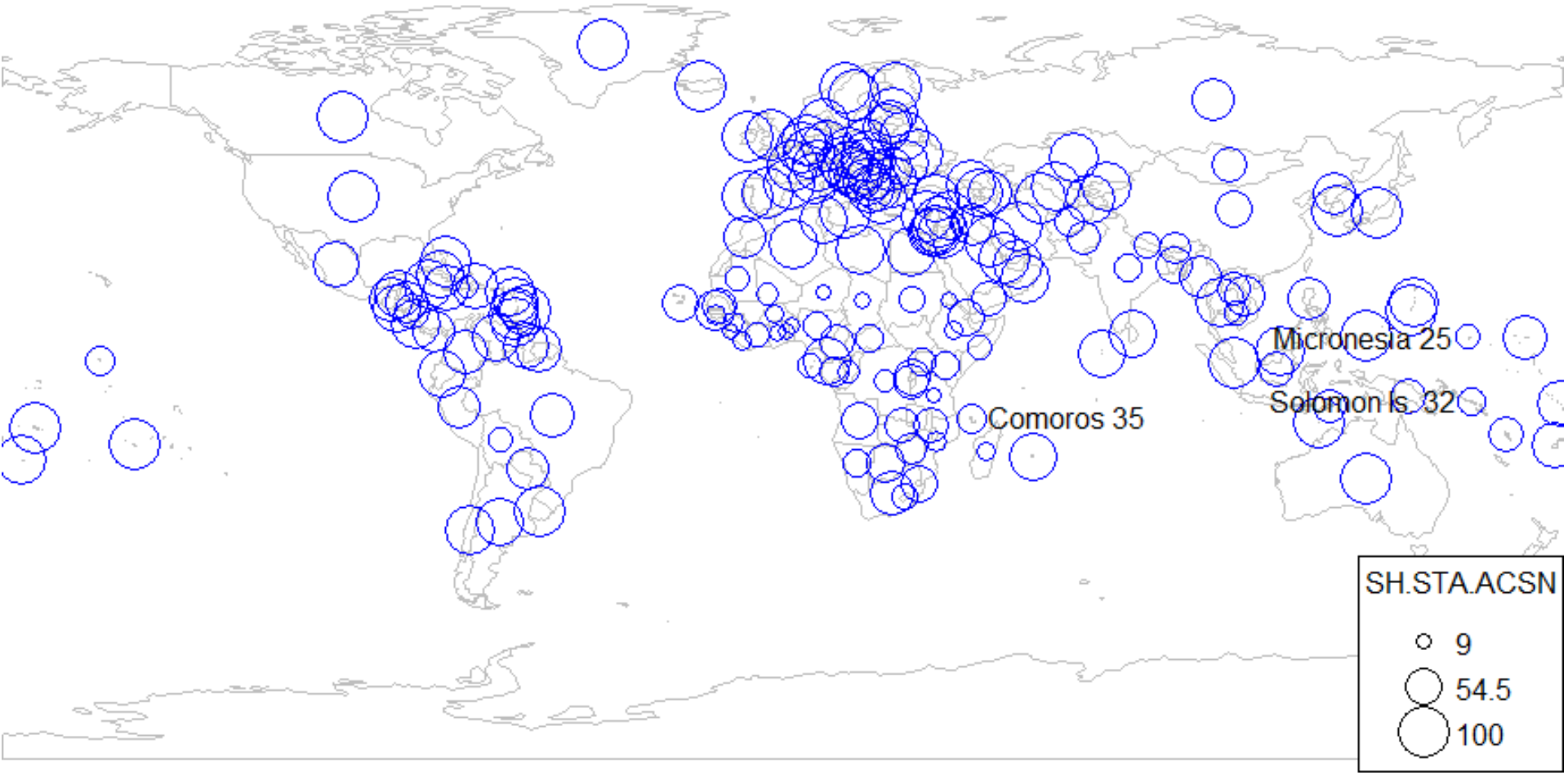
```
library(rworldmap)

sPDFsanitation <-
joinCountryData2Map( dFsanitation
                   , nameJoinColumn='iso2c'
                   , joinCode='ISO2')
library(RColorBrewer)
numCats <- 5
colourPalette <- rev(brewer.pal(numCats, "PuBuGn"))

mapCountryData( sPDFsanitation
              , nameColumnToPlot=indicator
              , colourPalette=colourPalette
              , numCats=numCats )
```

Access to Sanitation 2005



ii. bubble map

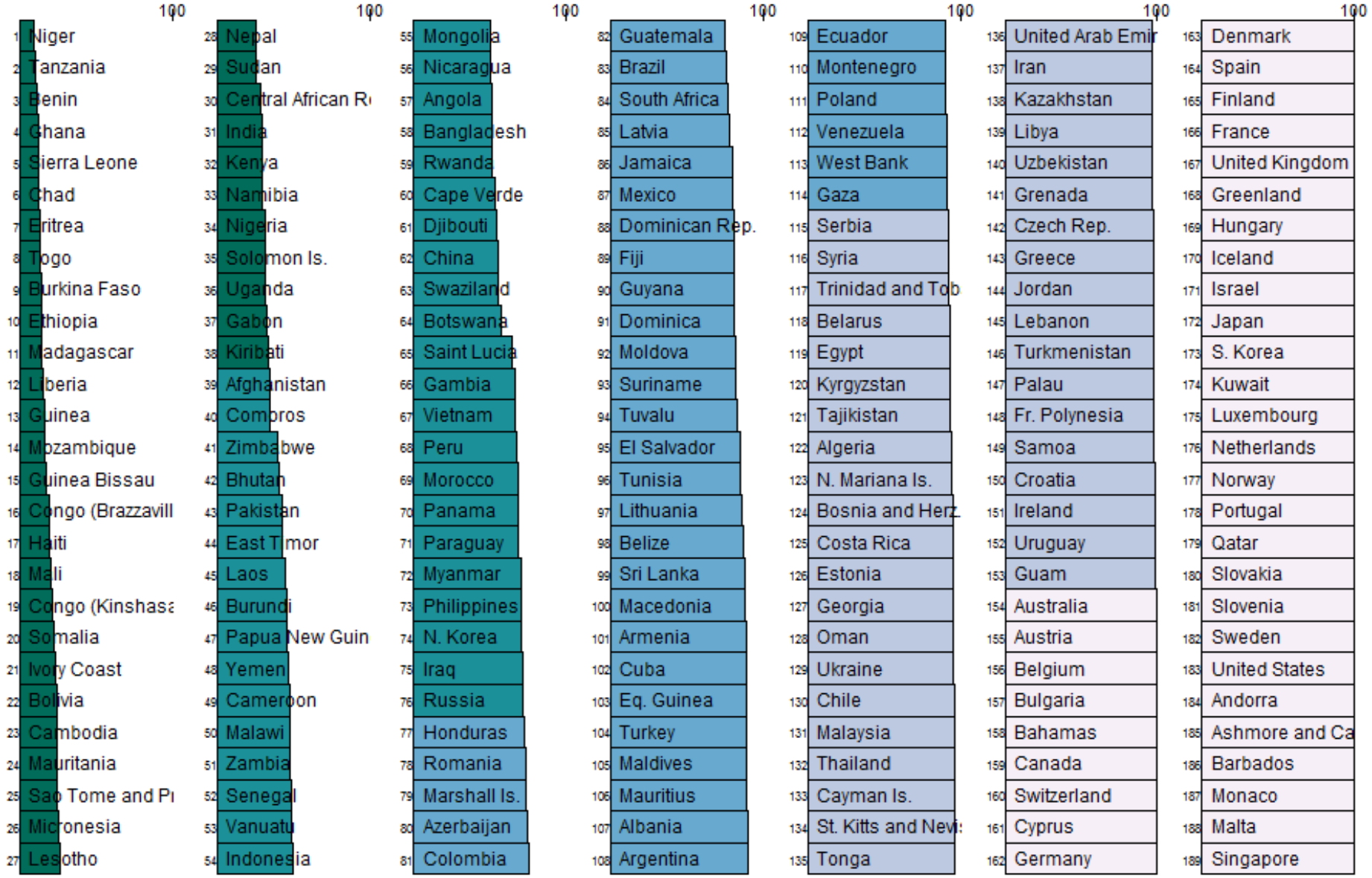
```
library(rworldmap)

mapBubbles( sPDFsanitation
          , nameZSize = indicator
          , nameZColour = 'blue'
          , fill = FALSE )

#optional interactive labelling of countries
identifyCountries( sPDFsanitation
                 , nameColumnToPlot = indicator )
```


Micronesia 25
Solomon Is 32
Comoros 35
SH.STA.ACSN
9
54.5
100

iii. Ranked bar plot

```
library(rworldmap)

barplotCountryData( sPDFsanitation
                    , nameColumnToPlot=indicator
                    , nameCountryColumn = "NAME"
                    , numCats = numCats
                    , colourPalette = colourPalette
                    , na.last = NA
                    , decreasing = FALSE
                    , scaleSameInPanels = TRUE
                    , numPanels = 7
                    , cex = 1.1 )
```

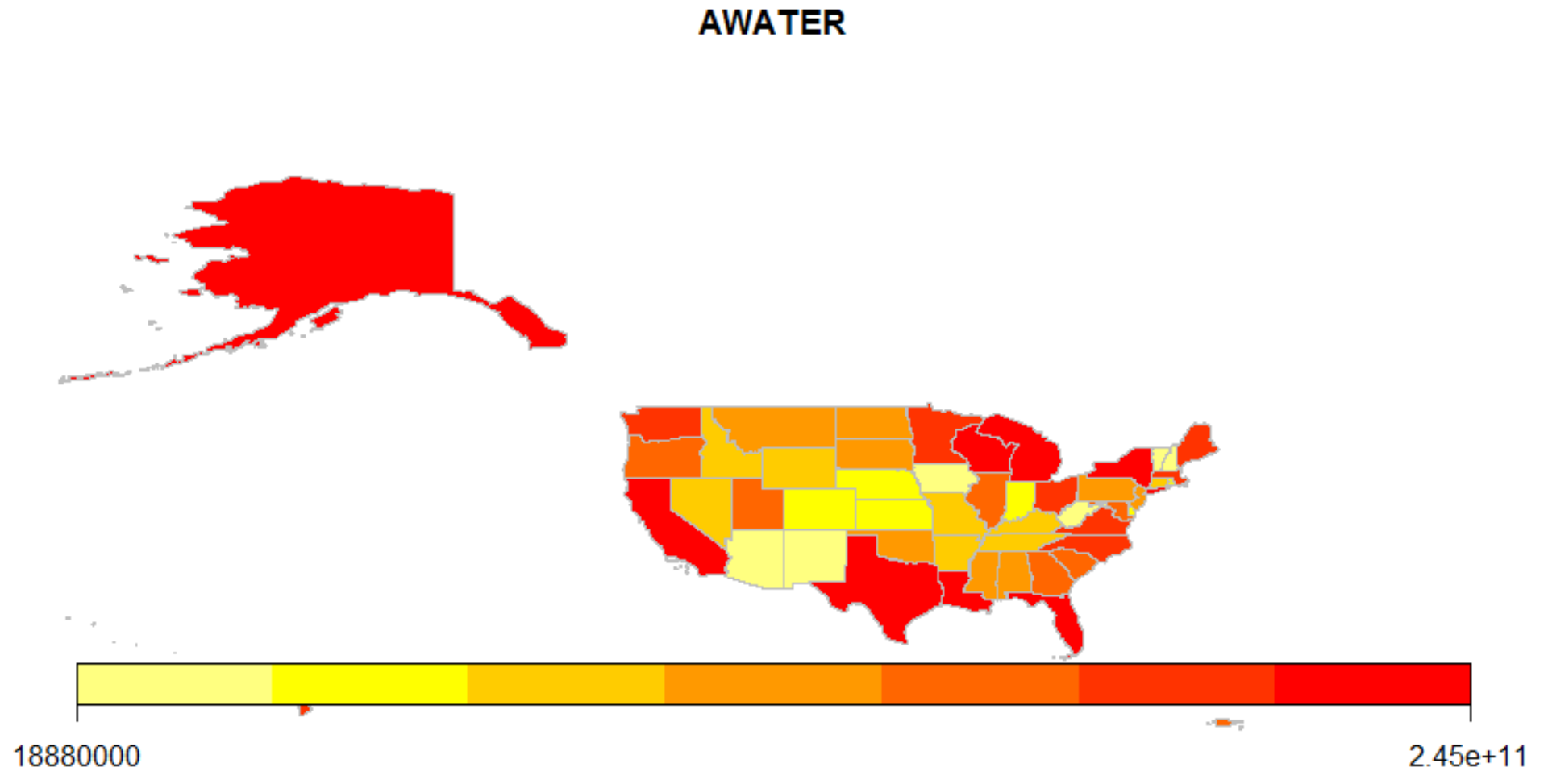
Access to sanitation



non world maps

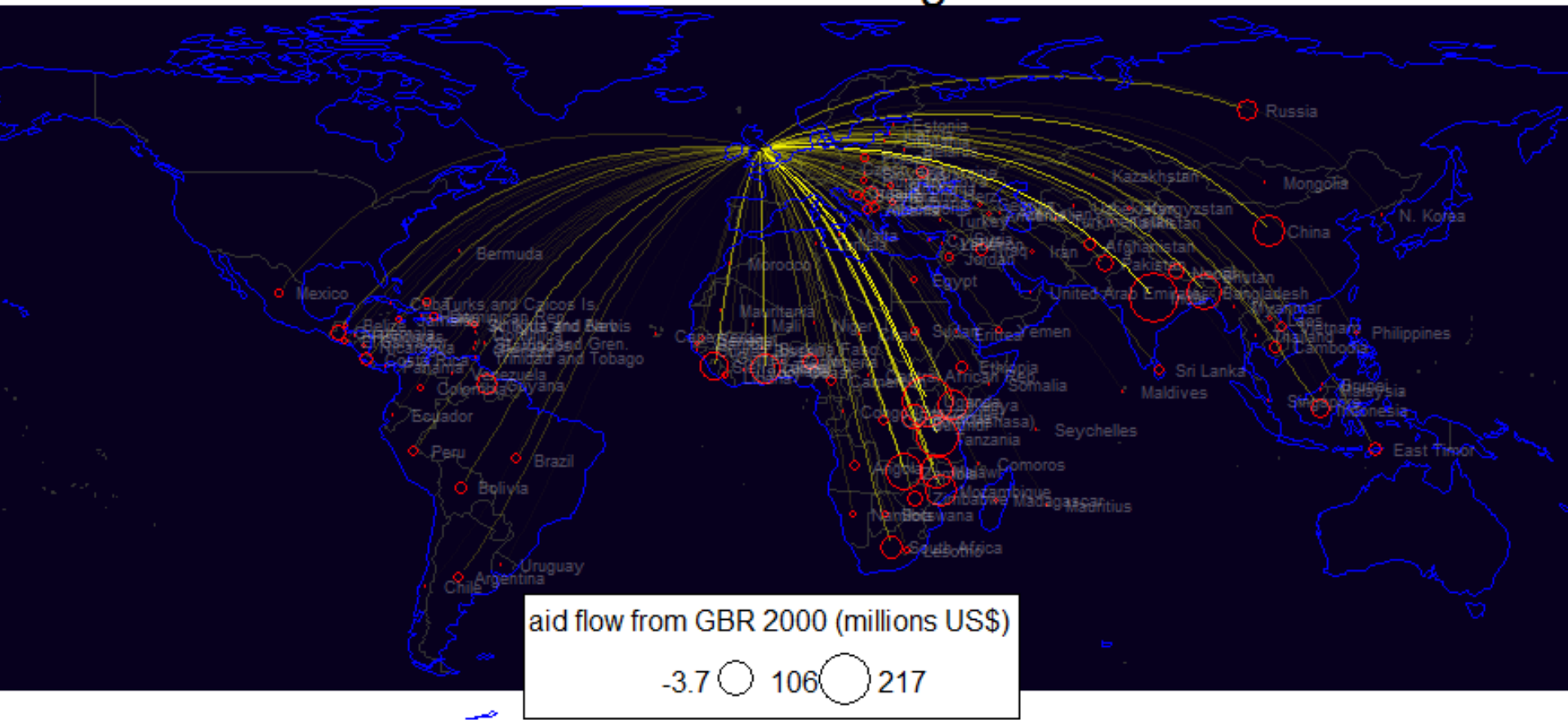
```
## US states map downloaded from :
## http://www2.census.gov/cgi-bin/shapefiles2009/national-files

inFile <- 'tl_2009_us_state.shp'
sPDF <- readShapePoly(inFile)
str(sPDF@data)

## use mapPolys to map the sPDF
mapPolys(sPDF,nameColumnToPlot = "AWATER" ,mapRegion='North America')
```

non world maps

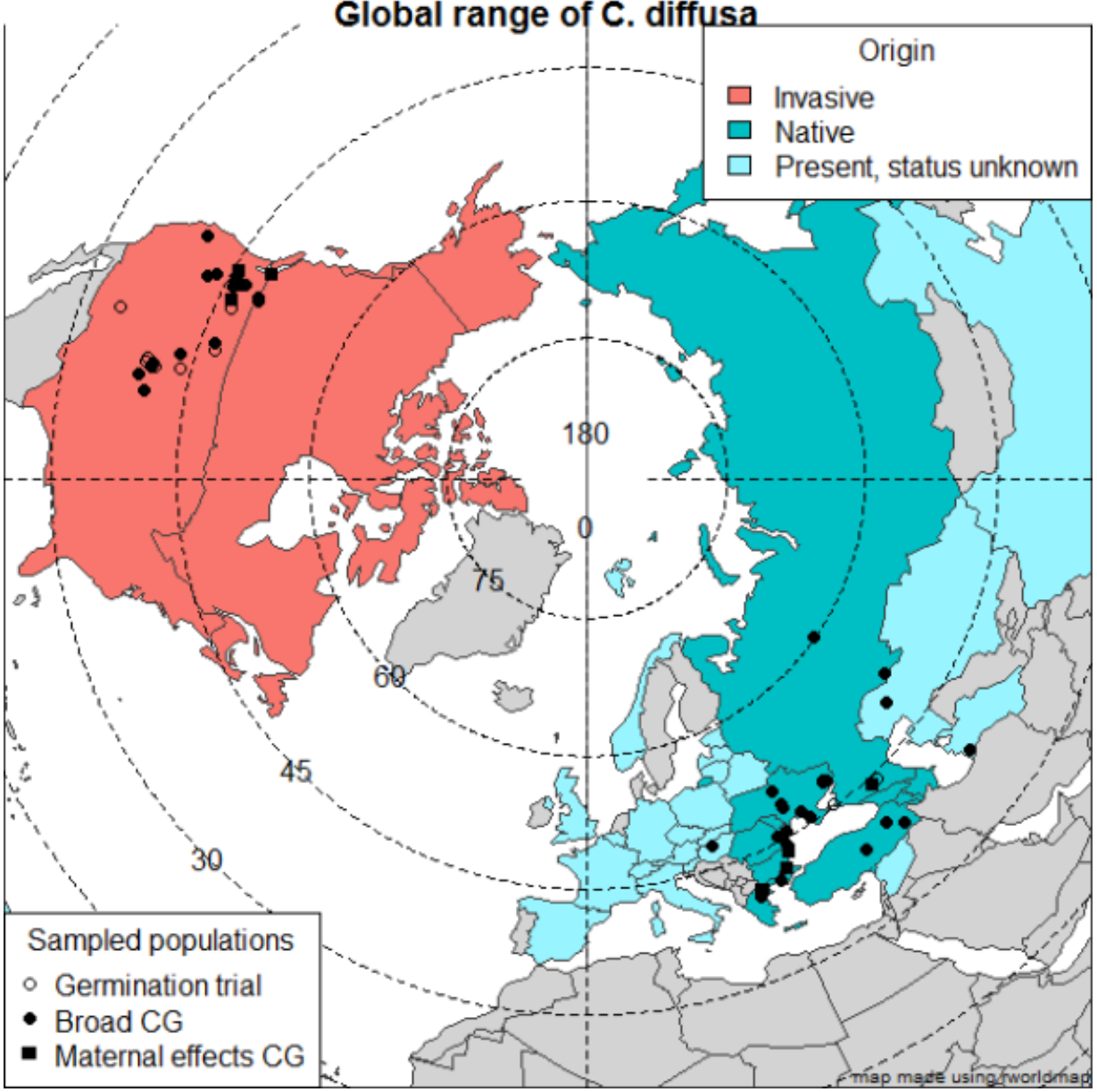


- These are the basics of rworldmap
- Add bits together to make more interesting plots …

Aid flow from United Kingdom 2000



stackoverflow

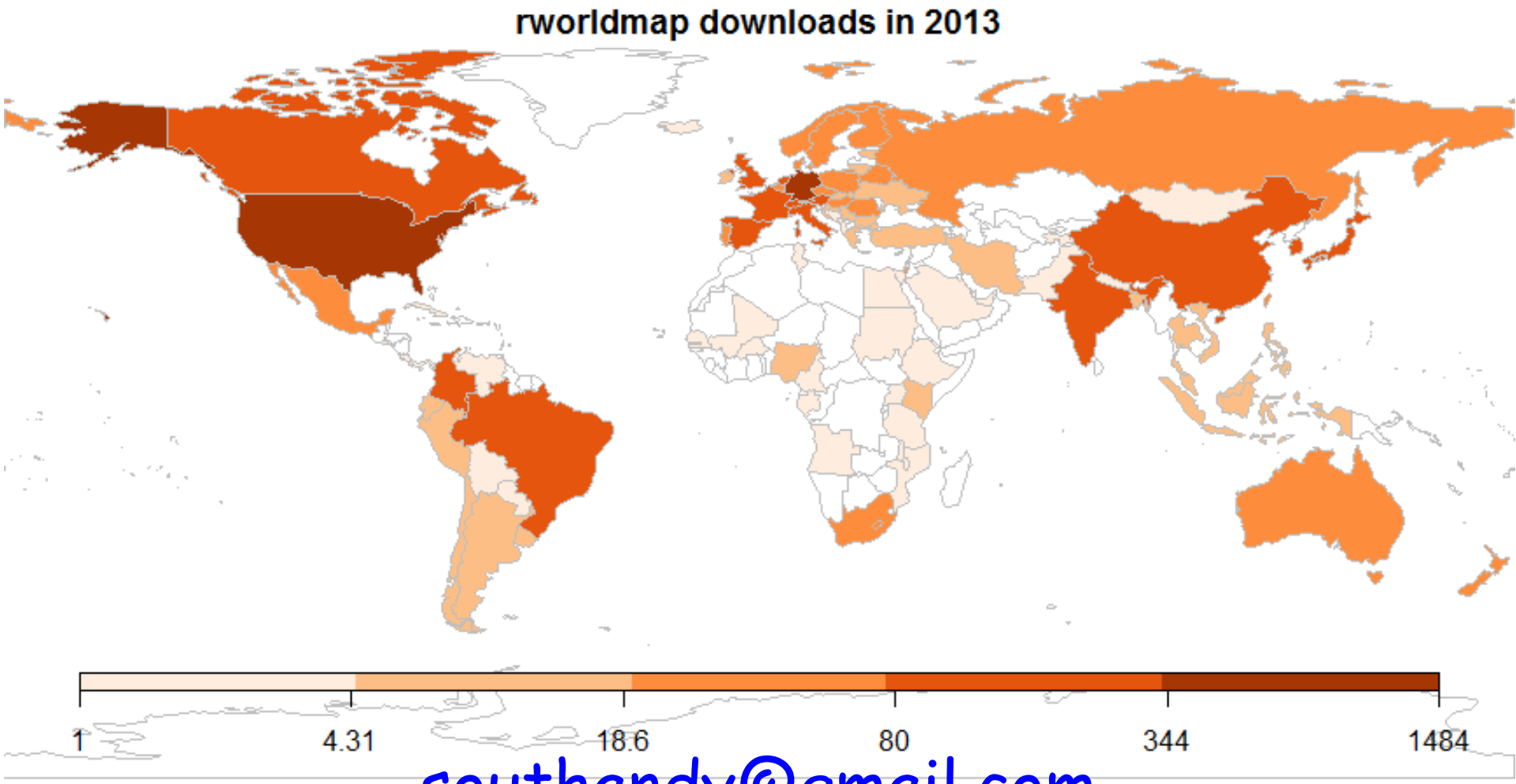


https://alienplantation.wordpress.com/2013/06/18/nuts-and-bolts-modern-maps-of-eurasia-in-r/

Things to remember maybe

- What a spatial polygons dataframe is
- Joining country data to maps
- Use country codes
- Thanks to the developers of the packages on which rworldmap is built (sp, classInt, …)

Meta-mapping
(using rworldmap to map the downloads of …)



southandy@gmail.com

andysouth.co.uk

Xtra bits after here …

modifying map legends

```
data(countryExData)
sPDF <- joinCountryData2Map(countryExData
                            , joinCode = "ISO3"
                            , nameJoinColumn = "ISO3V10")

mapParams <- mapCountryData(sPDF
                            , nameColumnToPlot="EPI"
                            , addLegend=FALSE )

do.call( addMapLegend
         , c(mapParams
         , legendLabels="all"
         , legendWidth=0.5 ))
```

adding multiple elements to a plot

```
mapCountryData()

mapBubbles( getMap()
                , nameZSize="GDP_MD_EST"
                , nameZColour="black"
                , add=TRUE )
```

interactive identification & labelling

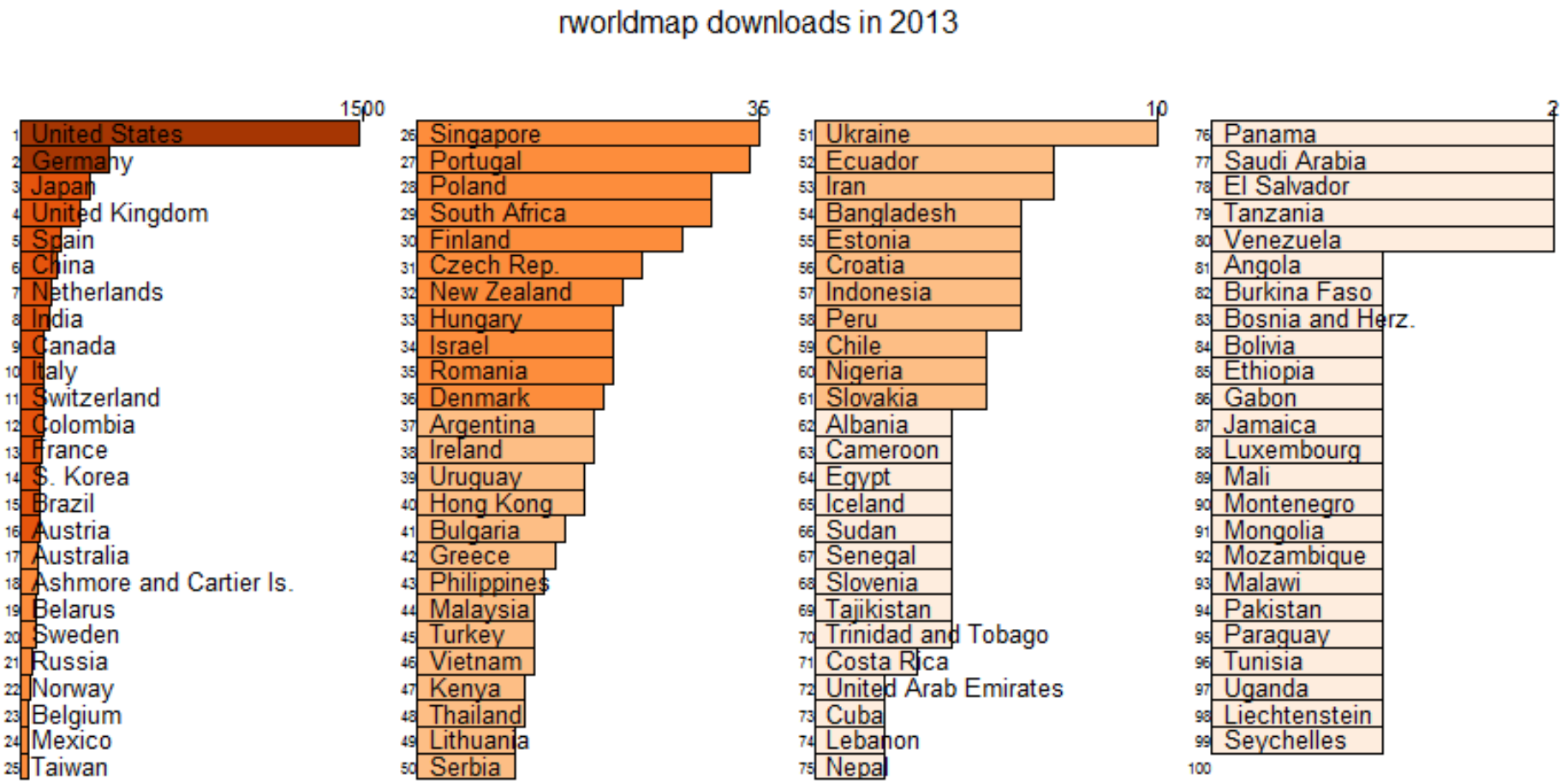
```
mapCountryData(nameColumnToPlot="POP_EST")
identifyCountries(nameColumnToPlot="POP_EST")
```

Then click close to the centre of countries to bring up country labels.

Resources

http://andysouth.co.uk/softwarerworldmap/

https://groups.google.com/group/rworldmap


rworldmap downloads in 2013
1500
1 United States
2 Germany
3 Japan
4 United Kingdom
5 Spain
6 China
7 Netherlands
8 India
9 Canada
10 Italy
11 Switzerland
12 Colombia
13 France
14 S. Korea
15 Brazil
16 Austria
17 Australia
18 Ashmore and Cartier Is.
19 Belarus
20 Sweden
21 Russia
22 Norway
23 Belgium
24 Mexico
25 Taiwan
35
26 Singapore
27 Portugal
28 Poland
29 South Africa
30 Finland
31 Czech Rep.
32 New Zealand
33 Hungary
34 Israel
35 Romania
36 Denmark
37 Argentina
38 Ireland
39 Uruguay
40 Hong Kong
41 Bulgaria
42 Greece
43 Philippines
44 Malaysia
45 Turkey
46 Vietnam
47 Kenya
48 Thailand
49 Lithuania
50 Serbia
10
51 Ukraine
52 Ecuador
53 Iran
54 Bangladesh
55 Estonia
56 Croatia
57 Indonesia
58 Peru
59 Chile
60 Nigeria
61 Slovakia
62 Albania
63 Cameroon
64 Egypt
65 Iceland
66 Sudan
67 Senegal
68 Slovenia
69 Tajikistan
70 Trinidad and Tobago
71 Costa Rica
72 United Arab Emirates
73 Cuba
74 Lebanon
75 Nepal
2
76 Panama
77 Saudi Arabia
78 El Salvador
79 Tanzania
80 Venezuela
81 Angola
82 Burkina Faso
83 Bosnia and Herz.
84 Bolivia
85 Ethiopia
86 Gabon
87 Jamaica
88 Luxembourg
89 Mali
90 Montenegro
91 Mongolia
92 Mozambique
93 Malawi
94 Pakistan
95 Paraguay
96 Tunisia
97 Uganda
98 Liechtenstein
99 Seychelles
100