Package ‘RCzechia’

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RCzechia-package

Description

A selection of spatial objects relevant to the Czech Republic. Due to CRAN package size requirements (5 MB) the objects are stored externally (on Amazon S3) - and therefore could not be implemented as datasets. They are functions returning data frames instead.

Details

To save time (and bandwidth) the downloaded objects are saved locally in ‘tempdir’ directory when requested, and downloaded at most once per R session; out of respect to CRAN Repository Policy a more permanent caching on user’s side is not attempted.

This means that:

• a working internet connection is required to use the full resolution objects
• all objects need to be called with (possibly empty) braces

For the most frequently used objects - republika, kraje and okresy - a low resolution version is also implemented. The low resolution data sets are stored locally (and working internet connection is not necessary to use them).

All objects are implemented as sf data frames.
Administrative regions

- republika - borders of the Czech Republic
- kraje - regions / NUTS3 units
- okresy - districts / LAU1 units
- orp_polygony - municipalities with extended powers (obce s rozšířenou působností)
- obce_polygony - municipalities as polygons
- obce_body - municipalities as centroids (points)
- casti - city districts (for cities that implement them)

Natural objects

- reky - rivers
- plochy - water bodies
- lesy - woodland areas (more than 30 ha in area)

Other objects

- silnice - roads
- zeleznice - railroads
- KFME_grid - grid cells (faunistické čtverce) according to Kartierung der Flora Mitteleuropas methodology

Utility functions

In addition three utility functions are implemented to support spatial workflow:

- union_sf - merging polygons based on a key value
- geocode - geocoding (from address to coordinates)
- revgeo - reverse gecoding (from coordinates to address)

---

casti  

City Parts

---

Description

Function taking no parameters and returning data frame of districts of Prague and other major cities as sf polygons.

Usage

casti()
Format

`sf` data frame with 142 rows of 4 variables + geometry

- **KOD** Code of the city part / kod mestske casti
- **NAZEV** Name of the city part / nazev mestske casti
- **KOD_OBEC** Code of the city
- **NAZ_OBEC** Name of the city

Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 593.6 KB.

Source


---

**chr_uzemi**

*Protected Natural Areas*

Description

Function returning data frame of protected natural areas (Chráněná území) of the Czech Republic as `sf` polygons. It has no obligatory parameters.

Usage

`chr_uzemi()`

Format

`sf` data frame with 36 rows of 2 variables + geometry

- **TYP** Type of protected area: Národní park, Chráněná krajiná oblast
- **NAZEV** Name, with Czech accents

Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 114 KB.

Source

**Description**

This function connects to Czech State Administration of Land Surveying and Cadastre (https://www.cuzk.cz/en) API to geocode an address. As consequence it is implemented only for Czech addresses.

**Usage**

geocode(address, crs = 4326)

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>address</td>
<td>point to be geocoded, as character (vector)</td>
</tr>
<tr>
<td>crs</td>
<td>coordinate reference system of output; default = WGS84</td>
</tr>
</tbody>
</table>

**Format**

`sf` data frame with 3 variables + geometry

- **target**: the address searched (address input)
- **typ**: type of record matched by API
- **address**: address as recorded by RÚIAN
- **geometry**: hidden column with spatial point data

**Details**

Input of the function are an address to geocode (or a vector of addresses) and expected Coordinate Reference System of output (default is WGS84 = EPSG:4326, but in some use cases inž. Křovák = EPSG:5514 may be more relevant). Output is a `sf` data frame of spatial points.

Depending on the outcome of matching the address to RÚIAN data there is a number of possible outcomes:

- All items were *matched exactly*: the returned `sf` data frame has the same number of rows as there were elements in vector to be geocoded. The field **target** will have zero duplicates.
- Some items had *multiple matches*: the returned `sf` data frame has more rows than the there were elements in vector to be geocoded. In the field **target** will be duplicate values. Note that the RÚIAN API limits multiple matches to 10.
- Some (but not all) items had *no match* in RÚIAN data: the returned `sf` data frame will have fewer rows than the vector sent. to be geocoded elements. Some values will be missing from field **target**.
- No items were matched at all: the function returns NA.

Examples

```
asdf <- geocode("Pod sídlištěm 9, Praha 8") # physical address of ČÚZK
print(asdf)
```

---

**KFME_grid**

*KFME grid cells (faunistické čtverce) of the Czech Republic*

---

**Description**

Function returning grid covering the Czech Republic according to the Kartierung der Flora Mitteleuropas methodology.

**Usage**

```
KFME_grid(resolution = "low")
```

**Arguments**

- `resolution` Should the function return high or low resolution shapefile? Allowed values are "low" and "high". Default is "low".

**Format**

```
sf data frame with 1092 rows in low resolution and 4368 rows in high resolution
```

- `ctverec` KFME code of the grid cell; depending on value of 'resolution' parameter either 4 digits, or 4 digits + 1 letter

**Details**

The function returns a sf data frame of grid cells. Depending on the value of parameter ‘resolution’ either low resolution (26×42 cells - default) with labels in 4 digit format (e.g. Hřčava = 6479) or high resolution (104×168 cells) with labels in 4 digit + 1 letter format (e.g Hřčava = 6479c).

**Examples**

```
library(ggplot2)

ggplot() +
  geom_sf(data = republika("low")) +
  geom_sf(data = KFME_grid("low"), fill = NA)
```
Regions (kraje) of the Czech Republic

Description
Function returning data frame of NUTS3 administrative units for the Czech Republic as sf polygons. It takes a single parameter resolution - high res (default) or low res polygons.

Usage
kraje(resolution = "high")

Arguments
resolution Should the function return high or low resolution shapefile? Allowed values are "high" (default) and "low". This parameter affects only the geometry column, all other fields remain the same.

Format
sf data frame with 14 rows of 3 variables + geometry

KOD_KRAJ Code of the region, primary key. Use this as key to add other data items.
KOD_CZNUTS3 Code of the region as NUTS3 (kraj).
NAZ_CZNUTS3 Name of the region as NUTS3 (kraj).

Details
Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size of high resolution shapefile is 2.9 MB (so use with caution, and patience).

Source

Examples
library(sf)
hranice <- kraje()plot(hranice, col = "white", max.plot = 1)
lesy  

**Woodland Areas**

**Description**
Function returning data frame of woodland areas (lesy) of more than 30 hectares in area of the Czech Republic as sf polygons. It has no obligatory parameters.

**Usage**
lesy()

**Format**
sf data frame with 2.366 rows of geometry variable only

**Details**
Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 2.1 MB.

**Source**

---

obce_body  

**Municipalities / communes (obce) as centerpoints**

**Description**
Function returning data frame of LAU2 administrative units for the Czech Republic as sf points. It takes no parameters.

**Usage**
obce_body()

**Format**
sf data frame with 6.258 rows of 14 variables + geometry

**KOD_OBEC** Code of the level I commune (obec).
**NAZ_OBEC** Name of the level I commune (obec).
**KOD_ZUJ** Code of the basic administrative unit (ICZUJ).
**NAZ_ZUJ** Name of the basic administrative unit (ICZUJ).
obce_polygony

KOD_POU   Code of the level II commune (obec s poverenym uradem).
NAZ_POU   Name of the level II commune (obec s poverenym uradem).
KOD_ORP   Code of the level III commune (obec s rozsirenom pusobnosti).
NAZ_ORP   Name of the level III commune (obec s rozsirenom pusobnosti).
KOD_OKRES  Code of the district (okres).
KOD_LAU1   Code of the LAU1 administrative unit (okres).
NAZ_LAU1   Name of the LAU1 administrative unit (okres).
KOD_KRAJ   Code of the region (kraj).
KOD_CZNUTS3  Code of the NUTS3 unit (kraj)
NAZ_CZNUTS3  Name of the NUTS3 unit (kraj)

Details
Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 270 KB.

Source

obce_polygony      Municipalities / communes (obce) as polygons

Description
Function returning data frame of LAU2 administrative units for the Czech Republic as sf polygons. It takes no parameters.

Usage
obce_polygony()

Format
sf data frame with 6.258 rows of 14 variables + geometry

KOD_OBEC   Code of the level I commune (obec).
NAZ_OBEC   Name of the level I commune (obec).
KOD_ZUJ    Code of the basic administrative unit (ICZUJ).
NAZ_ZUJ    Name of the basic administrative unit (ICZUJ).
KOD_POU    Code of the level II commune (obec s poverenym uradem).
NAZ_POU    Name of the level II commune (obec s poverenym uradem).
KOD_ORP    Code of the level III commune (obec s rozsirenom pusobnosti).
NAZ_OKRES Name of the level III commune (obec s rozsirenou pusbobnosti).
KOD_OKRES Code of the district (okres).
KOD_LAU1 Code of the LAU1 administrative unit (okres).
NAZ_LAU1 Name of the LAU1 administrative unit (okres).
KOD_KRAJ Code of the region (kraj).
KOD_CZNUTS3 Code of the NUTS3 unit (kraj)
NAZ_CZNUTS3 Name of the NUTS3 unit (kraj)

Details
Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 36.3 MB (so use with caution, and patience).

Source

Examples
library(sf)
library(dplyr)

praha <- obce_polygony() %>%
  filter(NAZ_LAU1 == "Praha")

plot(praha, max.plot = 1)

---

okresy

**Districts (okresy)**

Description
Function returning data frame of LAU1 administrative units for the Czech Republic as sf polygons. It takes a single parameter resolution - high res (default) or low res polygons.

Usage
okresy(resolution = "high")

Arguments
resolution Should the function return high or low resolution shapefile? Allowed values are "high" (default) and "low". This parameter affects only the geometry column, all other fields remain the same.
**orp_polygony**

**Format**

*sf* data frame with 77 rows of 6 variables + geometry

- **KOD_OKRES** Code of the district (okres).
- **KOD_LAU1** Code of the district as LAU1 unit (okres), primary key. Use this as key to add other data items.
- **NAZ_LAU1** Name of the district as LAU1 unit (okres).
- **KOD_KRAJ** Code of the region.
- **KOD_CZNUTS3** Code of the region as NUTS3 (kraj).
- **NAZ_CZNUTS3** Name of the region (kraj).

**Details**

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size of high resolution shapefile is 6.1 MB (so use with caution, and patience).

**Source**


**Examples**

```r
library(sf)

hranice <- okresy()
plot(hranice, col = "white", max.plot = 1)

object.size(okresy("low"))
ox object.size(okresy("high"))
```

---

**orp_polygony**  
*Obce s rozsirenom púšobnosti*

**Description**

Function returning data frame of municipalities with extended powers (obce s rozšírenou působností) as *sf* polygons. It takes no parameters.

**Usage**

```r
orp_polygony()
```
**Format**

sf data frame with 206 rows of 10 variables + geometry

- **KOD_ORP** Code of the level III commune (obec s rozsirenom psovobnosti).
- **NAZ_ZKR_ORP** Short name of the level III commune (obec s rozsirenom psovobnosti).
- **NAZ_ORP** Full name of the level III commune (obec s rozsirenom psovobnosti).
- **KOD_RUIAN** RUIAN (Registru uzemní identifikace, adres a nemovitostí) code.
- **KOD_OKRES** Code of the district (okres).
- **KOD_LAU1** Code of the LAU1 administrative unit (okres).
- **NAZ_LAU1** Name of the LAU1 administrative unit (okres).
- **KOD_KRAJ** Code of the region (kraj).
- **KOD_KRAJ** Code of the region (kraj).
- **KOD_CZNUTS2** Code of the NUTS3 unit (kraj).
- **NAZ_CZNUTS2** Name of the NUTS3 unit (kraj).

**Details**

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 9 MB (so use with caution, and patience).

**Source**


---

**plochy**

*Water Bodies*

**Description**

Function returning data frame of water bodies of the Czech Republic as sf polygons. It takes no parameters.

**Usage**

plochy()

**Format**

sf data frame with 480 rows of 5 variables + geometry

- **TYP** Type of water body: 1 = dam, 2 = pond, 3 = lake
- **NAZEV** Name, with Czech accents
- **NAZEV_ASCII** Name, without Czech accents
- **VYSKA** water level, meters above sea level
- **Major** Boolean indicating major water bodies
Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 118.6 KB.

Source


| reky | Rivers |

Description

Function returning data frame of rivers of the Czech Republic as sf lines. It takes no parameters.

Usage

reky()

Format

sf data frame with 6.198 rows of 4 variables + geometry:

TYP Type of river: 1 = natural, 2 = man-made, 3 = fictional
NAZEV Name, with Czech accents
NAZEV_ASCII Name, without Czech accents
Major Boolean indicating one of the major rivers.

Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 1 MB.

Source

Description

Boundaries of the Czech Republic as sf polygon.

Usage

republika(resolution = "high")

Arguments

resolution Should the function return high or low resolution shapefile? Allowed values are "high" (default) and "low". This parameter affects only the geometry column, all other fields remain the same.

Format

sf data frame with 1 row of 1 variable + geometry:

Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size of high resolution shapefile is 949.7 KB.

Source


Examples

library(sf)

hranice <- republika()
plot(hranice, col = "white")
Description

This function connects to Czech State Administration of Land Surveying and Cadastre (https://www.cuzk.cz/en) API to reversely geocode an address. As consequence it is implemented only for Czech addresses.

Usage

revgeo(coords)

Arguments

 coords coordinates to be reverse geocoded; expected as sf data frame of spatial points

Details

Input of the function is a sf data frame of spatial points, and output a vector of characters.

The function returns the same sf data frame as input, with added field revgeocoded; it contains the result of operation. If the data frame contained a column named revgeocoded it gets overwritten.

In case of reverse geocoding failures (e.g. coordinates outside of the Czech Republic and therefore scope of ČÚZK) NA is returned.


Examples

library(dplyr)
library(sf)

brno <- obce_polygony() %>% # shapefile of Brno
   filter(NAZ_OBEC == "Brno") %>%
   st_set_crs(5514) %>% # a planar CRS
   st_set_agr("constant") # to avoid raising a warning
pupek_brna <- st_centroid(brno) # calculate centroid
adresa_pupku <- revgeo(pupek_brna)$revgeocoded # address of the center
silnice

**Road Network**

**Description**

Function returning data frame of roads of the Czech Republic as sf lines. It has no obligatory parameters.

**Usage**

silnice()

**Format**

sf data frame with 18,979 rows of 4 variables + geometry:

**TRIDA** Class of the road: highway = dálnice, speedway = rychlostní silnice, 1st clas road = silnice I. třídy, 2nd class road = silnice II. třídy, 3rd class road = silnice III. třídy, other road = nevidovaná silnice

**CISLO_SILNICE** Local road code

**MEZINARODNI_OZNACENI** International road code

**Details**

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 1.5 MB.

**Source**


union_sf

**Aggregate Polygons in a sf Object**

**Description**

The function aggregates polygons of geometry column of a sf data frame according to values of a single data column. It has outcome comparable to unionSpatialPolygons from maptools package, except that it works on sf and not sp objects.

**Usage**

union_sf(data, key, tolerance = 1, planar_CRS = 5514)
Arguments

- **data**: sf data frame to be aggregated
- **key**: name of a single column to define the output objects
- **tolerance**: buffer size for avoiding artefacts (slivers); default is one meter
- **planar_CRS**: planar CRS for avoiding artefacts (slivers); default is EPSG:5514 = ing. Křovák

Details

The function has data frame as the first argument, so it is pipe friendly. It retains only geometry and key value, dropping all other columns (they are easy to re-attach using tidyverse/dplyr workflow if required).

During processing the sf data frame is temporarily transformed to planar coordinates and - to avoid artefacts (slivers) at the place of former boundaries - buffered; the default values of planar_CRS and tolerance should cover most situations in the Czech Republic and near abroad.

Examples

```r
# library(sf)
NUTS3 <- union_sf(okresy(), "KOD_CZNUTS3")
# assembles NUTS3 regions from LAU1 regions of Czech Republic = equivalent to kraje() in geometry
plot(NUTS3)
```

vyskopis

Description

Terrain of the Czech Republic as a raster package object.

Usage

```r
vyskopis(format = "rayshaded")
```

Arguments

- **format**: Should the function return actual relief (meters above sea level) or shaded relief (rayshaded). Allowed values are "actual" and "rayshaded".

Format

- raster package RasterLayer.
Details

The function returns a raster file of either actual relief (values are meters above sea level) or rayshaded relief (created via highly recommended rayshader package).

The raster is 5084 by 3403 cells, meaning each pixel is about 90 x 90 meters. It works the best at level of country or regions, at the level of a city or lower it may be somewhat grainy.

Due to package size constraints both versions are stored externally (and a working internet connection is required to use the package). Downloaded size of the rayshaded raster is 8.4 MB, actual raster is 31.4 MB.

Source


Examples

```r
library(raster)
relief <- vyskopis("rayshaded")
plot(relief, col = gray.colors(16))
```

zeleznice  Railroad Network

Description

Function returning data frame of railroads of the Czech Republic as sf lines. It has no obligatory parameters.

Usage

```r
zeleznice()
```

Format

sf data frame with 3.525 rows of 4 variables + geometry:

- **ELEKTRIFIKACE** is the railroad electrified?: yes = ano, no = ne
- **KATEGORIE** category: international = mezinárodní, local = vnitrostátní
- **KOLEJNOST** track: single = jednokolejní, double = dvojkolejní, more = tři a vícekolejní
- **ROZCHODNOST** gauge: standard = normální, narrow = úzkokolejka

Details

Due to package size constraints the data are stored externally (and a working internet connection is required to use the package). Downloaded size is 285 KB.
zeleznice

Source

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