06_Orientation_towards_wind

October 14, 2020

1 Measure orientation of seashore streets in relation to SW wind

Computational notebook 06 for Climate adaptation plans in the context of coastal settlements: the case of Portugal.

Date: 27/06/2020

This notebook computes deviation of seashore street orientation from SW wind direction (45 degrees).

Requires attribute `case` in `name_str` capturing which LineStrings form the seashore street itself. (1 - True) (already used in `03_Calculate_contextual_characters.ipynb`.

Structure of GeoPackages:

```
./data/
    atlantic.gpkg
        name_blg    - Polygon layers
        name_str    - LineString layers
        name_case   - Polygon layers
        name_tess   - Polygon layers
        name_blocks - Polygon layers
        ...
     preatl.gpkg
        name_blg
        name_str
        name_case
        ...
     premed.gpkg
        name_blg
        name_str
        name_case
        ...
     med.gpkg
        name_blg
        name_str
        name_case
        ...
```

CRS of the original data is EPSG:3763.

```
<Projected CRS: EPSG:3763>
Name: ETRS89 / Portugal TM06
Axis Info [cartesian]:
- X[east]: Easting (metre)
- Y[north]: Northing (metre)
Area of Use:
- name: Portugal - mainland - onshore
- bounds: (-9.56, 36.95, -6.19, 42.16)
Coordinate Operation:
- name: Portugal TM06
- method: Transverse Mercator
Datum: European Terrestrial Reference System 1989
- Ellipsoid: GRS 1980
- Prime Meridian: Greenwich
```

[1]:
```
import fiona
import geopandas as gpd
import shapely
import numpy as np
import pandas as pd
```

[2]:
```
fiona.__version__, gpd.__version__, shapely.__version__, np.__version__, pd.
 ↪__version__
```

[2]:
```
('1.8.13', '0.7.0', '1.7.0', '1.18.1', '1.0.3')
```

[ ]:
```
from shapely.ops import linemerge

def wind_issue(line, wind_angle=45):
    coords = line.coords
    angle = np.arctan2(coords[-1][0] - coords[0][0], coords[-1][1] -␣
 ↪coords[0][1])
    az = np.degrees(angle)

    if az < wind_angle:
        az += 180
    az -= wind_angle
    if az < 0:
        az = az * -1
    if 90 < az <= 180:
        diff = az - 90
        az = az - 2 * diff
    return az / 90


wind = pd.DataFrame(columns=['place', 'winddev'])
```

```
ix = 0

parts = ['atlantic', 'preatl', 'premed', 'med']

for part in parts:
    path = folder + part + '.gpkg'
    layers = [x[:-4] for x in fiona.listlayers(path) if 'blg' in x]
    for l in layers:
        streets = gpd.read_file(path, layer=l + '_str')
        seashore = streets[streets.case == 1].geometry.to_list()
        merged = linemerge(seashore)
        if merged.type != 'LineString':
            dims = {}
            for i, seg in enumerate(merged):
                dims[i] = seg.length
            key = max(dims, key=dims.get)
            wind.loc[ix] = [l, wind_issue(merged[key])]
            ix += 1
        else:
            wind.loc[ix] = [l, wind_issue(merged)]
            ix += 1
```

[ ]:
```
wind.to_csv(folder + 'wind_relation.csv')
```