Programming for Geo Informatics - Lab 6

Vector data processing 2

Submitted By :

Ashwin E

SC24M136

Point in Polygon Analysis

In [14]:
```
import geopandas as gpd
import matplotlib.pyplot as plt
```

Open countries vector layer

In [10]:
```
points = gpd.read_file(r"A:\IIST GEO INFORMATICS\Programming for geoinformatics Lab
polygons = gpd.read_file(r"A:\IIST GEO INFORMATICS\Programming for geoinformatics L
joined = gpd.sjoin(points, polygons, how="left", predicate="within")
```

The point dataset has places with Latitude/Longitude coordinates, choose WGS 84 EPSG:436 as the CRS in the Coordinate Reference System Selector dialog.

In [11]:
```
points = points.to_crs(epsg=4326)
polygons = polygons.to_crs(epsg=4326)
```

Using point in polygon vector analysis find the number of important places in each country. Colour code accordingly (You can highlight your favourite country)

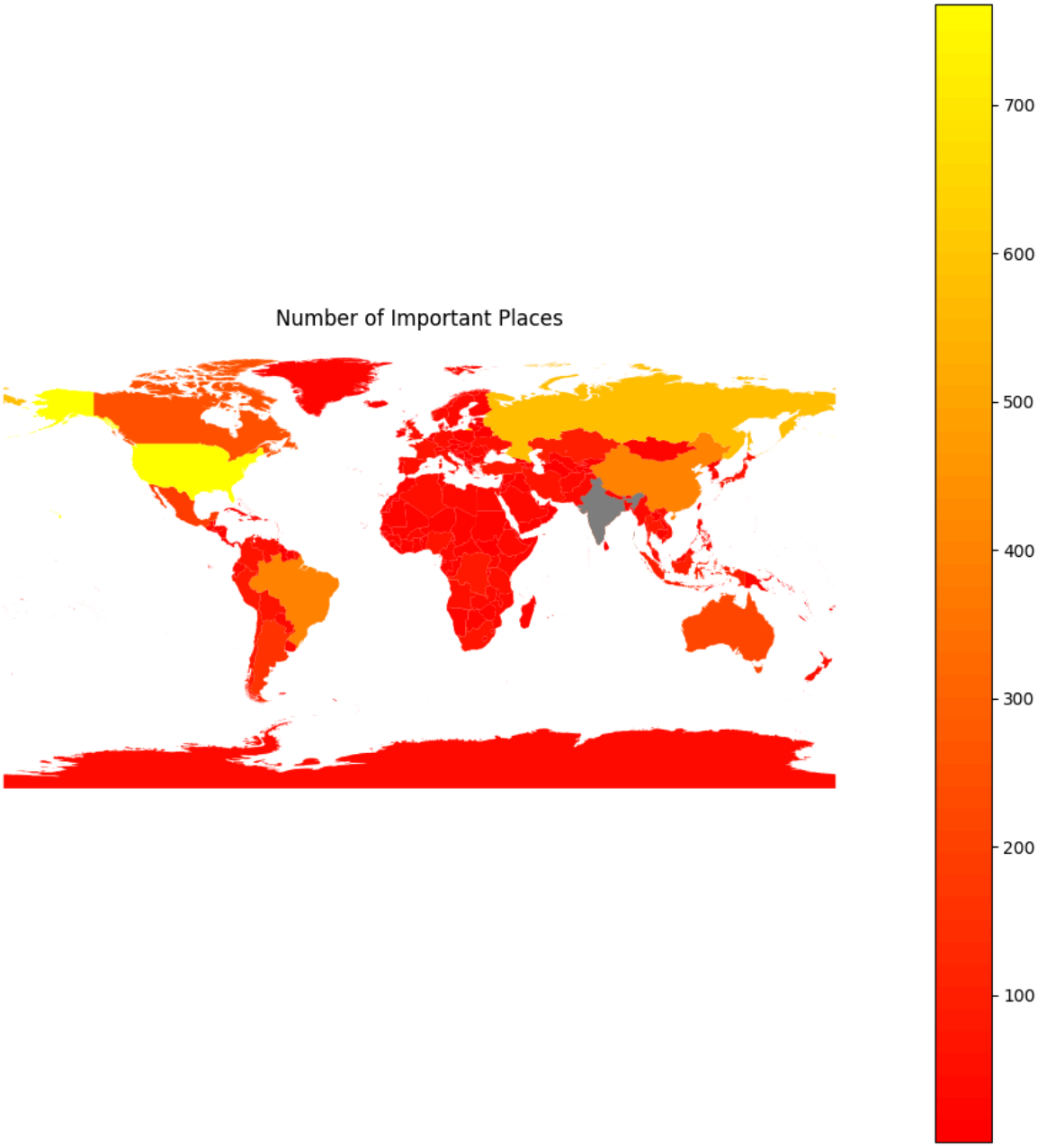
In [27]:
```
place_counts = joined.groupby('NAME').size()
print(place_counts)

favorite_country = 'India'
polygons['highlight'] = polygons['NAME'] == favorite_country

place_counts.name = 'important_places_count'
fig, ax = plt.subplots(figsize=(12, 12))
```

```
polygons.plot(column='important_places_count', cmap='autumn', legend=True, ax=ax)
polygons[polygons['highlight']].plot(ax=ax, color='Grey')
plt.axis ('off')
plt.title('Number of Important Places')
plt.show()
```

```
NAME
Afghanistan       33
Aland              1
Albania           26
Algeria           51
American Samoa     1
                  ..
Vietnam           60
W. Sahara          1
Yemen             20
Zambia            34
Zimbabwe          20
Length: 224, dtype: int64
```



Given the locations of all known significant places, we will try to find out which country has had the highest number of important places.

In [13]:
```
max_country = place_counts.idxmax()
max_count = place_counts.max()
print(f'The country with the highest number of important places is {max_country} wi
```

```
The country with the highest number of important places is United States with 768 pl
aces.
```

Spatial Querying

In [20]:

```
import geopandas as gpd
import matplotlib.pyplot as plt
from pyproj import CRS
import pandas as pd

lakes = gpd.read_file(r"A:\IIST GEO INFORMATICS\Programming for geoinformatics Lab\
cities = gpd.read_file(r"A:\IIST GEO INFORMATICS\Programming for geoinformatics Lab

print(cities.head())
print(lakes.head())

crs = CRS(proj='aeqd', lat_0=0, lon_0=0, x_0=0, y_0=0, units='m')
cities = cities.to_crs(crs)
lakes = lakes.to_crs(crs)

cities_buffer = cities.buffer(10000)
lakes_buffer = lakes.buffer(10000)

lakes_buffer_gdf = gpd.GeoDataFrame(geometry=lakes_buffer, crs=lakes.crs)
cities_buffer_gdf = gpd.GeoDataFrame(geometry=cities_buffer, crs=cities.crs)

cities_10km = gpd.sjoin(cities, lakes_buffer_gdf, how="inner",predicate="intersects

fig, ax = plt.subplots(figsize=(10, 10))
lakes_buffer_gdf.boundary.plot(ax=ax, color='blue', linewidth=1, label='LakesBuffer
cities_buffer_gdf.boundary.plot(ax=ax, color='grey', linewidth=1, label='CitiesBuff
cities.plot(ax=ax, color='orange', markersize=10, label='Cities', alpha=0.7)
lakes.plot(ax=ax, color='cyan', linewidth=0.5, label='Lakes', alpha=0.5)
plt.title('Buffers Around Cities and Lakes')
plt.xlabel('Longitude')
plt.ylabel('Latitude')
plt.legend()
plt.show()
cities_10km = cities_10km.to_crs(epsg=4326)

columns_to_keep = ['name', 'geometry', 'geonameid']
cities_10km_filtered = cities_10km[columns_to_keep]
cities_10km_filtered.to_file(r'A:\IIST GEO INFORMATICS\Programming for geoinformati
```

```
   scalerank  natscale  labelrank       featurecla                    name  \
0         10         1          8  Admin-1 capital  Colonia del Sacramento
1         10         1          8  Admin-1 capital               Trinidad
2         10         1          8  Admin-1 capital             Fray Bentos
3         10         1          8  Admin-1 capital               Canelones
4         10         1          8  Admin-1 capital                 Florida

  namepar namealt  diffascii               nameascii  adm0cap  ...  rank_max  \
0    None    None          0  Colonia del Sacramento      0.0  ...         7
1    None    None          0               Trinidad      0.0  ...         7
2    None    None          0             Fray Bentos      0.0  ...         7
3    None    None          0               Canelones      0.0  ...         6
4    None    None          0                 Florida      0.0  ...         7

  rank_min  geonameid  meganame ls_name ls_match checkme min_zoom       ne_id  \
0        7  3443013.0      None    None        0       0      9.0  1159112629
1        7  3439749.0      None    None        0       0      9.0  1159112647
2        7  3442568.0      None    None        0       0      9.0  1159112663
3        6  3443413.0      None    None        0       0      9.0  1159112679
4        7  3442585.0      None    None        0       0      7.0  1159112703

                 geometry
0    POINT (-57.84 -34.48)
1  POINT (-56.901 -33.544)
2  POINT (-58.304 -33.139)
3  POINT (-56.284 -34.538)
4  POINT (-56.215 -34.099)

[5 rows x 39 columns]
             dissolve  scalerank       featurecla             name name_alt  \
0              0River        1.0            River  Irrawaddy Delta     None
1  1001Lake Centerline        9.0  Lake Centerline        Tonle Sap     None
2           1001River        9.0            River        Tonle Sap     None
3  1002Lake Centerline        9.0  Lake Centerline          Sheksna     None
4           1002River        9.0            River          Sheksna     None

   rivernum  note  min_zoom    name_en  min_label  ...    name_pl  \
0         0  None       2.0  Irrawaddy        3.0  ...    Irawadi
1      1001  None       7.1       None        8.1  ...  Tonle Sap
2      1001  None       7.1       None        8.1  ...  Tonle Sap
3      1002  None       7.1    Sheksna        8.1  ...    Szeksna
4      1002  None       7.1    Sheksna        8.1  ...    Szeksna

       name_pt   name_ru    name_sv        name_tr           name_vi name_zh  \
0  Rio Irauádi   Иравади  Irrawaddy  İravadi Nehri  Sông Ayeyarwaddy   伊洛瓦底江
1         None  Тонлесап       None           None              None    None
2         None  Тонлесап       None           None              None    None
3         None    Шексна    Sjeksna           None              None   舍克斯納河
4         None    Шексна    Sjeksna           None              None   舍克斯納河

  wdid_score       ne_id                                           geometry
0          2  1159109417  MULTILINESTRING ((95.4511 17.8205, 95.42766 17...
1          4  1159109429  MULTILINESTRING ((103.68743 13.22468, 103.7133...
2          4  1159109445  LINESTRING (104.61476 12.38203, 104.61769 12.3...
3          4  1159109447  LINESTRING (37.73951 59.07954, 37.75733 59.103...
4          4  1159109461  LINESTRING (38.47804 59.21666, 38.48528 59.228...
```

[5 rows x 35 columns]