

```
In [1]: import pandas as pd #for analyzing panel data
import os #used to shorten filepaths
import geopandas as gpd # for handling GIS data and
from shapely.geometry import Point, Polygon #for adding Shapefiles for geograp
hic data
import matplotlib.pyplot as plt
```

```
In [2]: here = os.getcwd()
```

```
In [3]: Nigeria_Counties = here + "\\NigeriaShape\\NIR.shx"
#shapefile for States and Local Government Areas
```

```
In [61]: HouseData = here + "\\NigeriaHousehold\\sect4b_plantingw3.csv"
NigeriaPhones = pd.read_csv(HouseData)
```

```
In [62]: NigeriaPhones.head()
```

Out[62]:

	zone	state	lga	sector	ea	hhid	indiv	s4bq1	s4bq8	s4bq9	...	s4bq10h	s4bq14	s4bq15
0	4	1	115	1	670	10001	1	1	1.0	1.0	...	2.0	2.0	2.0
1	4	1	115	1	670	10001	2	1	1.0	1.0	...	2.0	2.0	2.0
2	4	1	115	1	670	10001	3	2	NaN	NaN	...	NaN	NaN	NaN
3	4	1	115	1	670	10001	4	1	1.0	1.0	...	2.0	2.0	2.0
4	4	1	115	1	670	10001	8	2	NaN	NaN	...	NaN	NaN	NaN

5 rows × 28 columns



Cleaning Household Survey Data

```
In [63]: NigeriaPhones.rename(columns = {'s4bq1':'>10?',
                                         's4bq8':'phone',
                                         's4bq10':'#phones',
                                         's4bq10b':'banking',
                                         's4bq10c':'mobile banking',
                                         's4bq10d':'mobile transfer',
                                         's4bq10g':'how often',
                                         's4bq14':'internet access',
                                         's4bq15':'internet source',
                                         's4bq15a1':'internet usage',
                                         's4bq15a3':'internet usage 2',
                                         }, inplace = True)
```

```
In [64]: NigeriaPhones.drop(['s4bq9', 's4bq10e', 's4bq10f', 's4bq10g_os', 's4bq10h', 's4bq15b', 's4bq15a1_os', 's4bq15a2', 's4bq15a2_os', 's4bq15a3_os'], axis = 1, inplace = True)
```

```
In [65]: NigeriaPhones.state.replace({1: 'Abia',
                                     2: 'Adamawa',
                                     3: 'Akwa Ibom',
                                     4: 'Anambra',
                                     5: 'Bauchi',
                                     6: 'Bayelsa',
                                     7: 'Benue',
                                     8: 'Borno',
                                     9: 'Cross River',
                                     10: 'Delta',
                                     11: 'Ebonyi',
                                     12: 'Edo',
                                     13: 'Ekiti',
                                     14: 'Enugu',
                                     15: 'Gombe',
                                     16: 'Imo',
                                     17: 'Jigawa',
                                     18: 'Kaduna',
                                     19: 'Kano',
                                     20: 'Katsina',
                                     21: 'Kebbi',
                                     22: 'Kogi',
                                     23: 'Kwara',
                                     24: 'Lagos',
                                     25: 'Nasarawa',
                                     26: 'Niger',
                                     27: 'Ogun',
                                     28: 'Ondo',
                                     29: 'Osun',
                                     30: 'Oyo',
                                     31: 'Plateau',
                                     32: 'Rivers',
                                     33: 'Sokoto',
                                     34: 'Taraba',
                                     35: 'Yobe',
                                     36: 'Zamfara',
                                     37: 'Abuja'
                                     }, inplace = True)
```

```
In [66]: NigeriaPhones.zone.replace({1: 'North Central',
                                     2: 'North East',
                                     3: 'North West',
                                     4: 'South East',
                                     5: 'South South',
                                     6: 'South West'},
                                     inplace = True)
```

In [70]: NigeriaPhones

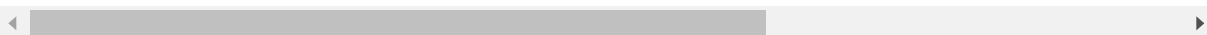
Out[70]:

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	#phones	banking	mob bankin
0	South East	Abia	115	1	670	10001	1	1	1.0	1.0	2.0	Næ
1	South East	Abia	115	1	670	10001	2	1	1.0	1.0	2.0	Næ
2	South East	Abia	115	1	670	10001	3	2	NaN	NaN	NaN	Næ
3	South East	Abia	115	1	670	10001	4	1	1.0	1.0	2.0	Næ
4	South East	Abia	115	1	670	10001	8	2	NaN	NaN	NaN	Næ
5	South East	Abia	115	1	670	10002	1	1	1.0	2.0	1.0	2
6	South East	Abia	115	1	670	10002	2	1	1.0	2.0	1.0	2
7	South East	Abia	115	1	670	10002	3	1	1.0	1.0	2.0	Næ
8	South East	Abia	115	1	670	10002	4	1	1.0	1.0	2.0	Næ
9	South East	Abia	115	1	670	10002	8	2	NaN	NaN	NaN	Næ
10	South East	Abia	115	1	670	10002	9	2	NaN	NaN	NaN	Næ
11	South East	Abia	115	1	670	10003	1	1	1.0	1.0	2.0	Næ
12	South East	Abia	115	1	670	10003	2	1	1.0	NaN	2.0	Næ
13	South East	Abia	115	1	670	10003	3	1	1.0	NaN	2.0	Næ
14	South East	Abia	115	1	670	10003	4	1	1.0	NaN	2.0	Næ
15	South East	Abia	115	1	670	10003	5	1	1.0	NaN	2.0	Næ
16	South East	Abia	115	1	670	10003	6	1	1.0	NaN	2.0	Næ
17	South East	Abia	115	1	670	10004	1	1	1.0	1.0	2.0	Næ
18	South East	Abia	115	1	670	10004	2	1	1.0	1.0	2.0	Næ
19	South East	Abia	115	1	670	10004	3	1	1.0	NaN	2.0	Næ
20	South East	Abia	115	1	670	10004	4	1	1.0	1.0	2.0	Næ
21	South East	Abia	115	1	670	10004	5	1	1.0	NaN	2.0	Næ
22	South East	Abia	115	1	670	10005	1	1	1.0	1.0	2.0	Næ

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	#phones	banking	mob bankii
23	South East	Abia	115	1	670	10005	2	1	1.0	1.0	2.0	Nz
24	South East	Abia	115	1	670	10005	3	1	1.0	NaN	2.0	Nz
25	South East	Abia	115	1	670	10005	4	1	1.0	NaN	2.0	Nz
26	South East	Abia	115	1	670	10005	5	2	NaN	NaN	NaN	Nz
27	South East	Abia	115	1	670	10005	6	1	1.0	1.0	2.0	Nz
28	South East	Abia	115	1	670	10005	7	2	NaN	NaN	NaN	Nz
29	South East	Abia	115	1	0	10006	1	1	1.0	2.0	1.0	2
...
26841	North Central	Niger	2609	1	0	370036	1	1	1.0	1.0	2.0	Nz
26842	North Central	Niger	2609	1	0	370036	2	1	1.0	1.0	2.0	Nz
26843	North Central	Niger	2609	1	0	370036	3	2	NaN	NaN	NaN	Nz
26844	North Central	Niger	2609	1	0	370036	4	2	NaN	NaN	NaN	Nz
26845	North Central	Niger	2609	1	0	370036	5	1	1.0	1.0	2.0	Nz
26846	North Central	Niger	2609	1	0	370036	6	2	NaN	NaN	NaN	Nz
26847	North Central	Abuja	3706	2	6	370037	1	1	1.0	1.0	2.0	Nz
26848	North Central	Abuja	3706	2	6	370037	2	1	1.0	1.0	2.0	Nz
26849	North Central	Abuja	3706	2	6	370037	3	1	1.0	NaN	2.0	Nz
26850	North Central	Abuja	3706	2	6	370037	4	1	1.0	NaN	2.0	Nz
26851	North Central	Abuja	3706	2	6	370037	5	2	NaN	NaN	NaN	Nz
26852	North Central	Abuja	3706	2	6	370038	1	1	1.0	1.0	2.0	Nz
26853	North Central	Abuja	3706	2	6	370038	2	1	1.0	1.0	2.0	Nz
26854	North Central	Abuja	3706	2	6	370038	4	1	1.0	NaN	2.0	Nz
26855	North Central	Abuja	3706	2	6	370038	5	2	NaN	NaN	NaN	Nz

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	#phones	banking	mob bankii
26856	North Central	Abuja	3706	2	6	370039	1	1	1.0	2.0	2.0	Nz
26857	North Central	Abuja	3706	2	6	370039	2	1	1.0	1.0	2.0	Nz
26858	North Central	Abuja	3706	2	6	370039	3	1	1.0	1.0	2.0	Nz
26859	North Central	Abuja	3706	2	6	370039	4	1	1.0	1.0	2.0	Nz
26860	North Central	Abuja	3706	2	6	370039	5	1	1.0	1.0	2.0	Nz
26861	North Central	Abuja	3706	2	6	370039	6	1	1.0	1.0	2.0	Nz
26862	North Central	Abuja	3706	2	6	370039	7	1	1.0	1.0	2.0	Nz
26863	North Central	Abuja	3706	2	6	370039	8	1	1.0	1.0	2.0	Nz
26864	North Central	Abuja	3706	2	6	370039	9	1	1.0	1.0	2.0	Nz
26865	North Central	Abuja	3706	2	6	370040	1	1	1.0	1.0	2.0	Nz
26866	North Central	Abuja	3706	2	6	370040	2	1	1.0	1.0	2.0	Nz
26867	North Central	Abuja	3706	2	6	370040	3	1	1.0	NaN	2.0	Nz
26868	North Central	Abuja	3706	2	6	370040	4	1	1.0	NaN	2.0	Nz
26869	North Central	Abuja	3706	2	6	370040	5	2	NaN	NaN	NaN	Nz
26870	North Central	Abuja	3706	2	6	370040	6	2	NaN	NaN	NaN	Nz

26871 rows × 18 columns



```
In [18]: lgacode = pd.read_excel(here + '\\lgacodes.xlsx') #excel file I used to map LG
A codes to their names,
#useful for plotting
```

```
In [34]: lgacode.head(3)
```

```
Out[34]:
```

	Code	LGA
0	101	ABA NORTH
1	102	ABA SOUTH
2	103	AROCHUKWU

```
In [32]: newdict = {}
```

```
In [58]: print(lgacode.shape[0])  
print(NigeriaPhones.shape[0])
```

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```

```
In [43]: lgadict = lgacode.to_dict('split')
```

In [44]: lgadict


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Out[44]: {'index': [0,  
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[3701, 'ABAJI AREA COUNCIL'],  
[3702, 'BWARI AREA COUNCIL'],  
[3703, 'GWAGWALADA AREA COUNCIL'],  
[3704, 'KUJE AREA COUNCIL'],  
[3705, 'KWALI AREA COUNCIL'],  
[3706, 'MUNICIPAL AREA COUNCIL']]}
```

```
In [72]: print(NigeriaPhones)
```

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	\
0	South East	Abia	115	1	670	10001	1	1	1.0	
1	South East	Abia	115	1	670	10001	2	1	1.0	
2	South East	Abia	115	1	670	10001	3	2	NaN	
3	South East	Abia	115	1	670	10001	4	1	1.0	
4	South East	Abia	115	1	670	10001	8	2	NaN	
5	South East	Abia	115	1	670	10002	1	1	1.0	
6	South East	Abia	115	1	670	10002	2	1	1.0	
7	South East	Abia	115	1	670	10002	3	1	1.0	
8	South East	Abia	115	1	670	10002	4	1	1.0	
9	South East	Abia	115	1	670	10002	8	2	NaN	
10	South East	Abia	115	1	670	10002	9	2	NaN	
11	South East	Abia	115	1	670	10003	1	1	1.0	
12	South East	Abia	115	1	670	10003	2	1	1.0	
13	South East	Abia	115	1	670	10003	3	1	1.0	
14	South East	Abia	115	1	670	10003	4	1	1.0	
15	South East	Abia	115	1	670	10003	5	1	1.0	
16	South East	Abia	115	1	670	10003	6	1	1.0	
17	South East	Abia	115	1	670	10004	1	1	1.0	
18	South East	Abia	115	1	670	10004	2	1	1.0	
19	South East	Abia	115	1	670	10004	3	1	1.0	
20	South East	Abia	115	1	670	10004	4	1	1.0	
21	South East	Abia	115	1	670	10004	5	1	1.0	
22	South East	Abia	115	1	670	10005	1	1	1.0	
23	South East	Abia	115	1	670	10005	2	1	1.0	
24	South East	Abia	115	1	670	10005	3	1	1.0	
25	South East	Abia	115	1	670	10005	4	1	1.0	
26	South East	Abia	115	1	670	10005	5	2	NaN	
27	South East	Abia	115	1	670	10005	6	1	1.0	
28	South East	Abia	115	1	670	10005	7	2	NaN	
29	South East	Abia	115	1	0	10006	1	1	1.0	
...	
26841	North Central	Niger	2609	1	0	370036	1	1	1.0	
26842	North Central	Niger	2609	1	0	370036	2	1	1.0	
26843	North Central	Niger	2609	1	0	370036	3	2	NaN	
26844	North Central	Niger	2609	1	0	370036	4	2	NaN	
26845	North Central	Niger	2609	1	0	370036	5	1	1.0	
26846	North Central	Niger	2609	1	0	370036	6	2	NaN	
26847	North Central	Abuja	3706	2	6	370037	1	1	1.0	
26848	North Central	Abuja	3706	2	6	370037	2	1	1.0	
26849	North Central	Abuja	3706	2	6	370037	3	1	1.0	
26850	North Central	Abuja	3706	2	6	370037	4	1	1.0	
26851	North Central	Abuja	3706	2	6	370037	5	2	NaN	
26852	North Central	Abuja	3706	2	6	370038	1	1	1.0	
26853	North Central	Abuja	3706	2	6	370038	2	1	1.0	
26854	North Central	Abuja	3706	2	6	370038	4	1	1.0	
26855	North Central	Abuja	3706	2	6	370038	5	2	NaN	
26856	North Central	Abuja	3706	2	6	370039	1	1	1.0	
26857	North Central	Abuja	3706	2	6	370039	2	1	1.0	
26858	North Central	Abuja	3706	2	6	370039	3	1	1.0	
26859	North Central	Abuja	3706	2	6	370039	4	1	1.0	
26860	North Central	Abuja	3706	2	6	370039	5	1	1.0	
26861	North Central	Abuja	3706	2	6	370039	6	1	1.0	
26862	North Central	Abuja	3706	2	6	370039	7	1	1.0	
26863	North Central	Abuja	3706	2	6	370039	8	1	1.0	
26864	North Central	Abuja	3706	2	6	370039	9	1	1.0	
26865	North Central	Abuja	3706	2	6	370040	1	1	1.0	

26866	North Central	Abuja	3706	2	6	370040	2	1	1.0
26867	North Central	Abuja	3706	2	6	370040	3	1	1.0
26868	North Central	Abuja	3706	2	6	370040	4	1	1.0
26869	North Central	Abuja	3706	2	6	370040	5	2	NaN
26870	North Central	Abuja	3706	2	6	370040	6	2	NaN

	#phones	banking	mobile banking	mobile transfer	how often	\
0	1.0	2.0	NaN	NaN	NaN	
1	1.0	2.0	NaN	NaN	NaN	
2	NaN	NaN	NaN	NaN	NaN	
3	1.0	2.0	NaN	NaN	NaN	
4	NaN	NaN	NaN	NaN	NaN	
5	2.0	1.0	2.0	1.0	4.0	
6	2.0	1.0	2.0	1.0	4.0	
7	1.0	2.0	NaN	NaN	NaN	
8	1.0	2.0	NaN	NaN	NaN	
9	NaN	NaN	NaN	NaN	NaN	
10	NaN	NaN	NaN	NaN	NaN	
11	1.0	2.0	NaN	NaN	NaN	
12	NaN	2.0	NaN	NaN	NaN	
13	NaN	2.0	NaN	NaN	NaN	
14	NaN	2.0	NaN	NaN	NaN	
15	NaN	2.0	NaN	NaN	NaN	
16	NaN	2.0	NaN	NaN	NaN	
17	1.0	2.0	NaN	NaN	NaN	
18	1.0	2.0	NaN	NaN	NaN	
19	NaN	2.0	NaN	NaN	NaN	
20	1.0	2.0	NaN	NaN	NaN	
21	NaN	2.0	NaN	NaN	NaN	
22	1.0	2.0	NaN	NaN	NaN	
23	1.0	2.0	NaN	NaN	NaN	
24	NaN	2.0	NaN	NaN	NaN	
25	NaN	2.0	NaN	NaN	NaN	
26	NaN	NaN	NaN	NaN	NaN	
27	1.0	2.0	NaN	NaN	NaN	
28	NaN	NaN	NaN	NaN	NaN	
29	2.0	1.0	2.0	2.0	4.0	
...	
26841	1.0	2.0	NaN	NaN	NaN	
26842	1.0	2.0	NaN	NaN	NaN	
26843	NaN	NaN	NaN	NaN	NaN	
26844	NaN	NaN	NaN	NaN	NaN	
26845	1.0	2.0	NaN	NaN	NaN	
26846	NaN	NaN	NaN	NaN	NaN	
26847	1.0	2.0	NaN	NaN	NaN	
26848	1.0	2.0	NaN	NaN	NaN	
26849	NaN	2.0	NaN	NaN	NaN	
26850	NaN	2.0	NaN	NaN	NaN	
26851	NaN	NaN	NaN	NaN	NaN	
26852	1.0	2.0	NaN	NaN	NaN	
26853	1.0	2.0	NaN	NaN	NaN	
26854	NaN	2.0	NaN	NaN	NaN	
26855	NaN	NaN	NaN	NaN	NaN	
26856	2.0	2.0	NaN	NaN	NaN	
26857	1.0	2.0	NaN	NaN	NaN	
26858	1.0	2.0	NaN	NaN	NaN	
26859	1.0	2.0	NaN	NaN	NaN	

26860	1.0	2.0	NaN	NaN	NaN
26861	1.0	2.0	NaN	NaN	NaN
26862	1.0	2.0	NaN	NaN	NaN
26863	1.0	2.0	NaN	NaN	NaN
26864	1.0	2.0	NaN	NaN	NaN
26865	1.0	2.0	NaN	NaN	NaN
26866	1.0	2.0	NaN	NaN	NaN
26867	NaN	2.0	NaN	NaN	NaN
26868	NaN	2.0	NaN	NaN	NaN
26869	NaN	NaN	NaN	NaN	NaN
26870	NaN	NaN	NaN	NaN	NaN

	internet access	internet source	internet usage	internet usage 2
0	2.0	NaN	NaN	NaN
1	2.0	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN
3	2.0	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN
5	1.0	1.0	1.0	7.0
6	1.0	1.0	7.0	3.0
7	1.0	1.0	1.0	6.0
8	1.0	1.0	4.0	1.0
9	NaN	NaN	NaN	NaN
10	NaN	NaN	NaN	NaN
11	1.0	3.0	1.0	3.0
12	1.0	3.0	1.0	3.0
13	1.0	3.0	1.0	3.0
14	2.0	NaN	NaN	NaN
15	2.0	NaN	NaN	NaN
16	2.0	NaN	NaN	NaN
17	1.0	5.0	1.0	NaN
18	2.0	NaN	NaN	NaN
19	2.0	NaN	NaN	NaN
20	1.0	5.0	1.0	NaN
21	2.0	NaN	NaN	NaN
22	1.0	5.0	4.0	NaN
23	1.0	5.0	4.0	NaN
24	2.0	NaN	NaN	NaN
25	2.0	NaN	NaN	NaN
26	NaN	NaN	NaN	NaN
27	1.0	5.0	4.0	NaN
28	NaN	NaN	NaN	NaN
29	1.0	1.0	1.0	NaN
...
26841	1.0	5.0	1.0	4.0
26842	2.0	NaN	NaN	NaN
26843	NaN	NaN	NaN	NaN
26844	NaN	NaN	NaN	NaN
26845	2.0	NaN	NaN	NaN
26846	NaN	NaN	NaN	NaN
26847	2.0	NaN	NaN	NaN
26848	2.0	NaN	NaN	NaN
26849	2.0	NaN	NaN	NaN
26850	2.0	NaN	NaN	NaN
26851	NaN	NaN	NaN	NaN
26852	2.0	NaN	NaN	NaN
26853	2.0	NaN	NaN	NaN

26854	2.0	NaN	NaN	NaN
26855	NaN	NaN	NaN	NaN
26856	1.0	1.0	1.0	NaN
26857	2.0	NaN	NaN	NaN
26858	1.0	1.0	1.0	NaN
26859	1.0	1.0	1.0	NaN
26860	1.0	1.0	1.0	NaN
26861	1.0	1.0	1.0	NaN
26862	1.0	1.0	1.0	NaN
26863	2.0	NaN	NaN	NaN
26864	1.0	1.0	1.0	NaN
26865	2.0	NaN	NaN	NaN
26866	2.0	NaN	NaN	NaN
26867	2.0	NaN	NaN	NaN
26868	2.0	NaN	NaN	NaN
26869	NaN	NaN	NaN	NaN
26870	NaN	NaN	NaN	NaN

[26871 rows x 18 columns]

In [75]: `#print(lgacode)`

```
In [81]: for i in range(lgacode.shape[0]):
        NigeriaPhones.lga.replace(lgacode['Code'].iloc[i], ""+lgacode['LGA'][i], inplace = True)

        NigeriaPhones.head()
```

Out[81]:

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	#phones	banking	mobile banking
0	South East	Abia	UMUAHIA NORTH	1	670	10001	1	1	1.0	1.0	2.0	NaN
1	South East	Abia	UMUAHIA NORTH	1	670	10001	2	1	1.0	1.0	2.0	NaN
2	South East	Abia	UMUAHIA NORTH	1	670	10001	3	2	NaN	NaN	NaN	NaN
3	South East	Abia	UMUAHIA NORTH	1	670	10001	4	1	1.0	1.0	2.0	NaN
4	South East	Abia	UMUAHIA NORTH	1	670	10001	8	2	NaN	NaN	NaN	NaN

In [140]: `#NigeriaPhones.tail(20)`In [100]: `#NigeriaPhones.lga.str.Lower()`In [147]: `len(NigeriaPhones.lga.unique())`

Out[147]: 434

In [85]: NigeriaPhones.head()

Out[85]:

	zone	state	lga	sector	ea	hhid	indiv	>10?	phone	#phones	banking	mobile banking
0	South East	Abia	UMUAHIA NORTH	1	670	10001	1	1	1.0	1.0	2.0	NaN
1	South East	Abia	UMUAHIA NORTH	1	670	10001	2	1	1.0	1.0	2.0	NaN
2	South East	Abia	UMUAHIA NORTH	1	670	10001	3	2	NaN	NaN	NaN	NaN
3	South East	Abia	UMUAHIA NORTH	1	670	10001	4	1	1.0	1.0	2.0	NaN
4	South East	Abia	UMUAHIA NORTH	1	670	10001	8	2	NaN	NaN	NaN	NaN

Preparing Shapefile

In [10]: Nigeria_map = gpd.read_file(Nigeria_Counties)

In [139]: #Nigeria_map.head(20)

In [88]: Nigeria_map.ADM2 = Nigeria_map.ADM2.str.upper()

In [92]: Nigeria_map.rename(columns = {"ADM2":"lga"}, inplace = True)

In [93]: Nigeria_map.tail()

Out[93]:

	ID	LBL	FIP	MMT_ID	SHORT_FRM	LONG_FRM	ADM0	ADM1	lga	ADM3	/
545	546	NIR-546	NI	NIR	Nigeria	Federal Republic of Nigeria	Nigeria	Zamfara	KAURA- NA	-	
546	547	NIR-547	NI	NIR	Nigeria	Federal Republic of Nigeria	Nigeria	Zamfara	MARADUN	-	
547	548	NIR-548	NI	NIR	Nigeria	Federal Republic of Nigeria	Nigeria	Zamfara	TALATAR	-	
548	549	NIR-549	NI	NIR	Nigeria	Federal Republic of Nigeria	Nigeria	Zamfara	TSAFE	-	
549	550	NIR-550	NI	NIR	Nigeria	Federal Republic of Nigeria	Nigeria	Zamfara	ZURMI	-	

```
In [104]: Nigeria_map.drop(['STL-3', 'ID', 'LBL', 'FIP', 'MMT_ID', 'SHORT__FRM', 'LONG_FRM'],  
axis = 1, inplace = True)
```

```
In [76]: Nigeria_map.shape
```

```
Out[76]: (550, 12)
```

```
In [145]: Nigeria_map.lga.unique()
```

```

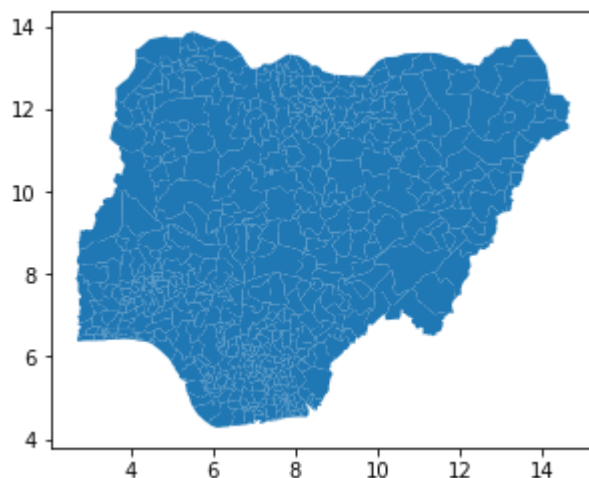
Out[145]: array(['ABA', 'AROCHUKW', 'BENDE', 'IKWUANO', 'ISIALA-N', 'OBIOMA-N',
'OHAFIA ABIA', 'UKWA', 'UKWAEAST', 'UMUAHIA', 'FUFORE', 'GANYE',
'GOMBI', 'GUYUK', 'HONG', 'JADA', 'MADAGALI', 'MAIHA', 'MAYO-BEL',
'MICHIKA', 'MUBI', 'NUMAN', 'SHELLENG', 'SONG', 'YOLA', 'ABAK',
'EKET', 'EKPE-ATA', 'ESSIEN-U', 'ETIMEKPO', 'ETINAN', 'IKONO',
'IKOT-ABA', 'IKOT-EKP', 'INI', 'ITU', 'MBO', 'MKPAT-EN',
'NSIT-IBO', 'NSIT-UBI', 'OKOBO', 'ONNA', 'ORON', 'ORUK-ANA',
'UKANAFUN', 'UQUOIBEN', 'URUAN', 'URUEOFFO', 'UYO', 'AGUATA',
'ANAMBRA', 'ANAOCHA', 'AWKANORT', 'AWKASOUT', 'IDEMILI', 'IHIALA',
'NJIKOKA', 'NNEWINORT', 'NNEWISOU', 'OGBARU', 'ONITSHAN',
'ORUMBANO', 'ORUMBASO', 'OYI', 'ALKALERI', 'BAUCHI', 'DARAZO',
'DASS', 'GAMAWA', 'GAMJUWA', 'ITAS/GAD', 'JAMA'ARE', 'KATAGUM',
'MISAU', 'NINGI', 'SHIRA', 'TAFAWA-B', 'TORO', 'ZAKI', 'BRASS',
'EKEREMOR', 'NORTHERN', 'SAGBAMA', 'SOUTHERNIJAW', 'ADO', 'APA',
'BURUKU', 'GBOKO', 'GUMA', 'GWER', 'GWERWEST', 'KATSINA (BENUE)',
'KONSHISH', 'KWANDE', 'MAKURDI', 'OGBADIBO', 'OHAIKWU', 'OJU',
'OKPOKWU', 'OTURKPO', 'UKUM', 'USHONGO', 'VANDEIKY', 'ASKIRA/U',
'BAMA', 'BIU', 'DAMBOA', 'DIKWA', 'GWOZA', 'KAGA', 'KONDUGA',
'KUKAWA', 'MAIDUGUR', 'MOBBAR', 'MONGUNO', 'NGALA', 'SHANI', 'ABI',
'AKAMKPA', 'AKPABUYO', 'BIASE', 'BOKI', 'CALABAR', 'IKOM',
'OBANLIKU', 'OBUBRA', 'OBUDU', 'ODUKPANI', 'OGOJA', 'YAKURR',
'YALA CROSS', 'ANIOCHAN', 'ANIOCHAS', 'BOMADI', 'BURUTU',
'ETHIOPEE', 'ETHIOPEW', 'IKANORTH', 'IKASOUTH', 'ISOKONOR',
'ISOKOSOU', 'NDOKWAEA', 'NDOKWAWA', 'OKPE', 'OSHIKILL', 'SAPELE',
'UGHELINO', 'UGHELISO', 'WARRINORTH', 'WARRISOUTH', 'ABAKALIK',
'AFIKPO', 'AFIKPOSO', 'EZZA', 'IKWO', 'ISHIELU', 'IZZI',
'OHAOZARA', 'ONICHA', 'AKOKO-ED', 'ESANCENT', 'ESANNORT',
'ESANSOUT', 'ESANWEST', 'ETSAKOE', 'ETSAKOWE', 'OKENE',
'OREDO EDO', 'ORHIONMW', 'OVIANORT', 'OVIASOUTH-WEST', 'OWANWEST',
'ADO-EKITI', 'EKITIEAS', 'EKITISOUTH-WEST', 'EKITIWEST',
'EMURE/ISE/ORUN', 'IDO/OSI', 'IJERO', 'IKERE', 'IKOLE', 'MOBA',
'OYE', 'AWGU', 'ENUGUSOU', 'EZEAGU', 'IGBO-ETI', 'IGBO-EZE',
'ISI-UZO', 'NKANU', 'NSUKKA', 'OJI-RIVER', 'UDI', 'UZO-UWANI',
'ABAJI', 'ABUJAMUN', 'GWAGWALA', 'KUJE', 'AKKO', 'BALANGA',
'BILLIRI', 'DUKKU', 'GOMBE', 'KALTUNGO', 'NAFADA/B', 'YAMALTU/',
'ABOH-MBA', 'AHIZU-MB', 'EHIME-MB', 'EZINIHIT', 'IDEATO',
'IDEATONO', 'IHITTE/U', 'IKEDURU', 'ISIALAMB', 'ISU', 'ISUIKWUA',
'MBAITOLI', 'NGOR-OKP', 'NKWERRE', 'OBOWO', 'OGUTA', 'OHAJI/EG',
'OKIGWE', 'ORLU', 'ORSU', 'ORU', 'OWERRI', 'BABURA', 'BIRINIWA',
'BIRNINKU', 'DUTSE', 'GARKI', 'GUMEL', 'GWARAM', 'HADEJIA',
'JAHUN', 'KAFINHAU', 'KAZAURE', 'KIRIKASA', 'KIYAWA', 'MALAMMAD',
'RINGIM', 'RONI', 'SULE-TAN', 'AKWANGA', 'BIRNIN-G', 'CHIKUN',
'DOKA/KAW', 'GIWA', 'IGABI', 'IKARA', 'JABA', 'JEMA'A', 'KACHIA',
'KAURA', 'KAURU', 'LERE', 'MAKARFI', 'SABON-GA', 'SOBA', 'TUDUN',
'TUDUNWAD', 'ZANGONKA', 'ZARIA', 'ALBASU', 'BAGWAI', 'BEBEJI',
'BICHI', 'BUNKURE', 'DALA', 'DAMBATTA', 'DAWAKINK', 'DAWAKINT',
'GABASAWA', 'GAYA', 'GEZAWA', 'GWARZO', 'KABO', 'KANO', 'KARAYE',
'KUMBOTSO', 'KURA', 'MINJIBIR', 'NASSARAW', 'RANO', 'RIMINGAD',
'SHANONO', 'SUMAILA', 'TAKAI', 'TSANYAWA', 'UNGOGO', 'WUDIL',
'BAKORI', 'BATSARI', 'BINDAWA', 'DAURA', 'DUTSIN-M', 'FASKARI',
'FUNTUA', 'INGAWA', 'JIBIA', 'KAITA', 'KANKARA', 'KANKIYA',
'KATSINA (K)', 'MALUMFAS', 'MANI', 'MASHI', 'MUSAWA', 'RIMI',
'SAFANA', 'ZANGO', 'AREWA', 'ARGUNGU', 'BAGUDO', 'BIRNINKE',
'BUNZA', 'DANDI', 'GWANDU', 'JEGA', 'KOKO/BES', 'MAIYAMA',
'NGASKI', 'SAKABA', 'SURU', 'YAURI', 'ZURU', 'ADAVI', 'AJAOKUTA',
'ANKPA', 'BASSA', 'DEKINA', 'IDAH', 'IJUMU', 'KABBA/BU', 'KOGI',
'KOTONKAR', 'OFU', 'OKEHI', 'OLAMABOR', 'YAGBAEAS', 'YAGBAWES',

```

```
'ASA', 'BARUTEN', 'EDU', 'IFELODUN', 'ILORINWE', 'IREPODUN',
'KAIAMA', 'MORO', 'OFFA', 'OYUN', 'AGEGE', 'BADAGARY', 'EPE',
'ETI-OSA', 'IBEJU/LEKKI', 'IKEJA', 'IKORODU', 'LAGOSISLAND',
'MAINLAND', 'MUSHIN', 'OJO', 'SHOMOLU', 'AWE', 'DOMA', 'KEFFI',
'LAFIA', 'NASARAWA', 'AGAIE', 'AGWARA', 'BIDA', 'BORGU', 'BOSSO',
'GBAKO', 'GURARA', 'KONTOGUR', 'LAPAI', 'LAVUN', 'MAGAMA', 'MOKWA',
'PAIKORO', 'RAFI', 'RIJAU', 'SHIRORO', 'SULEJA', 'WUSHISHI',
'ABEEKUTANORTH', 'ADODO/OTA', 'EGBADONORTH', 'EGBADOSOUTH', 'IFO',
'IJEBUEAST', 'IJEBUNORTH', 'IJEBUODE', 'OBAFEMI-OWODE', 'ODEDA',
'OGUNWATERSIDE', 'SHAGAMU', 'AKOKONORTH', 'AKOKONORTHWEST',
'AKOKOSOU', 'AKURE', 'IDANRE', 'IFEDORE', 'IKALE', 'ILAJEESODO',
'ILEOLUJI/OKEIGBO', 'IRELE', 'ODIGBO', 'ONDO', 'OSE', 'OWO',
'ATAKUMOSA', 'AYEDAADE', 'AYEDIRE', 'BORIPE', 'EDE', 'EGBEDORE',
'EJIGBO', 'IFECENTRAL', 'IFENORTH', 'IFESOUTH', 'ILA', 'ILESA',
'IREPODUN (B)', 'IREWOLE', 'IWO', 'OBOKUN', 'ODOOTIN', 'OGO-OLUW',
'OLA-OLUWA', 'OLORUNDA', 'ORIADE', 'OSOGBO', 'AFIJIO', 'AKINYELE',
'EGBEDA', 'IBADANNORTH', 'IBADANNORTH-EAST', 'IBADANNORTH-WEST',
'IBADANSOUTH-EAST', 'IBADANSOUTH-WEST', 'IBARAPA', 'IDO',
'IFEDAPO', 'IFELOJU', 'IREPO', 'ISEYIN', 'KAJOLA', 'LAGELU',
'OGBOMOSO', 'OLUYOLE', 'ONA-ARA', 'ORELOPE', 'ORIRE', 'OYO',
'SURULERE', 'BARINKIL', 'JOSNORTH', 'KANAM', 'LANGTANG',
'LANGTANG (B)', 'MANGU', 'PANKSHIN', "QUA'ANPA", 'SHENDAM', 'WASE',
'ABUA/ODU', 'AHOADA', 'AKUKUTOR', 'ANDONI/O', 'ASARI-TO', 'BONNY',
'DEGEMA', 'EMUOHA', 'ETCHE', 'GOKANA', 'IKWERRE', 'KHANA',
'OBIO/AKP', 'OGBA/EGBE', 'OKRIKA', 'PORTHARCOURT', 'TAI/EKEM',
'BAKURA', 'BINJI', 'BODINGA', 'DANGE-SH', 'GADA', 'GORONYO',
'GWADABAW', 'ILLELA', 'KWARE', 'RABAH', 'SABONBIR', 'SILAME',
'SOKOTO', 'TAMBAWAL', 'TANGAZAR', 'WAMAKKO', 'WURNO', 'YABO',
'BALI', 'DONGA', 'GASHAKA', 'IBI', 'JALINGO', 'KARIM-LA', 'LAU',
'SARDAUNA', 'TAKUM', 'WUKARI', 'YORRO', 'ZING', 'BADE', 'DAMATURU',
'FIKA', 'FUNE', 'GEIDAM', 'GUJBA', 'NANGERE', 'NGURU', 'YUNUSARI',
'YUSUFARI', 'ANKA', 'BUNGUDU', 'GUMMI', 'GUSAU', 'ISA', 'KAURA-NA',
'MARADUN', 'TALATAR', 'TSAFE', 'ZURMI'], dtype=object)
```

In [42]: Nigeria_map.plot()

Out[42]: <matplotlib.axes._subplots.AxesSubplot at 0x17f96783198>



Merging Data DF with Map DF

```
In [106]: Nigeria_map1 = Nigeria_map.merge(NigeriaPhones, on = 'lga', how = 'left', indicator = True)
```

In [107]: Nigeria_map1

Out[107]:

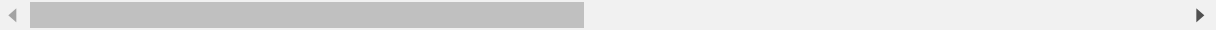
	ADM0	ADM1	lga	geometry	zone	state	sector	ea
0	Nigeria	Abia	ABA	POLYGON ((2.7513099999999648 6.906810000000405,...	NaN	NaN	NaN	NaN
1	Nigeria	Abia	AROCHUKW	POLYGON ((2.9599999999999127 7.730000000003201,...	NaN	NaN	NaN	NaN
2	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
3	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
4	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
5	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
6	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
7	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
8	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
9	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
10	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
11	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
12	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
13	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
14	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
15	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100
16	Nigeria	Abia	BENDE	POLYGON ((3.2799999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0 100

	ADM0	ADM1	lga	geometry	zone	state	sector	ea	
17	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
18	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
19	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
20	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
21	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
22	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
23	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
24	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
25	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	0.0	100
26	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	0.0	100
27	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
28	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
29	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	Abia	2.0	1364.0	100
...
12604	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0	3600
12605	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0	3600
12606	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0	3600

	ADMO	ADM1	lga	geometry	zone	state	sector	ea
12607	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12608	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12609	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12610	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12611	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12612	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12613	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12614	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12615	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12616	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12617	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12618	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12619	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12620	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12621	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12622	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C
12623	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 360C

	ADM0	ADM1	lga	geometry	zone	state	sector	ea
12624	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12625	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12626	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12627	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12628	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12629	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12630	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12631	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12632	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	Zamfara	2.0	1066.0 3600
12633	Nigeria	Zamfara	ZURMI	POLYGON ((3.159999999999854 7.360000000000582,...	NaN	NaN	NaN	NaN

12634 rows × 22 columns



```
In [137]: lgalist = Nigeria_map1.lga.unique()  
lgalist
```

```

Out[137]: array(['ABA', 'AROCHUKW', 'BENDE', 'IKWUANO', 'ISIALA-N', 'OBIOMA-N',
                'OHAFIA ABIA', 'UKWA', 'UKWAEAST', 'UMUAHIA', 'FUFORE', 'GANYE',
                'GOMBI', 'GUYUK', 'HONG', 'JADA', 'MADAGALI', 'MAIHA', 'MAYO-BEL',
                'MICHIKA', 'MUBI', 'NUMAN', 'SHELLENG', 'SONG', 'YOLA', 'ABAK',
                'EKET', 'EKPE-ATA', 'ESSIEN-U', 'ETIMEKPO', 'ETINAN', 'IKONO',
                'IKOT-ABA', 'IKOT-EKP', 'INI', 'ITU', 'MBO', 'MKPAT-EN',
                'NSIT-IBO', 'NSIT-UBI', 'OKOBO', 'ONNA', 'ORON', 'ORUK-ANA',
                'UKANAFUN', 'UQUOIBEN', 'URUAN', 'URUEOFFO', 'UYO', 'AGUATA',
                'ANAMBRA', 'ANAOCHA', 'AWKANORT', 'AWKASOUT', 'IDEMILI', 'IHIALA',
                'NJIKOKA', 'NNEWINORT', 'NNEWISOU', 'OGBARU', 'ONITSHAN',
                'ORUMBANO', 'ORUMBASO', 'OYI', 'ALKALERI', 'BAUCHI', 'DARAZO',
                'DASS', 'GAMAWA', 'GAMJUWA', 'ITAS/GAD', 'JAMA'ARE', 'KATAGUM',
                'MISAU', 'NINGI', 'SHIRA', 'TAFAWA-B', 'TORO', 'ZAKI', 'BRASS',
                'EKEREMOR', 'NORTHERN', 'SAGBAMA', 'SOUTHERNIJAW', 'ADO', 'APA',
                'BURUKU', 'GBOKO', 'GUMA', 'GWER', 'GWERWEST', 'KATSINA (BENUE)',
                'KONSHISH', 'KWANDE', 'MAKURDI', 'OGBADIBO', 'OHAIKWU', 'OJU',
                'OKPOKWU', 'OTURKPO', 'UKUM', 'USHONGO', 'VANDEIKY', 'ASKIRA/U',
                'BAMA', 'BIU', 'DAMBOA', 'DIKWA', 'GWOZA', 'KAGA', 'KONDUGA',
                'KUKAWA', 'MAIDUGUR', 'MOBBAR', 'MONGUNO', 'NGALA', 'SHANI', 'ABI',
                'AKAMKPA', 'AKPABUYO', 'BIASE', 'BOKI', 'CALABAR', 'IKOM',
                'OBANLIKU', 'OBUBRA', 'OBUDU', 'ODUKPANI', 'OGOJA', 'YAKURR',
                'YALA CROSS', 'ANIOCHAN', 'ANIOCHAS', 'BOMADI', 'BURUTU',
                'ETHIOPEE', 'ETHIOPEW', 'IKANORTH', 'IKASOUTH', 'ISOKONOR',
                'ISOKOSOU', 'NDOKWAEA', 'NDOKWAWA', 'OKPE', 'OSHIKILL', 'SAPELE',
                'UGHELINO', 'UGHELISO', 'WARRINORTH', 'WARRISOUTH', 'ABAKALIK',
                'AFIKPO', 'AFIKPOSO', 'EZZA', 'IKWO', 'ISHIELU', 'IZZI',
                'OHAOZARA', 'ONICHA', 'AKOKO-ED', 'ESANCENT', 'ESANNORT',
                'ESANSOUT', 'ESANWEST', 'ETSAKOE', 'ETSAKOWE', 'OKENE',
                'OREDO EDO', 'ORHIONMW', 'OVIANORT', 'OVIASOUTH-WEST', 'OWANWEST',
                'ADO-EKITI', 'EKITIEAS', 'EKITISOUTH-WEST', 'EKITIWEST',
                'EMURE/ISE/ORUN', 'IDO/OSI', 'IJERO', 'IKERE', 'IKOLE', 'MOBA',
                'OYE', 'AWGU', 'ENUGUSOU', 'EZEAGU', 'IGBO-ETI', 'IGBO-EZE',
                'ISI-UZO', 'NKANU', 'NSUKKA', 'OJI-RIVER', 'UDI', 'UZO-UWANI',
                'ABAJI', 'ABUJAMUN', 'GWAGWALA', 'KUJE', 'AKKO', 'BALANGA',
                'BILLIRI', 'DUKKU', 'GOMBE', 'KALTUNGO', 'NAFADA/B', 'YAMALTU/',
                'ABOH-MBA', 'AHIZU-MB', 'EHIME-MB', 'EZINIHIT', 'IDEATO',
                'IDEATONO', 'IHITTE/U', 'IKEDURU', 'ISIALAMB', 'ISU', 'ISUIKWUA',
                'MBAITOLI', 'NGOR-OKP', 'NKWERRE', 'OBOWO', 'OGUTA', 'OHAJI/EG',
                'OKIGWE', 'ORLU', 'ORSU', 'ORU', 'OWERRI', 'BABURA', 'BIRINIWA',
                'BIRNINKU', 'DUTSE', 'GARKI', 'GUMEL', 'GWARAM', 'HADEJIA',
                'JAHUN', 'KAFINHAU', 'KAZAURE', 'KIRIKASA', 'KIYAWA', 'MALAMMAD',
                'RINGIM', 'RONI', 'SULE-TAN', 'AKWANGA', 'BIRNIN-G', 'CHIKUN',
                'DOKA/KAW', 'GIWA', 'IGABI', 'IKARA', 'JABA', 'JEMA'A', 'KACHIA',
                'KAURA', 'KAURU', 'LERE', 'MAKARFI', 'SABON-GA', 'SOBA', 'TUDUN',
                'TUDUNWAD', 'ZANGONKA', 'ZARIA', 'ALBASU', 'BAGWAI', 'BEBEJI',
                'BICHI', 'BUNKURE', 'DALA', 'DAMBATTA', 'DAWAKINK', 'DAWAKINT',
                'GABASAWA', 'GAYA', 'GEZAWA', 'GWARZO', 'KABO', 'KANO', 'KARAYE',
                'KUMBOTSO', 'KURA', 'MINJIBIR', 'NASSARAW', 'RANO', 'RIMINGAD',
                'SHANONO', 'SUMAILA', 'TAKAI', 'TSANYAWA', 'UNGOGO', 'WUDIL',
                'BAKORI', 'BATSARI', 'BINDAWA', 'DAURA', 'DUTSIN-M', 'FASKARI',
                'FUNTUA', 'INGAWA', 'JIBIA', 'KAITA', 'KANKARA', 'KANKIYA',
                'KATSINA (K)', 'MALUMFAS', 'MANI', 'MASHI', 'MUSAWA', 'RIMI',
                'SAFANA', 'ZANGO', 'AREWA', 'ARGUNGU', 'BAGUDO', 'BIRNINKE',
                'BUNZA', 'DANDI', 'GWANDU', 'JEGA', 'KOKO/BES', 'MAIYAMA',
                'NGASKI', 'SAKABA', 'SURU', 'YAUARI', 'ZURU', 'ADAVI', 'AJAOKUTA',
                'ANKPA', 'BASSA', 'DEKINA', 'IDAH', 'IJUMU', 'KABBA/BU', 'KOGI',
                'KOTONKAR', 'OFU', 'OKEHI', 'OLAMABOR', 'YAGBAEAS', 'YAGBAWES',

```

```
'ASA', 'BARUTEN', 'EDU', 'IFELODUN', 'ILORINWE', 'IREPODUN',
'KAIAMA', 'MORO', 'OFFA', 'OYUN', 'AGEGE', 'BADAGARY', 'EPE',
'ETI-OSA', 'IBEJU/LEKKI', 'IKEJA', 'IKORODU', 'LAGOSISLAND',
'MAINLAND', 'MUSHIN', 'OJO', 'SHOMOLU', 'AWE', 'DOMA', 'KEFFI',
'LAFIA', 'NASARAWA', 'AGAIE', 'AGWARA', 'BIDA', 'BORGU', 'BOSSO',
'GBAKO', 'GURARA', 'KONTOGUR', 'LAPAI', 'LAVUN', 'MAGAMA', 'MOKWA',
'PAIKORO', 'RAFI', 'RIJAU', 'SHIRORO', 'SULEJA', 'WUSHISHI',
'ABEEKUTANORTH', 'ADODO/OTA', 'EGBADONORTH', 'EGBADOSOUTH', 'IFO',
'IJEBUEAST', 'IJEBUNORTH', 'IJEBUODE', 'OBAFEMI-OWODE', 'ODEDA',
'OGUNWATERSIDE', 'SHAGAMU', 'AKOKONORTH', 'AKOKONORTHWEST',
'AKOKOSOU', 'AKURE', 'IDANRE', 'IFEDORE', 'IKALE', 'ILAJEEO',
'ILEOLUJI/OKEIGBO', 'IRELE', 'ODIGBO', 'ONDO', 'OSE', 'OWO',
'ATAKUMOSA', 'AYEDAADE', 'AYEDIRE', 'BORIPE', 'EDE', 'EGBEDORE',
'EJIGBO', 'IFECENTRAL', 'IFENORTH', 'IFESOUTH', 'ILA', 'ILESA',
'IREPODUN (B)', 'IREWOLE', 'IWO', 'OBOKUN', 'ODOOTIN', 'OGO-OLUW',
'OLA-OLUWA', 'OLORUNDA', 'ORIADE', 'OSOGBO', 'AFIJIO', 'AKINYELE',
'EGBEDA', 'IBADANNORTH', 'IBADANNORTH-EAST', 'IBADANNORTH-WEST',
'IBADANSOUTH-EAST', 'IBADANSOUTH-WEST', 'IBARAPA', 'IDO',
'IFEDAPO', 'IFELOJU', 'IREPO', 'ISEYIN', 'KAJOLA', 'LAGELU',
'OGBOMOSO', 'OLUYOLE', 'ONA-ARA', 'ORELOPE', 'ORIRE', 'OYO',
'SURULERE', 'BARINKIL', 'JOSNORTH', 'KANAM', 'LANGTANG',
'LANGTANG (B)', 'MANGU', 'PANKSHIN', 'QUA'ANPA', 'SHENDAM', 'WASE',
'ABUA/ODU', 'AHOADA', 'AKUKUTOR', 'ANDONI/O', 'ASARI-TO', 'BONNY',
'DEGEMA', 'EMUOHA', 'ETCHE', 'GOKANA', 'IKWERRE', 'KHANA',
'OBIO/AKP', 'OGBA/EGBE', 'OKRIKA', 'PORTHARCOURT', 'TAI/EKEM',
'BAKURA', 'BINJI', 'BODINGA', 'DANGE-SH', 'GADA', 'GORONYO',
'GWADABAW', 'ILLELA', 'KWARE', 'RABAH', 'SABONBIR', 'SILAME',
'SOKOTO', 'TAMBAWAL', 'TANGAZAR', 'WAMAKKO', 'WURNO', 'YABO',
'BALI', 'DONGA', 'GASHAKA', 'IBI', 'JALINGO', 'KARIM-LA', 'LAU',
'SARDAUNA', 'TAKUM', 'WUKARI', 'YORRO', 'ZING', 'BADE', 'DAMATURU',
'FIKA', 'FUNE', 'GEIDAM', 'GUJBA', 'NANGERE', 'NGURU', 'YUNUSARI',
'YUSUFARI', 'ANKA', 'BUNGUDU', 'GUMMI', 'GUSAU', 'ISA', 'KAURA-NA',
'MARADUN', 'TALATAR', 'TSAFE', 'ZURMI'], dtype=object)
```

```
In [113]: #Nigeria_map1['#phones','banking','mobile banking','mobile transfer','how ofte
n','internet access','internet source','internet usage','internet usage 2'].re
place(NaN,0.0,inplace = True)
```

```
In [116]: Nigeria_map1_fix = Nigeria_map1[Nigeria_map1['_merge'] == 'both'] #the data se
ts were inconsistent on the LGA county names, this only includes names of town
s present on the original GDF
```

```
In [ ]:
```

```
In [ ]:
```

```
In [148]: lgalist = Nigeria_map1_fix.lga.unique() #only 187 LGAs were in the Survey were
consistently named between the data sources
```

Now that the Dataframes are merged, I wil aggregate the individual and household responses to the lga level, so the metrics i'm trying to show are easily represented

```
In [119]: Nigeria_map2 = Nigeria_map1_fix.groupby("lga")
```

```
In [131]: len(check)
```

```
Out[131]: 187
```

```
In [ ]: check = []
```



```
In [149]: scores1 = {}  
         for x in lgalist:  
  
             lgagroup = Nigeria_map2.get_group(x)  
             scores = lgagroup['Score']  
             average = np.mean(scores)  
             scores1[x] = average  
         print(scores1)
```

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```
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2.6578947368421053, 'TSAFE': 2.292682926829268}
```

In [82]: `Nigeria_map2.head()`

Out[82]:

	ADM0	ADM1	lga	geometry	zone	indiv	>10?	phone	#phones
2	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.06999999999709,...	South East	1.0	1.0	1.0	4.0
3	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.06999999999709,...	South East	2.0	1.0	1.0	7.0
4	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.06999999999709,...	South East	3.0	1.0	1.0	4.0
5	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.06999999999709,...	South East	4.0	1.0	1.0	4.0
6	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.06999999999709,...	South East	5.0	1.0	1.0	4.0
50	Nigeria	Abia	IKWUANO	POLYGON ((6.849343776702881 13.08229064941406,...	South East	1.0	1.0	1.0	9.0
51	Nigeria	Abia	IKWUANO	POLYGON ((6.849343776702881 13.08229064941406,...	South East	2.0	1.0	1.0	9.0
52	Nigeria	Abia	IKWUANO	POLYGON ((6.849343776702881 13.08229064941406,...	South East	3.0	2.0	NaN	0.0
53	Nigeria	Abia	IKWUANO	POLYGON ((6.849343776702881 13.08229064941406,...	South East	5.0	2.0	NaN	0.0
54	Nigeria	Abia	IKWUANO	POLYGON ((6.849343776702881 13.08229064941406,...	South East	6.0	1.0	1.0	4.0
99	Nigeria	Adamawa	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	North East	1.0	1.0	1.0	3.0
100	Nigeria	Adamawa	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	North East	2.0	1.0	1.0	3.0
101	Nigeria	Adamawa	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	North East	3.0	1.0	1.0	3.0
102	Nigeria	Adamawa	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	North East	1.0	1.0	1.0	3.0
103	Nigeria	Adamawa	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	North East	2.0	1.0	1.0	3.0
167	Nigeria	Adamawa	GOMBI	POLYGON ((6.299067974090576 13.66119956970215,...	North East	1.0	1.0	2.0	1.0
168	Nigeria	Adamawa	GOMBI	POLYGON ((6.299067974090576 13.66119956970215,...	North East	1.0	1.0	1.0	4.0

	ADM0	ADM1	lga	geometry	zone	indiv	>10?	phone	#phones
169	Nigeria	Adamawa	GOMBI	POLYGON ((6.299067974090576 13.66119956970215,...	North East	2.0	1.0	1.0	4.0
170	Nigeria	Adamawa	GOMBI	POLYGON ((6.299067974090576 13.66119956970215,...	North East	3.0	1.0	1.0	4.0
171	Nigeria	Adamawa	GOMBI	POLYGON ((6.299067974090576 13.66119956970215,...	North East	5.0	1.0	1.0	4.0
230	Nigeria	Adamawa	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	North East	1.0	1.0	1.0	4.0
231	Nigeria	Adamawa	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	North East	2.0	1.0	1.0	3.0
232	Nigeria	Adamawa	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	North East	4.0	1.0	1.0	4.0
233	Nigeria	Adamawa	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	North East	6.0	1.0	1.0	3.0
234	Nigeria	Adamawa	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	North East	7.0	1.0	1.0	3.0
303	Nigeria	Adamawa	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	North East	1.0	1.0	2.0	1.0
304	Nigeria	Adamawa	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	North East	2.0	1.0	2.0	1.0
305	Nigeria	Adamawa	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	North East	3.0	1.0	2.0	1.0
306	Nigeria	Adamawa	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	North East	4.0	1.0	2.0	1.0
307	Nigeria	Adamawa	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	North East	5.0	1.0	2.0	1.0
...
12184	Nigeria	Yobe	YUNUSARI	POLYGON ((7.199999809265137 4.590000152587891,...	North East	1.0	1.0	1.0	NaN
12185	Nigeria	Yobe	YUNUSARI	POLYGON ((7.199999809265137 4.590000152587891,...	North East	2.0	1.0	1.0	NaN
12186	Nigeria	Yobe	YUNUSARI	POLYGON ((7.199999809265137 4.590000152587891,...	North East	3.0	1.0	1.0	NaN

	ADM0	ADM1	Iga	geometry	zone	indiv	>10?	phone	#phones
12187	Nigeria	Yobe	YUNUSARI	POLYGON ((7.199999809265137 4.590000152587891,...	North East	4.0	1.0	1.0	NaN
12188	Nigeria	Yobe	YUNUSARI	POLYGON ((7.199999809265137 4.590000152587891,...	North East	5.0	1.0	1.0	NaN
12228	Nigeria	Zamfara	ANKA	POLYGON ((8.329202651977539 4.63828706741333, ...	North West	1.0	1.0	1.0	1.0
12229	Nigeria	Zamfara	ANKA	POLYGON ((8.329202651977539 4.63828706741333, ...	North West	2.0	1.0	1.0	1.0
12230	Nigeria	Zamfara	ANKA	POLYGON ((8.329202651977539 4.63828706741333, ...	North West	3.0	1.0	1.0	NaN
12231	Nigeria	Zamfara	ANKA	POLYGON ((8.329202651977539 4.63828706741333, ...	North West	4.0	1.0	1.0	1.0
12232	Nigeria	Zamfara	ANKA	POLYGON ((8.329202651977539 4.63828706741333, ...	North West	5.0	1.0	1.0	NaN
12330	Nigeria	Zamfara	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	North West	1.0	1.0	1.0	NaN
12331	Nigeria	Zamfara	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	North West	2.0	1.0	1.0	NaN
12332	Nigeria	Zamfara	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	North West	3.0	2.0	NaN	NaN
12333	Nigeria	Zamfara	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	North West	4.0	1.0	1.0	NaN
12334	Nigeria	Zamfara	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	North West	6.0	2.0	NaN	NaN
12417	Nigeria	Zamfara	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	North West	1.0	1.0	1.0	1.0
12418	Nigeria	Zamfara	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	North West	2.0	1.0	1.0	NaN
12419	Nigeria	Zamfara	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	North West	4.0	1.0	1.0	NaN
12420	Nigeria	Zamfara	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	North West	5.0	2.0	NaN	NaN
12421	Nigeria	Zamfara	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	North West	6.0	2.0	NaN	NaN

	ADM0	ADM1	lga	geometry	zone	indiv	>10?	phone	#phones
12471	Nigeria	Zamfara	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	North West	2.0	1.0	1.0	NaN
12472	Nigeria	Zamfara	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	North West	3.0	1.0	1.0	NaN
12473	Nigeria	Zamfara	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	North West	4.0	2.0	NaN	NaN
12474	Nigeria	Zamfara	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	North West	5.0	1.0	2.0	NaN
12475	Nigeria	Zamfara	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	North West	6.0	1.0	2.0	NaN
12551	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	1.0	1.0	1.0	1.0
12552	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	2.0	1.0	1.0	NaN
12553	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	4.0	1.0	1.0	NaN
12554	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	5.0	1.0	1.0	NaN
12555	Nigeria	Zamfara	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	North West	6.0	1.0	1.0	NaN

930 rows × 18 columns



In [134]:

Here I realized that the values of the survey responses represent a specific type of response, I'll make a new column that aggregates the responses into a pseudo index called 'score', where every response will equal 1, and the score will be the total number of responses per response, not economically sound way of doing this, but after submission, I'll work on making this more statistically accurate, for now i just want a rough picture

In []:


```
In [56]: cols = Nigeria_map1_fix.iloc[0:10,19:29]
cols
```

Out[56]:

	phone	#phones	banking	mobile banking	mobile transfer	how often	internet access	internet source	internet usage	internet usage 2
2	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
3	1.0	7.0	2.0	NaN	NaN	NaN	1.0	5.0	1.0	6.0
4	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
5	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
6	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
7	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
8	1.0	4.0	2.0	NaN	NaN	NaN	2.0	NaN	NaN	NaN
9	1.0	10.0	1.0	2.0	2.0	4.0	1.0	5.0	4.0	1.0
10	1.0	10.0	1.0	2.0	2.0	4.0	1.0	5.0	1.0	2.0
11	1.0	10.0	1.0	2.0	2.0	4.0	1.0	5.0	4.0	3.0

```
In [57]: import numpy as np
```

```
In [ ]:
```

```
In [67]: Nigeria_map1_fix['Score'] = np.nan
newcols = []
for i in range(Nigeria_map1_fix.shape[0]):
    count = 0
    cols = Nigeria_map1_fix.iloc[i,19:29]
    for x in cols:
        if x > 0:
            count+=1
    newcols.append(count)

Nigeria_map1_fix['Score']=newcols
```

C:\Users\jmjoh\Anaconda3\lib\site-packages\ipykernel_launcher.py:1: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-copy>

"""Entry point for launching an IPython kernel.

C:\Users\jmjoh\Anaconda3\lib\site-packages\ipykernel_launcher.py:11: SettingWithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-copy>

This is added back by InteractiveShellApp.init_path()

In [68]: Nigeria_map1_fix

Out[68]:

	ADM0	ADM1	Iga	ADM3	ADM4	ADM5	STL-0	STL-1	STL-2	STL-4	...	banking	mobile banking
2	Nigeria	Abia	BENDE	-	-	-	168	1	1	-	...	2.0	NaN
3	Nigeria	Abia	BENDE	-	-	-	168	1	1	-	...	2.0	NaN
4	Nigeria	Abia	BENDE	-	-	-	168	1	1	-	...	2.0	NaN
5	Nigeria	Abia	BENDE	-	-	-	168	1	1	-	...	2.0	NaN
6	Nigeria	Abia	BENDE	-	-	-	168	1	1	-	...	2.0	NaN

5 rows × 31 columns

In [71]: Nigeria_map1_fix.drop(['ADM3', 'ADM4', 'ADM5', 'STL-0', 'STL-1', 'STL-2', 'STL-4', '_merge'], axis = 1, inplace = True)

C:\Users\jmjoh\Anaconda3\lib\site-packages\pandas\core\frame.py:3697: Setting WithCopyWarning:

A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-copy>
errors=errors)

In [73]: Nigeria_map1_fix.drop(['STL-5', 'state', 'sector', 'ea', 'hhid'], axis = 1, inplace = True)

In [74]: Nigeria_map1_fix.head()

Out[74]:

	ADM0	ADM1	Iga	geometry	zone	indiv	>10?	phone	#phones	banking
2	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	1.0	1.0	1.0	4.0	2.0
3	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	2.0	1.0	1.0	7.0	2.0
4	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	3.0	1.0	1.0	4.0	2.0
5	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	4.0	1.0	1.0	4.0	2.0
6	Nigeria	Abia	BENDE	POLYGON ((3.279999999998836 7.069999999999709,...	South East	5.0	1.0	1.0	4.0	2.0

```
In [123]: type(Nigeria_map1_fix['geometry'])
```

```
Out[123]: geopandas.geoseries.GeoSeries
```

How do I aggregate by lga without upsetting geometry column

in mapping?

```
In [122]: newDict = dict(zip(Nigeria_map1_fix["lga"],Nigeria_map1_fix['geometry']))  
newDict
```

```
Out[122]: {'BENDE': <shapely.geometry.polygon.Polygon at 0x24ce77e7d30>,  
'IKWUANO': <shapely.geometry.polygon.Polygon at 0x24ce77ec2b0>,  
'GANYE': <shapely.geometry.polygon.Polygon at 0x24ce77dd198>,  
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```
In [154]: final_df = pd.DataFrame(list(newDict.items()), columns = ['lga', 'geometry'])  
final_df['Scores'] = scores1.values()  
final_df
```

Out[154]:

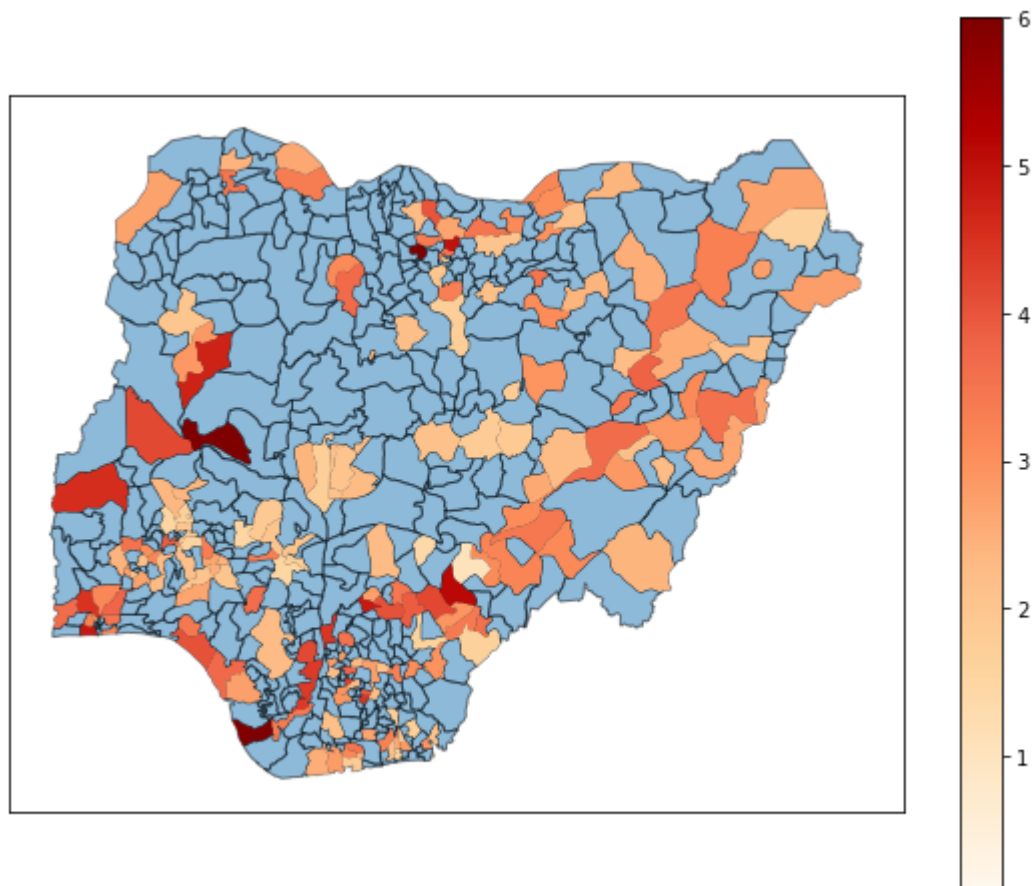
	Iga	geometry	Scores
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2	GANYE	POLYGON ((4.129106044769287 13.23579025268555,...	2.705882
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4	HONG	POLYGON ((10.18986129760742 13.26098728179932,...	3.180556
5	MADAGALI	POLYGON ((11.26132965087891 13.37434673309326,...	2.416667
6	NUMAN	POLYGON ((4.710000038146973 10.6899995803833, ...	2.884058
7	SONG	POLYGON ((4.710000038146973 10.6899995803833, ...	2.000000
8	ABAK	POLYGON ((5.130000114440918 10.82999992370605,...	4.720930
9	INI	POLYGON ((5.300000190734863 9.539999961853027,...	8.750000
10	MBO	POLYGON ((4.789999961853027 9.130000114440918,...	4.166667
11	OKOBO	POLYGON ((3.590000000000146 8.940000000002328,...	4.558140
12	URUAN	POLYGON ((2.719779999999446 6.49489000000176, ...	3.655172
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14	AGUATA	POLYGON ((3.289999961853027 6.710000038146973,...	3.252427
15	IHIALA	POLYGON ((3.400000095367432 7.130000114440918,...	3.146552
16	NJIKOKA	POLYGON ((3.410000085830688 6.699999809265137,...	3.508475
17	OGBARU	POLYGON ((3.369999885559082 6.659999847412109,...	2.972973
18	OYI	POLYGON ((3.730000019073486 7.840000152587891,...	3.512195
19	ALKALERI	POLYGON ((3.690000057220459 7.71999979019165, ...	2.437500
20	BAUCHI	POLYGON ((4.159999847412109 8.710000038146973,...	2.378049
21	DASS	POLYGON ((13.41999999999825 11.47000000000116,...	2.783784
22	MISAU	POLYGON ((12.67000007629395 11.27000045776367,...	3.299401
23	NINGI	POLYGON ((13.1899995803833 12.38000011444092, ...	1.688889
24	SHIRA	POLYGON ((13.3100004196167 11.73999977111816, ...	2.762712
25	TORO	POLYGON ((13.34000015258789 10.77999973297119,...	2.238095
26	ZAKI	POLYGON ((12.55000019073486 10.77000045776367,...	2.545455
27	BRASS	POLYGON ((12.10999965667725 11.07999992370605,...	3.456522
28	EKEREMOR	POLYGON ((13.31681999999273 10.11045999999624,...	2.700000
29	SAGBAMA	POLYGON ((13.13844999999856 9.51886999999879,...	3.571429
...
157	ONA-ARA	POLYGON ((6.800000190734863 5.929999828338623,...	2.230769
158	SURULERE	POLYGON ((7.03000020980835 5.920000076293945, ...	3.785714
159	KANAM	POLYGON ((7.440000057220459 5.690000057220459,...	2.215569
160	MANGU	POLYGON ((6.949999809265137 5.619999885559082,...	2.913043

	Iga	geometry	Scores
161	PANKSHIN	POLYGON ((6.900000095367432 5.53000020980835, ...	2.933333
162	SHENDAM	POLYGON ((6.769999980926514 5.269999980926514,...	2.173333
163	BONNY	POLYGON ((7.369999885559082 5.460000038146973,...	4.470588
164	DEGEMA	POLYGON ((7.400000095367432 5.510000228881836,...	3.892857
165	GOKANA	POLYGON ((7.239999771118164 5.739999771118164,...	2.240741
166	IKWERRE	POLYGON ((7.139999866485596 5.71999979019165, ...	4.300000
167	GADA	POLYGON ((7.769999980926514 5.289999961853027,...	1.712644
168	KWARE	POLYGON ((8.069999694824219 5.159999847412109,...	1.662338
169	WAMAKKO	POLYGON ((8.029999732971191 4.699999809265137,...	2.822917
170	DONGA	POLYGON ((7.130000114440918 4.800000190734863,...	3.506329
171	GASHAKA	POLYGON ((7.039999961853027 4.789999961853027,...	3.125000
172	JALINGO	POLYGON ((6.889999866485596 4.75, 6.8899998664...)	2.800000
173	LAU	POLYGON ((6.739999771118164 4.760000228881836,...	2.541667
174	TAKUM	POLYGON ((7.440000057220459 5, 7.4499998092651...)	2.693548
175	YORRO	POLYGON ((7.900000095367432 4.909999847412109,...	1.980769
176	ZING	POLYGON ((7.809999942779541 4.989999771118164,...	2.625000
177	BADE	POLYGON ((7.769999980926514 4.889999866485596,...	2.129730
178	DAMATURU	POLYGON ((7.760000228881836 4.889999866485596,...	3.253968
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183	BUNGUDU	POLYGON ((5.745728969573975 4.488255977630615,...	2.103448
184	GUMMI	POLYGON ((11.89999999999418 7.428690000000643,...	2.407407
185	GUSAU	POLYGON ((13.07089000000269 9.513449999998556,...	2.657895
186	TSAFE	POLYGON ((7.960000038146973 12.56999969482422,...	2.292683

187 rows × 3 columns

```
In [156]: final_geo = gpd.GeoDataFrame(final_df)
```

```
In [162]: fig, ax = plt.subplots(figsize = (10,8))
Nigeria_map.plot(ax=ax, edgecolor = 'k', alpha = .5)
final_geo.plot(ax=ax, column = 'Scores', cmap = 'OrRd', legend = True, vmin =
0.1, vmax = 6 )
ax.get_xaxis().set_visible(False)
ax.get_yaxis().set_visible(False)
```



In []:

In []:

In []: