```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from datetime import datetime

df=pd.read_csv("/content/dataset_tk.csv")
df_long=pd.read_csv("/content/long_data_.csv")

df.isnull().sum()
df_long.isnull().sum()
```

```
States       0
Regions      0
latitude     0
longitude    0
Dates        0
Usage        0
dtype: int64
```

```
df.rename(columns={'Unnamed: 0':'Date'}, inplace=True)
df['Date']=pd.to_datetime(df['Date'])
df["year"]=df["Date"].dt.year
df["month"]=df["Date"].dt.month
df["day"]=df["Date"].dt.day
df.drop(["Date"],axis=1,inplace=True)
df_long.head()
```

	States	Regions	latitude	longitude	Dates	Usage
0	Punjab	NR	31.519974	75.980003	02/01/2019 00:00:00	119.9
1	Haryana	NR	28.450006	77.019991	02/01/2019 00:00:00	130.3
2	Rajasthan	NR	26.449999	74.639981	02/01/2019 00:00:00	234.1
3	Delhi	NR	28.669993	77.230004	02/01/2019 00:00:00	85.8
4	UP	NR	27.599981	78.050006	02/01/2019 00:00:00	313.9

```
df_long=pd.read_csv("/content/long_data_.csv")
df_long['Dates']=pd.to_datetime(df_long["Dates"],dayfirst=True)
df_long["year"]=df_long["Dates"].dt.year
df_long["month"]=df_long["Dates"].dt.month
df_long["day"]=df_long["Dates"].dt.day
#df_long.drop(["latitude","longitude","Dates"],axis=1,inplace=True)
df_long.tail(25)
```

	States	Regions	latitude	longitude	...	Usage	year	month	day
16574	Chandigarh	NR	30.719997	76.780006	...	3.5	2020	12	5
16575	Chhattisgarh	WR	22.090420	82.159987	...	102.4	2020	12	5
16576	Gujarat	WR	22.258700	71.192400	...	362.5	2020	12	5
16577	MP	WR	21.300391	76.130019	...	200.1			

```
2020     12    5
16578        Maharashtra      WR  19.250232  73.160175  ...  470.5
2020     12    5
16579                Goa      WR  15.491997  73.818001  ...   12.0
2020     12    5
16580                DNH      WR  20.266578  73.016618  ...   18.4
2020     12    5
16581     Andhra Pradesh      SR  14.750429  78.570026  ...  181.9
2020     12    5
16582          Telangana      SR  18.112400  79.019300  ...  197.0
2020     12    5
16583          Karnataka      SR  12.570381  76.919997  ...  218.6
2020     12    5
16584             Kerala      SR   8.900373  76.569993  ...   78.7
2020     12    5
16585         Tamil Nadu      SR  12.920386  79.150042  ...  323.7
2020     12    5
16586              Pondy      SR  11.934994  79.830000  ...    7.9
2020     12    5
16587              Bihar      ER  25.785414  87.479973  ...   61.7
2020     12    5
16588          Jharkhand      ER  23.800393  86.419986  ...   17.7
2020     12    5
16589             Odisha      ER  19.820430  85.900017  ...   95.1
2020     12    5
16590        West Bengal      ER  22.580390  88.329947  ...  110.4
2020     12    5
16591             Sikkim      ER  27.333330  88.616647  ...    1.2
2020     12    5
16592  Arunachal Pradesh     NER  27.100399  93.616601  ...    2.1
2020     12    5
16593              Assam     NER  26.749981  94.216667  ...   20.3
2020     12    5
16594            Manipur     NER  24.799971  93.950017  ...    2.5
2020     12    5
16595          Meghalaya     NER  25.570492  91.880014  ...    5.8
2020     12    5
16596            Mizoram     NER  23.710399  92.720015  ...    1.6
2020     12    5
16597           Nagaland     NER  25.666998  94.116570  ...    2.1
2020     12    5
16598            Tripura     NER  23.835404  91.279999  ...    3.3
2020     12    5

[25 rows x 9 columns]
```

```
c=dict()
for i in (df_long.Regions.unique()):
    a=df_long[(df_long["Regions"]==i)&(df_long["year"]==2020)]
    b=a.Usage.sum()
```

```
    c.update({i:b})

print(c)



d=dict()
for i in (df_long.Regions.unique()):
    a=df_long[(df_long["Regions"]==i)&(df_long["year"]==2019)]
    b=a.Usage.sum()
    d.update({i:b})

print(d)

Region_2020=pd.DataFrame.from_dict(c,orient="index")
Region_2019=pd.DataFrame.from_dict(d,orient="index")
```

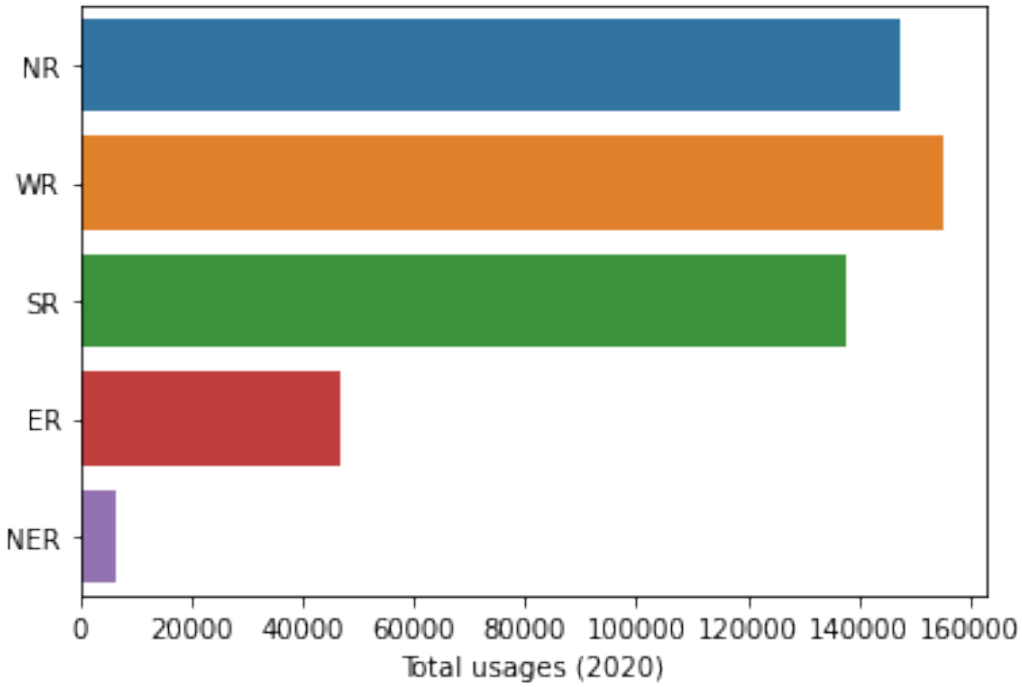
```
{'NR': 147559.8, 'WR': 155089.3, 'SR': 137883.39999999997, 'ER':
46799.4, 'NER': 6190.7}
{'NR': 358694.8, 'WR': 385280.5, 'SR': 338795.20000000007, 'ER':
117915.1, 'NER': 15519.7}
```

```
Region_2020.rename(columns={0:"Total usages (2020)"},inplace=True)
Region_2019.rename(columns={0:"Total usages (2019)"},inplace=True)
Region_2019.head()
```

```
     Total usages (2019)
NR              358694.8
WR              385280.5
SR              338795.2
ER              117915.1
NER              15519.7

Region_2020.head()
```

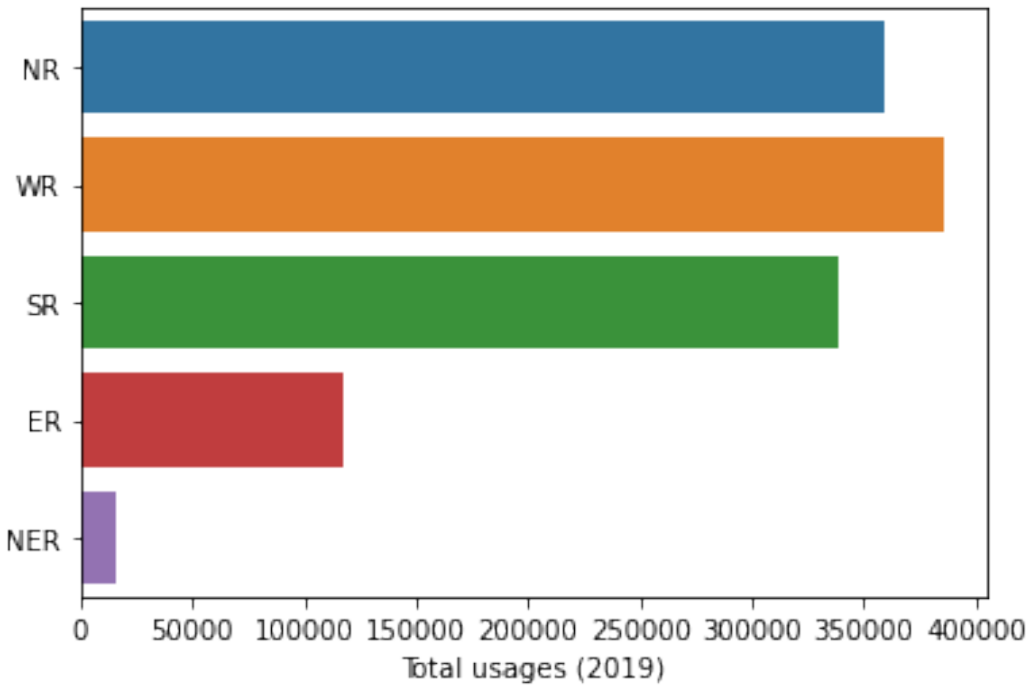
```
     Total usages (2020)
NR              147559.8
WR              155089.3
SR              137883.4
ER               46799.4
NER               6190.7

sns.barplot(x="Total usages
(2020)",y=Region_2020.index,data=Region_2020)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2ceb2bd0>
```




```
sns.barplot(x="Total usages
(2019)",y=Region_2019.index,data=Region_2019)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2d021a50>
```




```
usage_2020=dict()
for i in (df_long.States.unique()):
    a=df_long[(df_long["States"]==i)&(df_long["year"]==2020)]
```

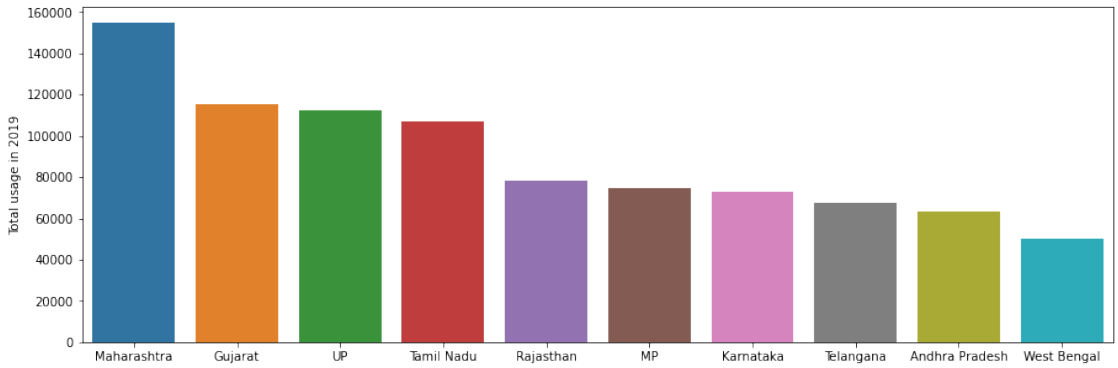
```
    b=a.Usage.sum()
    usage_2020.update({i:b})

usage_2019=dict()
for i in (df_long.States.unique()):
    a=df_long[(df_long["States"]==i)&(df_long["year"]==2019)]
    b=a.Usage.sum()
    usage_2019.update({i:b})

table1=pd.DataFrame.from_dict(usage_2020,orient="index")
table2=pd.DataFrame.from_dict(usage_2019,orient="index")

table1.rename(columns={0:'Total usage in 2020'},inplace=True)
table2.rename(columns={0:'Total usage in 2019'},inplace=True)

table1.sort_values(by=['Total usage in
2020'],ascending=False,inplace=True)
table2.sort_values(by=['Total usage in
2019'],ascending=False,inplace=True)

table1.head()
```

	Total usage in 2020
Maharashtra	62163.1
Gujarat	47131.5
UP	45270.4
Tamil Nadu	44551.3
Rajasthan	31738.2

Top 10 States with most cosumption in the year 2019

```
table3=table2.head(10)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2019",x=table3.index,data=table3)
```

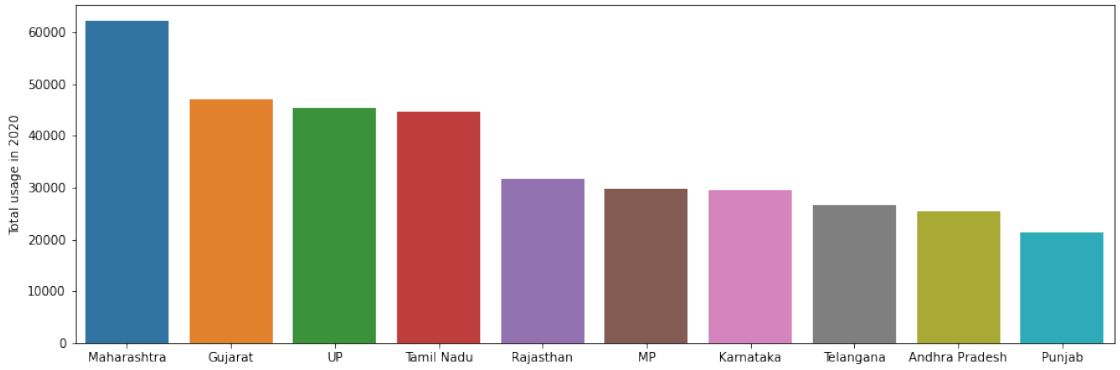
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2d1e4b10>
```



Top 10 States with most cosumption in the year 2020

```
table4=table1.head(10)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2020",x=table4.index,data=table4)
```

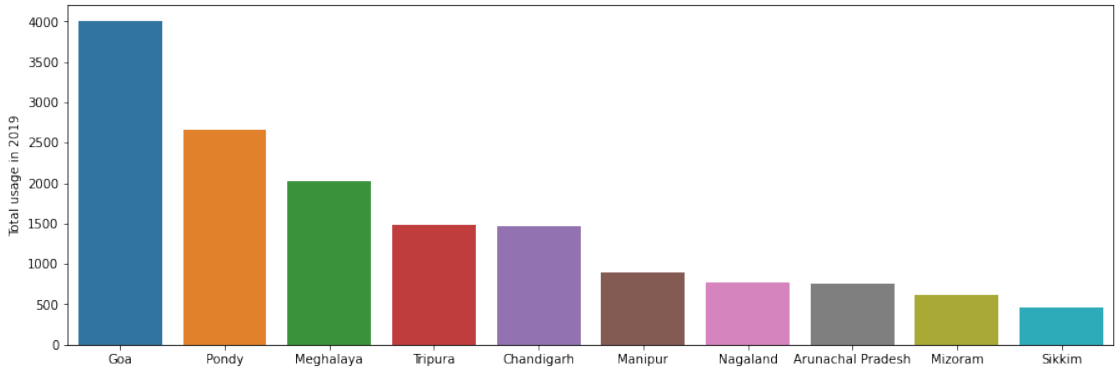
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f31c91d10>
```



States with low consumotion in year 2019

```
table5=table2.tail(10)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2019",x=table5.index,data=table5)
```

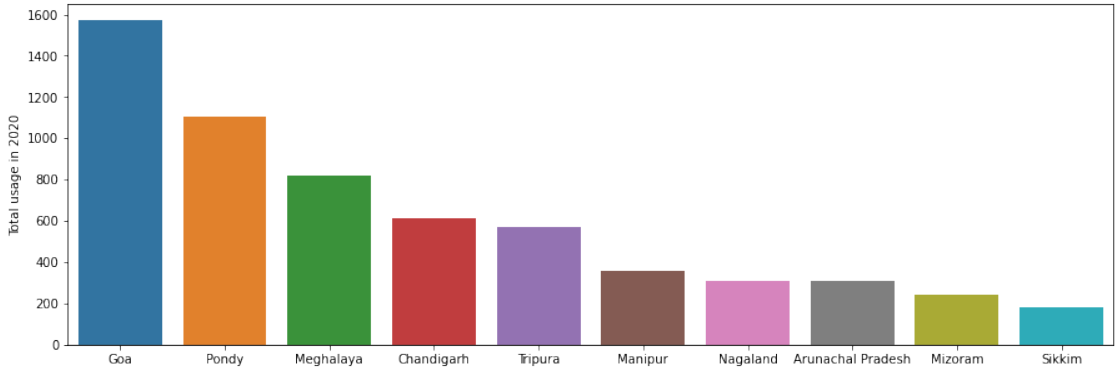
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2c2b50d0>
```



States with low consumotion in year 2019

```
table6=table1.tail(10)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2020",x=table6.index,data=table6)
```

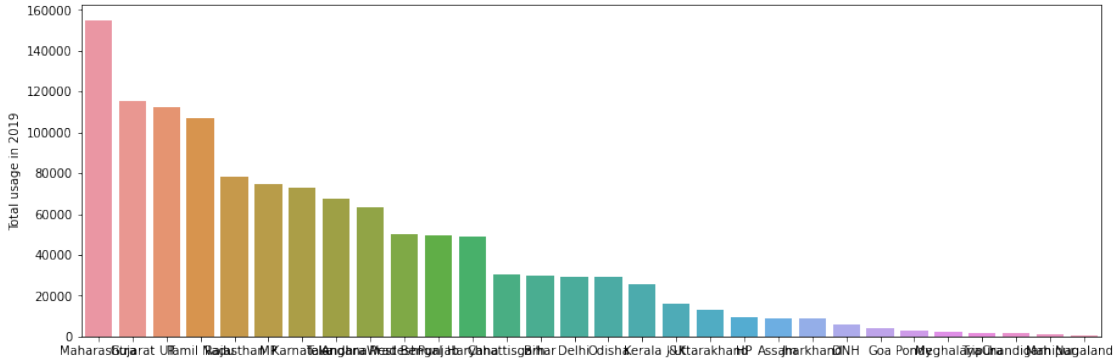
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2d146350>
```



Overview of consumption in year 2019

```
table5=table2.head(30)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2019",x=table5.index,data=table5)
```

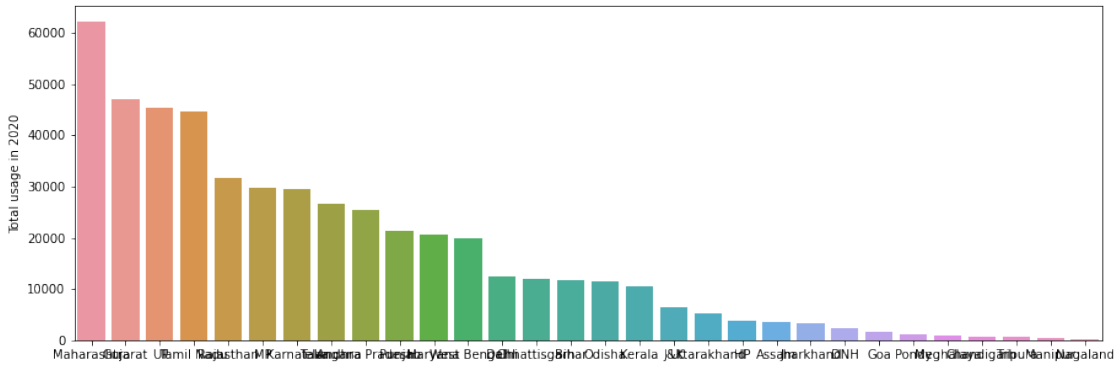
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2d003310>
```



Overview of consumption in year 2020

```
table6=table1.head(30)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2020",x=table6.index,data=table6)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5f2c1e0790>
```



Month wise Consumption

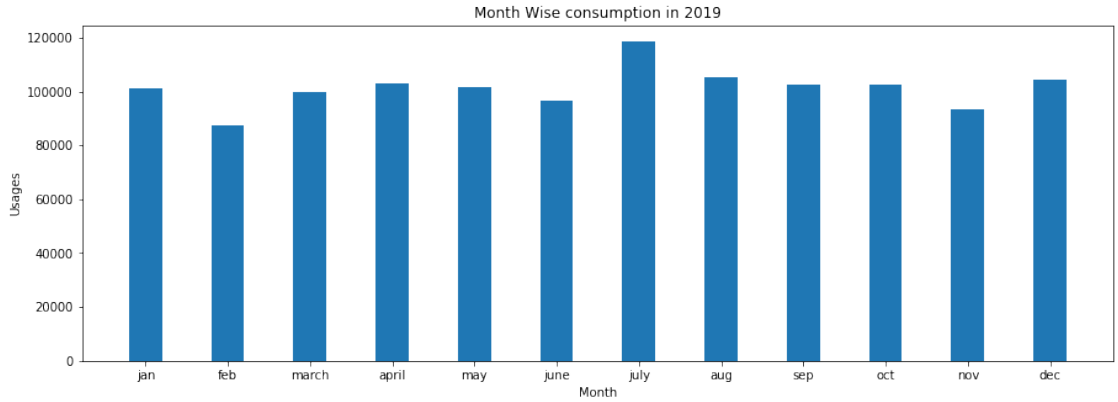
```
month2020=dict()
for i in range(1,6):
    c=df_long[(df_long["month"]==i)&(df_long["year"]==2020)]
    d=c["Usage"].sum()
    month2020.update({i:d})

month2019=dict()
for i in range(1,13):
    c=df_long[(df_long["month"]==i)&(df_long["year"]==2019)]
    d=c["Usage"].sum()
    month2019.update({i:d})

month_2019=["jan","feb",'march',"april","may","june","july","aug","sep
","oct","nov","dec"]
month_2020=["jan","feb",'march',"april","may"]

list1=list(month2019.values())
list2=list(month2020.values())

A=max(list1)
B=list1.index(A)
C=month_2019[B]
X=max(list2)
Y=list2.index(X)
Z=month_2020[Y]

print("The month in which consumption is More in 2019",C)
print("The month in which consumption is More in 2020",Z)
```

```
The month in which consumption is More in 2019 july
The month in which consumption is More in 2020 jan
```

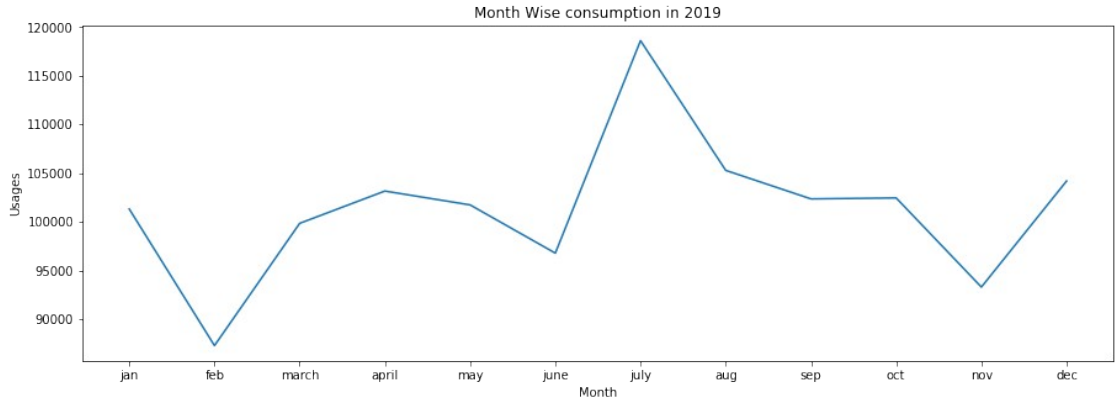
Month wise comsumption in 2019

```
plt.figure(figsize = (15, 5))
plt.bar(month_2019,list1,width = 0.4)
```

```
plt.ylabel("Usages")
plt.xlabel("Month")
plt.title("Month Wise consumption in 2019")
plt.show()
```

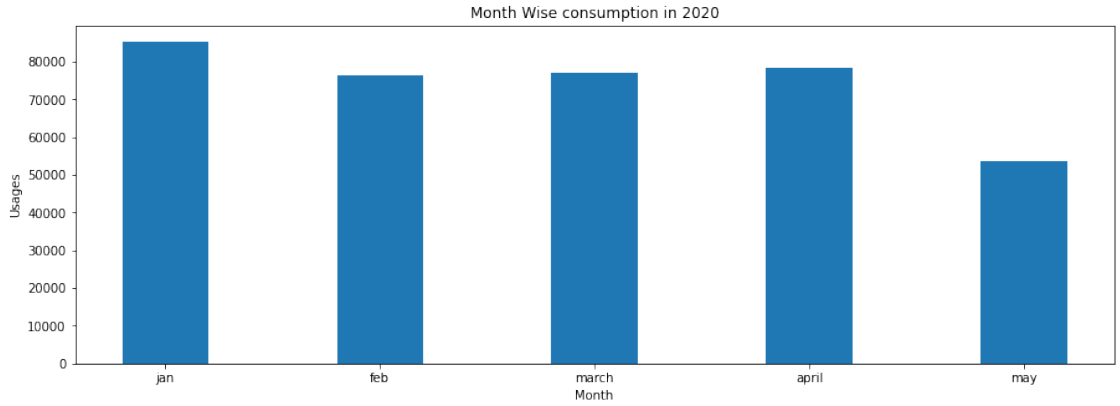



```
plt.figure(figsize = (15, 5))
plt.plot(month_2019,list1)

plt.ylabel("Usages")
plt.xlabel("Month")
plt.title("Month Wise consumption in 2019")
plt.show()
```



Month wise consumption in 2020

```
plt.figure(figsize = (15, 5))
plt.bar(month_2020,list2,width = 0.4)

plt.ylabel("Usages")
plt.xlabel("Month")
plt.title("Month Wise consumption in 2020")
plt.show()
```



Lowest consumption in the year

```
a=min(list1)
b=list1.index(a)
c=month_2020[b]
x=min(list2)
y=list2.index(x)
z=month_2020[y]

print("The month in which consumption is less in 2019",c)
print("The month in which consumption is less in 2020",z)
```

```
The month in which consumption is less in 2019 feb
The month in which consumption is less in 2020 may
```

Total Usage in the year

```
Totalusage_2020=dict()
for i in range(2020,2021):
    a=df_long[(df_long["year"]==2020)]
    b=a.Usage.sum()
    Totalusage_2020.update({i:b})

Totalusage_2019=dict()
for i in range(2019,2020):
    a=df_long[(df_long["year"]==2019)]
    b=a.Usage.sum()
    Totalusage_2019.update({i:b})

table7=pd.DataFrame.from_dict(Totalusage_2020,orient="index")
table8=pd.DataFrame.from_dict(Totalusage_2019,orient="index")

#table7.rename(columns={0:'total usage in 2020'},inplace=True)
#table8.rename(columns={0:'total usage in 2019'},inplace=True)
table7.head()
```

```
             0
2020  493522.6
```

```
table8.head()
```

```
              0
2019  1216205.3
```

```
Total_consumption= pd.concat([table7,table8])
Total_consumption.rename(columns={0:'Total Consumption'},inplace=True)
Total_consumption.head()
```

```
      Total Consumption
2020           493522.6
2019          1216205.3
```

Total Consumption in both the year

```
T=Total_consumption.sum()
print('In 2019-2020 the',T)
```

```
In 2019-2020 the Total Consumption    1709727.9
dtype: float64
```

Type of energy

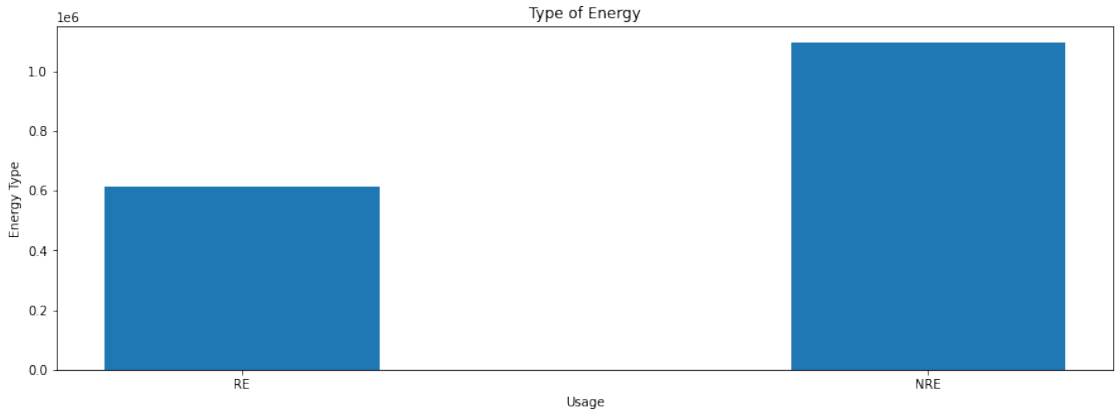
```
RE=(0.3586*T )
print('Green',RE)
```

```
Green Total Consumption    613108.42494
dtype: float64
```

```
NRE=(T-RE)
print('Non-Green',NRE)
```

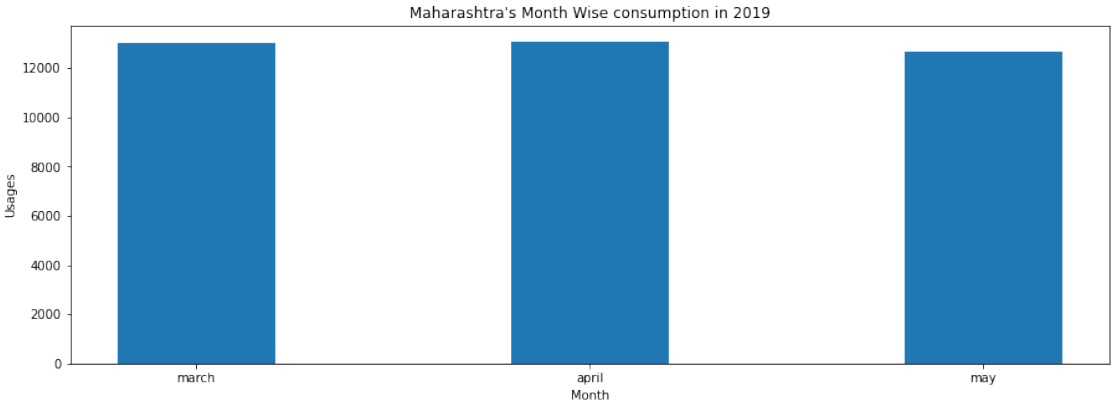
```
Non-Green Total Consumption    1.096619e+06
dtype: float64
```

```
list3={'RE':613108, "NRE":1096620}
Energy_type= list(list3.keys())
Energy_Usage=list(list3.values())

plt.figure(figsize = (15, 5))
plt.bar(Energy_type,Energy_Usage,width = 0.4)

plt.ylabel("Energy Type")
plt.xlabel("Usage")
plt.title("Type of Energy")
plt.show()
```

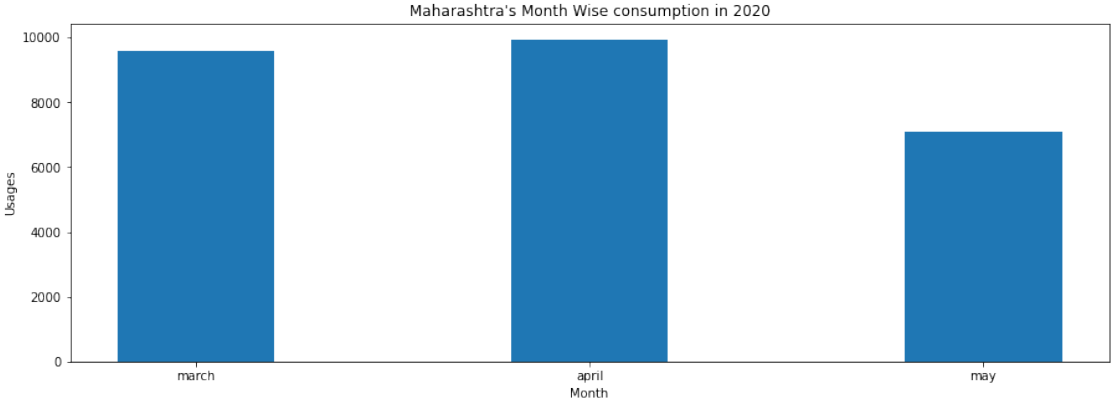


Pre-Covid and Post-Covid consumption of Maharashtra

```
list4=[3,4,5]
mm2020=dict()
for i in list4:

a=df_long[(df_long["month"]==i)&(df_long["States"]=="Maharashtra")&(df
_long["year"]==2020)]
    b=a.Usage.sum()
    mm2020.update({i:b})

mm2019=dict()
for i in list4:

a=df_long[(df_long["month"]==i)&(df_long["States"]=="Maharashtra")&(df
_long["year"]==2019)]
    b=a.Usage.sum()
    mm2019.update({i:b})

table9=pd.DataFrame.from_dict(mm2020,orient="index")
table10=pd.DataFrame.from_dict(mm2019,orient="index")

table9.rename(columns={0:'Usage in March-May 2020'},inplace=True)
table10.rename(columns={0:'Usage in March-May 2019'},inplace=True)

list5=list(mm2019.values())
list6=list(mm2020.values())
list7=["march","april","may"]

plt.figure(figsize = (15, 5))
plt.bar(list7,list5,width = 0.4)

plt.ylabel("Usages")
plt.xlabel("Month")
plt.title("Maharashtra's Month Wise consumption in 2019")
plt.show()
```




```
plt.figure(figsize = (15, 5))
plt.bar(list7,list6,width = 0.4)

plt.ylabel("Usages")
plt.xlabel("Month")
plt.title("Maharashtra's Month Wise consumption in 2020")
plt.show()
```




```
# This Python 3 environment comes with many helpful analytics
libraries installed
# It is defined by the kaggle/python Docker image:
https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)

# Input data files are available in the read-only "../input/"
directory
# For example, running this (by clicking run or pressing Shift+Enter)
will list all files under the input directory

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
```

```
    for filename in filenames:
        print(os.path.join(dirname, filename))

# You can write up to 20GB to the current directory (/kaggle/working/) that gets preserved as output when you create a version using "Save & Run All"
# You can also write temporary files to /kaggle/temp/, but they won't be saved outside of the current session
```

```
/kaggle/input/raw-data-for-ml-states/raw_data_1.csv
/kaggle/input/state-wise-power-consumption-in-india/dataset_tk.csv
/kaggle/input/state-wise-power-consumption-in-india/long_data_.csv
/kaggle/input/indian-gis-data/India States/Indian_states.shp
/kaggle/input/indian-gis-data/India States/Indian_states.prj
/kaggle/input/indian-gis-data/India States/Indian_states.dbf
/kaggle/input/indian-gis-data/India States/Indian_states.shx
/kaggle/input/indian-gis-data/India Boundary/India_boundary.dbf
/kaggle/input/indian-gis-data/India Boundary/India_boundary.prj
/kaggle/input/indian-gis-data/India Boundary/India_boundary.shx
/kaggle/input/indian-gis-data/India Boundary/India_boundary.shp
/kaggle/input/raw-data-state-for-usage/raw_data.csv
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.shx
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.sbx
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.shx
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.shp.xml
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.prj
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/README.md
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.dbf
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.shp
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.sbx
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.shp
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.cpg
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.dbf
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.sbn
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.sbn
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
```

```
Country-Shapefile-Updated-Jan-2020-master/India_State_Boundary.prj
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/India_Country_Boundary.cpg
/kaggle/input/india-shape-and-country-shape-file/India-State-and-
Country-Shapefile-Updated-Jan-2020-master/
India_Country_Boundary.shp.xml
```

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from datetime import datetime
```

Storing the dataset with date in "lpowerWithDate" and removing hours.

```
lpowerWithDate=pd.read_csv("/kaggle/input/state-wise-power-
consumption-in-india/long_data_.csv")
lpowerWithDate['Date_New']=pd.to_datetime(lpowerWithDate["Dates"],dayf
irst=True)
lpowerWithDate.drop(["latitude","longitude",
"Dates"],axis=1,inplace=True)
```

```
lpowerWithDate.index[lpowerWithDate.Usage == 119.9].tolist()
```

```
[0, 3621, 15303]
```

Store the data in "lpower" and convert the Dates column into "Day", "Month", "Year" columns.

We will drop the latitute and logitute in "lpower" data frame, since there's no use for that. We will use it in geographical plotting.

We are dropping the date column here too.

```
lpower=pd.read_csv("/kaggle/input/state-wise-power-consumption-in-
india/long_data_.csv")
lpower['Dates']=pd.to_datetime(lpower["Dates"],dayfirst=True)
lpower["year"]=lpower["Dates"].dt.year
lpower["month"]=lpower["Dates"].dt.month
lpower["day"]=lpower["Dates"].dt.day
lpower.drop(["latitude","longitude","Dates"],axis=1,inplace=True)
```

```
lpower
```

	States	Regions	Usage	year	month	day
0	Punjab	NR	119.9	2019	1	2
1	Haryana	NR	130.3	2019	1	2
2	Rajasthan	NR	234.1	2019	1	2
3	Delhi	NR	85.8	2019	1	2
4	UP	NR	313.9	2019	1	2
...	...	...	...	...	...	...
16594	Manipur	NER	2.5	2020	12	5

```
16595  Meghalaya     NER    5.8  2020     12    5
16596    Mizoram     NER    1.6  2020     12    5
16597   Nagaland     NER    2.1  2020     12    5
16598    Tripura     NER    3.3  2020     12    5

[16599 rows x 6 columns]
```

```
lpower.shape
```

```
(16599, 6)
```

```
lpower.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 16599 entries, 0 to 16598
Data columns (total 6 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   States   16599 non-null  object 
 1   Regions  16599 non-null  object 
 2   Usage    16599 non-null  float64
 3   year     16599 non-null  int64  
 4   month    16599 non-null  int64  
 5   day      16599 non-null  int64  
dtypes: float64(1), int64(3), object(2)
memory usage: 778.2+ KB
```

```
lpower1=pd.read_csv("/kaggle/input/state-wise-power-consumption-in-india/long_data_.csv")
lpower1['Dates']=pd.to_datetime(lpower1["Dates"],dayfirst=True)
lpower1["year"]=lpower1["Dates"].dt.year
lpower1["month"]=lpower1["Dates"].dt.month
lpower1["day"]=lpower1["Dates"].dt.day
lpower1.drop(["latitude","longitude"],axis=1,inplace=True)
```

```
lpower1
```

```
          States Regions      Dates  Usage  year  month  day
0         Punjab      NR 2019-01-02  119.9  2019      1    2
1        Haryana      NR 2019-01-02  130.3  2019      1    2
2      Rajasthan      NR 2019-01-02  234.1  2019      1    2
3          Delhi      NR 2019-01-02   85.8  2019      1    2
4             UP      NR 2019-01-02  313.9  2019      1    2
...          ...     ...        ...    ...   ...    ...  ...
16594    Manipur     NER 2020-12-05    2.5  2020     12    5
16595  Meghalaya     NER 2020-12-05    5.8  2020     12    5
16596    Mizoram     NER 2020-12-05    1.6  2020     12    5
16597   Nagaland     NER 2020-12-05    2.1  2020     12    5
16598    Tripura     NER 2020-12-05    3.3  2020     12    5

[16599 rows x 7 columns]
```

1) On which *DAY*, did we see the highest & lowest consumption in India

```
dictday=dict()
for i in range(1,32):
    day = lpower[lpower['day']==i]
    day_usage = day["Usage"].sum()
    dictday.update({i:day_usage})
dictday
```

```
{1: 62630.100000000006,
 2: 81678.4,
 3: 81592.6,
 4: 81350.40000000001,
 5: 81672.20000000001,
 6: 40160.5,
 7: 22434.800000000003,
 8: 40722.399999999994,
 9: 40675.4,
 10: 41757.7,
 11: 42334.8,
 12: 44003.2,
 13: 57716.59999999999,
 14: 58039.0,
 15: 57502.399999999994,
 16: 58247.4,
 17: 59688.7,
 18: 59311.600000000006,
 19: 59691.8,
 20: 58880.90000000001,
 21: 59337.100000000006,
 22: 58009.1,
 23: 59011.6,
 24: 55272.0,
 25: 55075.5,
 26: 54650.2,
 27: 54794.100000000006,
 28: 53726.7,
 29: 52004.7,
 30: 47628.100000000006,
 31: 30127.9}
```

```
dayList = list(dictday.values())
dayMax = max(dayList)
dayMin = min(dayList)
print(f"On {dayList.index(dayMax) + 1} we say the maximum usage in the
entire country")
print(f"On {dayList.index(dayMin) + 1} we say the minimum usage in the
entire country")
```

On 2 we say the maximum usage in the entire country
On 7 we say the minimum usage in the entire country

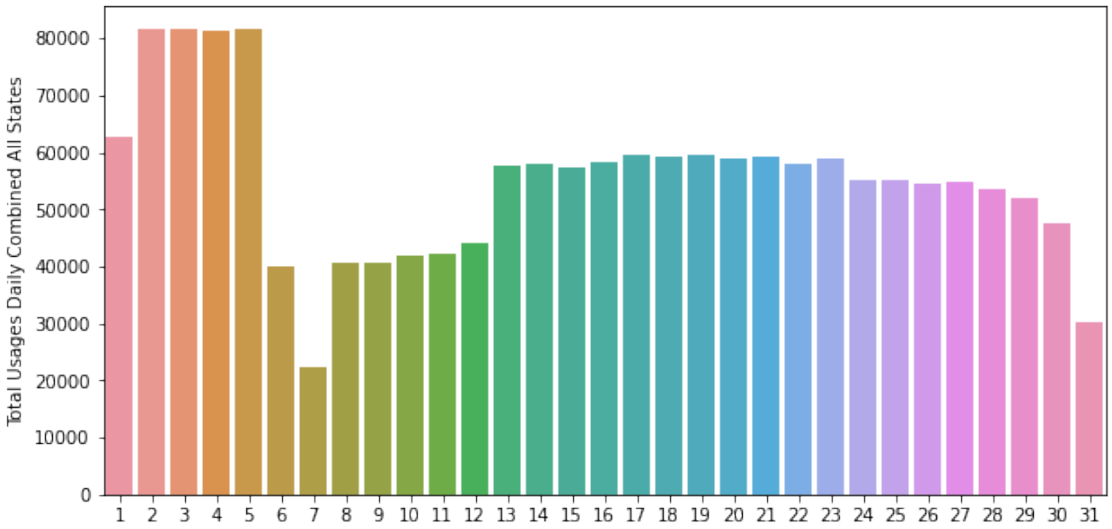
VISUALIZATION OF THE ABOVE

```
dictdayTable = pd.DataFrame.from_dict(dictday, orient="index")
dictdayTable.rename(columns={0:"Total Usages Daily Combined All
States"},inplace=True)
dictdayTable
```

```
    Total Usages Daily Combined All States
1                                    62630.1
2                                    81678.4
3                                    81592.6
4                                    81350.4
5                                    81672.2
6                                    40160.5
7                                    22434.8
8                                    40722.4
9                                    40675.4
10                                   41757.7
11                                   42334.8
12                                   44003.2
13                                   57716.6
14                                   58039.0
15                                   57502.4
16                                   58247.4
17                                   59688.7
18                                   59311.6
19                                   59691.8
20                                   58880.9
21                                   59337.1
22                                   58009.1
23                                   59011.6
24                                   55272.0
25                                   55075.5
26                                   54650.2
27                                   54794.1
28                                   53726.7
29                                   52004.7
30                                   47628.1
31                                   30127.9
```

```
plt.figure(figsize=(10, 5))
sns.barplot(y="Total Usages Daily Combined All
States",x=dictdayTable.index,data=dictdayTable)
```

```
<AxesSubplot:ylabel='Total Usages Daily Combined All States'>
```



1) On which *DAY*, did we see the highest & lowest consumption in India in 2019

```
dictday2019=dict()
for i in range(1,32):
    day = lpower[(lpower['day']==i) & (lpower['year']==2019)]
    day_usage = day["Usage"].sum()
    dictday2019.update({i:day_usage})
dictday2019
```

```
{1: 20811.5,
 2: 39992.6,
 3: 40783.799999999996,
 4: 40612.8,
 5: 40730.4,
 6: 40160.5,
 7: 22434.800000000003,
 8: 40722.399999999994,
 9: 40675.4,
 10: 41757.7,
 11: 42334.8,
 12: 44003.2,
 13: 41537.7,
 14: 41814.8,
 15: 40601.0,
 16: 41282.0,
 17: 42628.700000000004,
 18: 42203.6,
 19: 42238.9,
 20: 41318.7,
 21: 41805.8,
 22: 41693.7,
```

```
 23: 42184.0,
 24: 41776.100000000006,
 25: 41782.40000000001,
 26: 40628.600000000006,
 27: 40563.7,
 28: 39357.899999999994,
 29: 37579.8,
 30: 36909.2,
 31: 23278.800000000003}
```

```
dayList2019 = list(dictday2019.values())
dayMax2019 = max(dayList2019)
dayMin2019 = min(dayList2019)
print(f"On {dayList2019.index(dayMax2019) + 1} we say the maximum
usage in the entire country in 2019")
print(f"On {dayList2019.index(dayMin2019) + 1} we say the minimum
usage in the entire country in 2019")
```

```
On 12 we say the maximum usage in the entire country in 2019
On 1 we say the minimum usage in the entire country in 2019
```

VISUALIZATION OF ABOVE

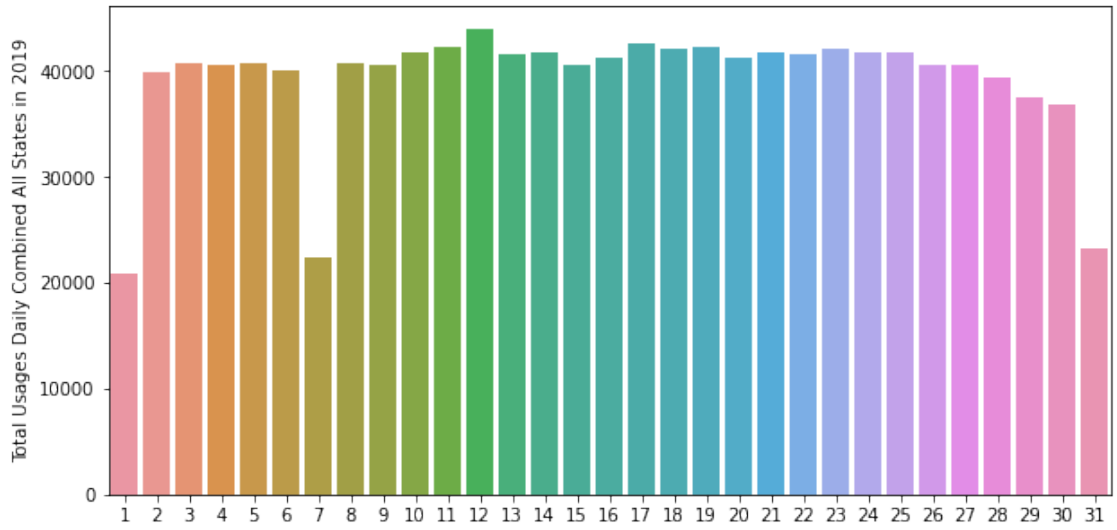
```
dictdayTable2019 = pd.DataFrame.from_dict(dictday2019, orient="index")
dictdayTable2019.rename(columns={0:"Total Usages Daily Combined All
States in 2019"},inplace=True)
dictdayTable2019
```

	Total Usages Daily Combined All States in 2019
1	20811.5
2	39992.6
3	40783.8
4	40612.8
5	40730.4
6	40160.5
7	22434.8
8	40722.4
9	40675.4
10	41757.7
11	42334.8
12	44003.2
13	41537.7
14	41814.8
15	40601.0
16	41282.0
17	42628.7
18	42203.6
19	42238.9
20	41318.7
21	41805.8
22	41693.7

```
23                                                  42184.0
24                                                  41776.1
25                                                  41782.4
26                                                  40628.6
27                                                  40563.7
28                                                  39357.9
29                                                  37579.8
30                                                  36909.2
31                                                  23278.8
```

```
plt.figure(figsize=(10, 5))
sns.barplot(y="Total Usages Daily Combined All States in
2019",x=dictdayTable2019.index,data=dictdayTable2019)
```

```
<AxesSubplot:ylabel='Total Usages Daily Combined All States in 2019'>
```



1) On which *DAY*, did we see the highest & lowest consumption in India in 2020

```
dictday2020=dict()
for i in range(1,32):
    day = lpower[(lpower['day']==i) & (lpower['year']==2020)]
    day_usage = day["Usage"].sum()
    dictday2020.update({i:day_usage})
dictday2020
```

```
{1: 41818.6,
 2: 41685.8,
 3: 40808.8,
 4: 40737.6,
 5: 40941.8,
 6: 0.0,
 7: 0.0,
```

```
 8: 0.0,
 9: 0.0,
 10: 0.0,
 11: 0.0,
 12: 0.0,
 13: 16178.900000000001,
 14: 16224.2,
 15: 16901.399999999998,
 16: 16965.4,
 17: 17060.0,
 18: 17108.0,
 19: 17452.899999999998,
 20: 17562.199999999997,
 21: 17531.300000000003,
 22: 16315.4,
 23: 16827.600000000002,
 24: 13495.900000000001,
 25: 13293.1,
 26: 14021.599999999999,
 27: 14230.4,
 28: 14368.800000000001,
 29: 14424.9,
 30: 10718.9,
 31: 6849.1}
```

```
dayList2020 = list(dictday2020.values())
dayMax2020 = max(dayList2020)
dayMin2020 = min(dayList2020)
print(f"On {dayList2020.index(dayMax2020) + 1} we say the maximum
usage in the entire country in 2020")
print(f"On {dayList2020.index(dayMin2020) + 1} we say the minimum
usage in the entire country in 2020")
```

```
On 1 we say the maximum usage in the entire country in 2020
On 6 we say the minimum usage in the entire country in 2020
```

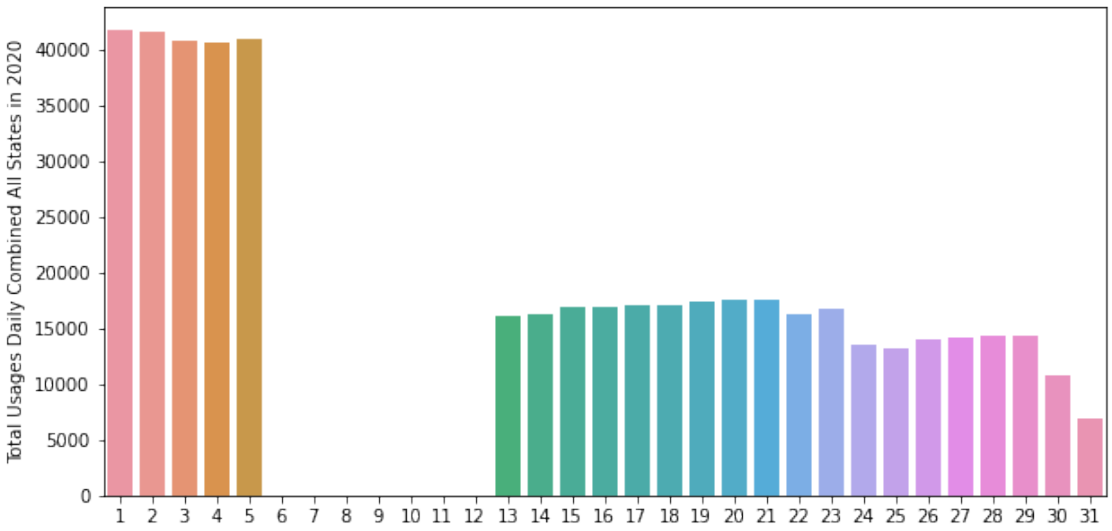
```
dictdayTable2020 = pd.DataFrame.from_dict(dictday2020, orient="index")
dictdayTable2020.rename(columns={0:"Total Usages Daily Combined All
States in 2020"},inplace=True)
dictdayTable2020
```

```
    Total Usages Daily Combined All States in 2020
1                                           41818.6
2                                           41685.8
3                                           40808.8
4                                           40737.6
5                                           40941.8
6                                               0.0
7                                               0.0
8                                               0.0
9                                               0.0
```

```
10                                                  0.0
11                                                  0.0
12                                                  0.0
13                                              16178.9
14                                              16224.2
15                                              16901.4
16                                              16965.4
17                                              17060.0
18                                              17108.0
19                                              17452.9
20                                              17562.2
21                                              17531.3
22                                              16315.4
23                                              16827.6
24                                              13495.9
25                                              13293.1
26                                              14021.6
27                                              14230.4
28                                              14368.8
29                                              14424.9
30                                              10718.9
31                                               6849.1
```

```
plt.figure(figsize=(10, 5))
sns.barplot(y="Total Usages Daily Combined All States in
2020",x=dictdayTable2020.index,data=dictdayTable2020)
```

```
<AxesSubplot:ylabel='Total Usages Daily Combined All States in 2020'>
```



On which *DATE*, did we saw highest and lowest consumption in India both in 2019 and 2020

```
dailyUsage = list(lpower.Usage)
dailyUsageMax = max(dailyUsage)
dailyUsageMin = min(dailyUsage)

dailyUsageMaxIndex = dailyUsage.index(dailyUsageMax)
dailyUsageMinIndex = dailyUsage.index(dailyUsageMin)

datesNew = lpowerWithDate['Date_New'].dt.date

print(f"On {datesNew[dailyUsageMaxIndex]} is the maximum usage in
India, which is {dailyUsageMax}")
print(f"On {datesNew[dailyUsageMinIndex]} is the minimum usage in
India, which is {dailyUsageMin}")
```

```
On 2019-06-20 is the maximum usage in India, which is 522.1
On 2020-02-03 is the minimum usage in India, which is 0.3
```

On which *DATE* and which *STATE*, showed the maximum and minimum usage both in 2019 and 2020?

```
print(f"On {datesNew[dailyUsageMaxIndex]}, in {(lpower['States'])
[dailyUsageMaxIndex]} is the maximum usage in India, which is
{dailyUsageMax}")
print(f"On {datesNew[dailyUsageMinIndex]} in {(lpower['States'])
[dailyUsageMinIndex]} is the minimum usage in India, which is
{dailyUsageMin}")
```

```
On 2019-06-20, in Maharashtra is the maximum usage in India, which is
522.1
On 2020-02-03 in Sikkim is the minimum usage in India, which is 0.3
```

State wise, which date had the maximum and minimum usage both in 2019 and 2020?

```
dictStateMax = dict()
dictStateDateMax = dict()
for i in (lpowerWithDate.States.unique()):
    #creating a df with only unique states
    onlyStates = lpowerWithDate[(lpowerWithDate.States == i)]

    #finding the max of usage from the list
    stateWiseUsageMax = max(onlyStates.Usage)

    #updating the dictornary with the state:max_usage
    dictStateMax.update({i:stateWiseUsageMax})
```

```
    #get index of the max usage statewise and add them into a lisy
    statesWiseMaxIndex = onlyStates.index[onlyStates.Usage ==
stateWiseUsageMax].tolist()

    #retrieve only the 1st value of the list
    newStatesWiseMaxIndex = statesWiseMaxIndex[0]

    #remove the time from the date_new column
    onlyStatesDFDatesNew = onlyStates.Date_New.dt.date

    #store the dates in a dict of the max usage statewise

dictStateDateMax.update({i:onlyStatesDFDatesNew[newStatesWiseMaxIndex]
})
    #print (onlyStatesDFDatesNew[newStatesWiseMaxIndex])

print ("Dictornary",dictStateMax)
print ("Dict", dictStateDateMax)
```

```
Dictornary {'Punjab': 300.0, 'Haryana': 237.2, 'Rajasthan': 278.0,
'Delhi': 147.1, 'UP': 471.8, 'Uttarakhand': 53.2, 'HP': 34.0, 'J&K':
54.2, 'Chandigarh': 7.4, 'Chhattisgarh': 111.6, 'Gujarat': 400.8,
'MP': 272.3, 'Maharashtra': 522.1, 'Goa': 14.0, 'DNH': 19.5, 'Andhra
Pradesh': 205.1, 'Telangana': 256.2, 'Karnataka': 273.3, 'Kerala':
89.4, 'Tamil Nadu': 365.4, 'Pondy': 9.7, 'Bihar': 121.4, 'Jharkhand':
28.9, 'Odisha': 113.0, 'West Bengal': 198.5, 'Sikkim': 2.8, 'Arunachal
Pradesh': 2.7, 'Assam': 38.0, 'Manipur': 3.2, 'Meghalaya': 6.9,
'Mizoram': 2.2, 'Nagaland': 2.7, 'Tripura': 6.6}
Dict {'Punjab': datetime.date(2020, 10, 4), 'Haryana':
datetime.date(2020, 10, 4), 'Rajasthan': datetime.date(2019, 12, 1),
'Delhi': datetime.date(2020, 10, 3), 'UP': datetime.date(2020, 4, 28),
'Uttarakhand': datetime.date(2019, 12, 4), 'HP': datetime.date(2019,
10, 31), 'J&K': datetime.date(2020, 2, 21), 'Chandigarh':
datetime.date(2020, 10, 4), 'Chhattisgarh': datetime.date(2019, 5,
13), 'Gujarat': datetime.date(2020, 4, 30), 'MP': datetime.date(2019,
8, 17), 'Maharashtra': datetime.date(2019, 6, 20), 'Goa':
datetime.date(2019, 9, 20), 'DNH': datetime.date(2020, 9, 3), 'Andhra
Pradesh': datetime.date(2019, 9, 6), 'Telangana': datetime.date(2019,
9, 8), 'Karnataka': datetime.date(2019, 3, 30), 'Kerala':
datetime.date(2019, 6, 20), 'Tamil Nadu': datetime.date(2020, 1, 30),
'Pondy': datetime.date(2019, 8, 4), 'Bihar': datetime.date(2020, 7,
3), 'Jharkhand': datetime.date(2019, 10, 15), 'Odisha':
datetime.date(2020, 12, 3), 'West Bengal': datetime.date(2020, 2, 27),
'Sikkim': datetime.date(2019, 6, 29), 'Arunachal Pradesh':
datetime.date(2020, 5, 23), 'Assam': datetime.date(2019, 7, 3),
'Manipur': datetime.date(2019, 10, 21), 'Meghalaya':
datetime.date(2020, 5, 20), 'Mizoram': datetime.date(2019, 7, 13),
```

```
'Nagaland': datetime.date(2019, 3, 29), 'Tripura': datetime.date(2019,
4, 16)}
```

Convert dict to df

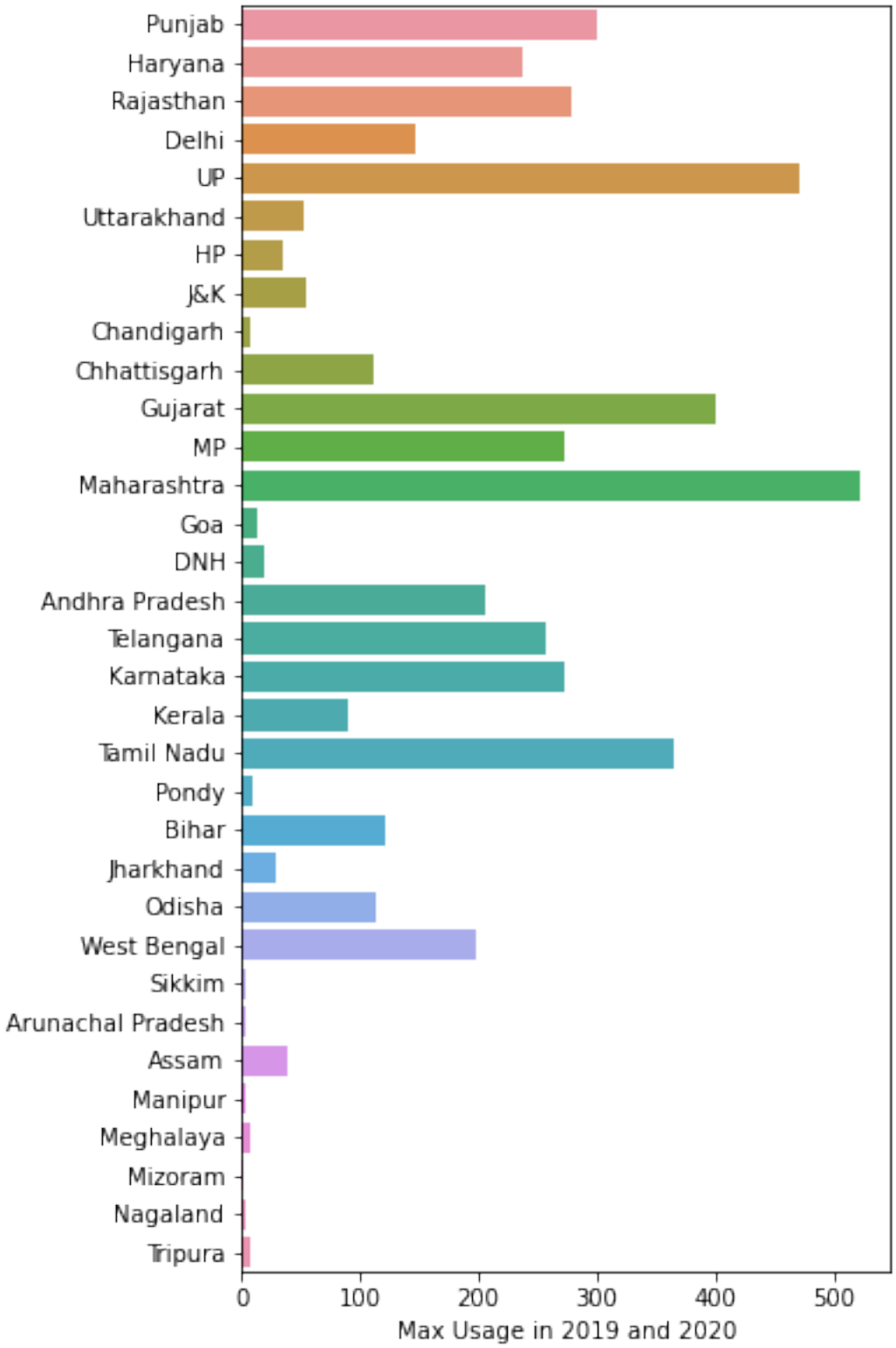
```
stateWiseMaxUsage = pd.DataFrame.from_dict(dictStateMax,
orient="index")
stateWiseMaxUsage.rename(columns={0:'Max Usage in 2019 and
2020'},inplace=True)

stateWiseMaxDate = pd.DataFrame.from_dict(dictStateDateMax,
orient="index")
stateWiseMaxDate.rename(columns={0:'Date'},inplace=True)

pd.concat([stateWiseMaxUsage, stateWiseMaxDate], axis = 1)
```

	Max Usage in 2019 and 2020	Date
Punjab	300.0	2020-10-04
Haryana	237.2	2020-10-04
Rajasthan	278.0	2019-12-01
Delhi	147.1	2020-10-03
UP	471.8	2020-04-28
Uttarakhand	53.2	2019-12-04
HP	34.0	2019-10-31
J&K	54.2	2020-02-21
Chandigarh	7.4	2020-10-04
Chhattisgarh	111.6	2019-05-13
Gujarat	400.8	2020-04-30
MP	272.3	2019-08-17
Maharashtra	522.1	2019-06-20
Goa	14.0	2019-09-20
DNH	19.5	2020-09-03
Andhra Pradesh	205.1	2019-09-06
Telangana	256.2	2019-09-08
Karnataka	273.3	2019-03-30
Kerala	89.4	2019-06-20
Tamil Nadu	365.4	2020-01-30
Pondy	9.7	2019-08-04
Bihar	121.4	2020-07-03
Jharkhand	28.9	2019-10-15
Odisha	113.0	2020-12-03
West Bengal	198.5	2020-02-27
Sikkim	2.8	2019-06-29
Arunachal Pradesh	2.7	2020-05-23
Assam	38.0	2019-07-03
Manipur	3.2	2019-10-21
Meghalaya	6.9	2020-05-20
Mizoram	2.2	2019-07-13
Nagaland	2.7	2019-03-29
Tripura	6.6	2019-04-16

VISUALITZATION OF ABOVE

```
plt.figure(figsize=(5, 10))
sns.barplot(x="Max Usage in 2019 and
2020",y=stateWiseMaxUsage.index,data=stateWiseMaxUsage)
```

```
<AxesSubplot:xlabel='Max Usage in 2019 and 2020'>
```




```
dictStateMin = dict()
dictStateDateMin = dict()
for i in (lpowerWithDate.States.unique()):
```

```
    #creating a df with only unique states
    onlyStates = lpowerWithDate[(lpowerWithDate.States == i)]

    #finding the max of usage from the list
    stateWiseUsageMin = min(onlyStates.Usage)

    #updating the dictornary with the state:min_usage
    dictStateMin.update({i:stateWiseUsageMin})

    #get index of the min usage statewise and add them into a lisy
    statesWiseMinIndex = onlyStates.index[onlyStates.Usage ==
stateWiseUsageMin].tolist()

    #retrieve only the 1st value of the list
    newStatesWiseMinIndex = statesWiseMinIndex[0]

    #remove the time from the date_new column
    onlyStatesDFDatesNew = onlyStates.Date_New.dt.date

    #store the dates in a dict of the min usage statewise

dictStateDateMin.update({i:onlyStatesDFDatesNew[newStatesWiseMinIndex]
})
    #print (onlyStatesDFDatesNew[newStatesWiseMinIndex])

print ("Dictornary",dictStateMin)
print ("Dict", dictStateDateMin)
```

```
Dictornary {'Punjab': 56.1, 'Haryana': 64.8, 'Rajasthan': 105.8,
'Delhi': 41.8, 'UP': 186.8, 'Uttarakhand': 16.8, 'HP': 11.8, 'J&K':
17.8, 'Chandigarh': 2.2, 'Chhattisgarh': 37.2, 'Gujarat': 192.3, 'MP':
131.8, 'Maharashtra': 305.6, 'Goa': 6.2, 'DNH': 1.3, 'Andhra Pradesh':
130.6, 'Telangana': 130.5, 'Karnataka': 121.0, 'Kerala': 55.0, 'Tamil
Nadu': 195.7, 'Pondy': 4.0, 'Bihar': 43.5, 'Jharkhand': 17.4,
'Odisha': 51.1, 'West Bengal': 51.5, 'Sikkim': 0.3, 'Arunachal
Pradesh': 1.1, 'Assam': 12.2, 'Manipur': 1.5, 'Meghalaya': 3.3,
'Mizoram': 1.2, 'Nagaland': 1.4, 'Tripura': 1.4}
Dict {'Punjab': datetime.date(2019, 6, 2), 'Haryana':
datetime.date(2019, 6, 2), 'Rajasthan': datetime.date(2019, 5, 31),
'Delhi': datetime.date(2019, 1, 30), 'UP': datetime.date(2019, 12,
26), 'Uttarakhand': datetime.date(2019, 1, 30), 'HP':
datetime.date(2019, 11, 8), 'J&K': datetime.date(2020, 4, 1),
'Chandigarh': datetime.date(2019, 1, 30), 'Chhattisgarh':
datetime.date(2019, 2, 26), 'Gujarat': datetime.date(2019, 5, 31),
'MP': datetime.date(2019, 5, 31), 'Maharashtra': datetime.date(2019,
2, 7), 'Goa': datetime.date(2019, 5, 29), 'DNH': datetime.date(2019,
2, 2), 'Andhra Pradesh': datetime.date(2020, 3, 26), 'Telangana':
datetime.date(2019, 3, 18), 'Karnataka': datetime.date(2019, 2, 11),
'Kerala': datetime.date(2019, 10, 25), 'Tamil Nadu':
datetime.date(2019, 6, 9), 'Pondy': datetime.date(2019, 1, 30),
```

```
'Bihar': datetime.date(2019, 5, 11), 'Jharkhand': datetime.date(2019,
4, 6), 'Odisha': datetime.date(2019, 1, 27), 'West Bengal':
datetime.date(2019, 8, 12), 'Sikkim': datetime.date(2020, 2, 3),
'Arunachal Pradesh': datetime.date(2019, 7, 9), 'Assam':
datetime.date(2020, 3, 27), 'Manipur': datetime.date(2019, 9, 21),
'Meghalaya': datetime.date(2020, 3, 26), 'Mizoram':
datetime.date(2020, 1, 2), 'Nagaland': datetime.date(2019, 7, 9),
'Tripura': datetime.date(2020, 5, 14)}

stateWiseMinUsage = pd.DataFrame.from_dict(dictStateMin,
orient="index")
stateWiseMinUsage.rename(columns={0:'Min Usage in 2019 and
2020'},inplace=True)

stateWiseMinDate = pd.DataFrame.from_dict(dictStateDateMin,
orient="index")
stateWiseMinDate.rename(columns={0:'Date'},inplace=True)

pd.concat([stateWiseMinUsage, stateWiseMinDate], axis = 1)
```

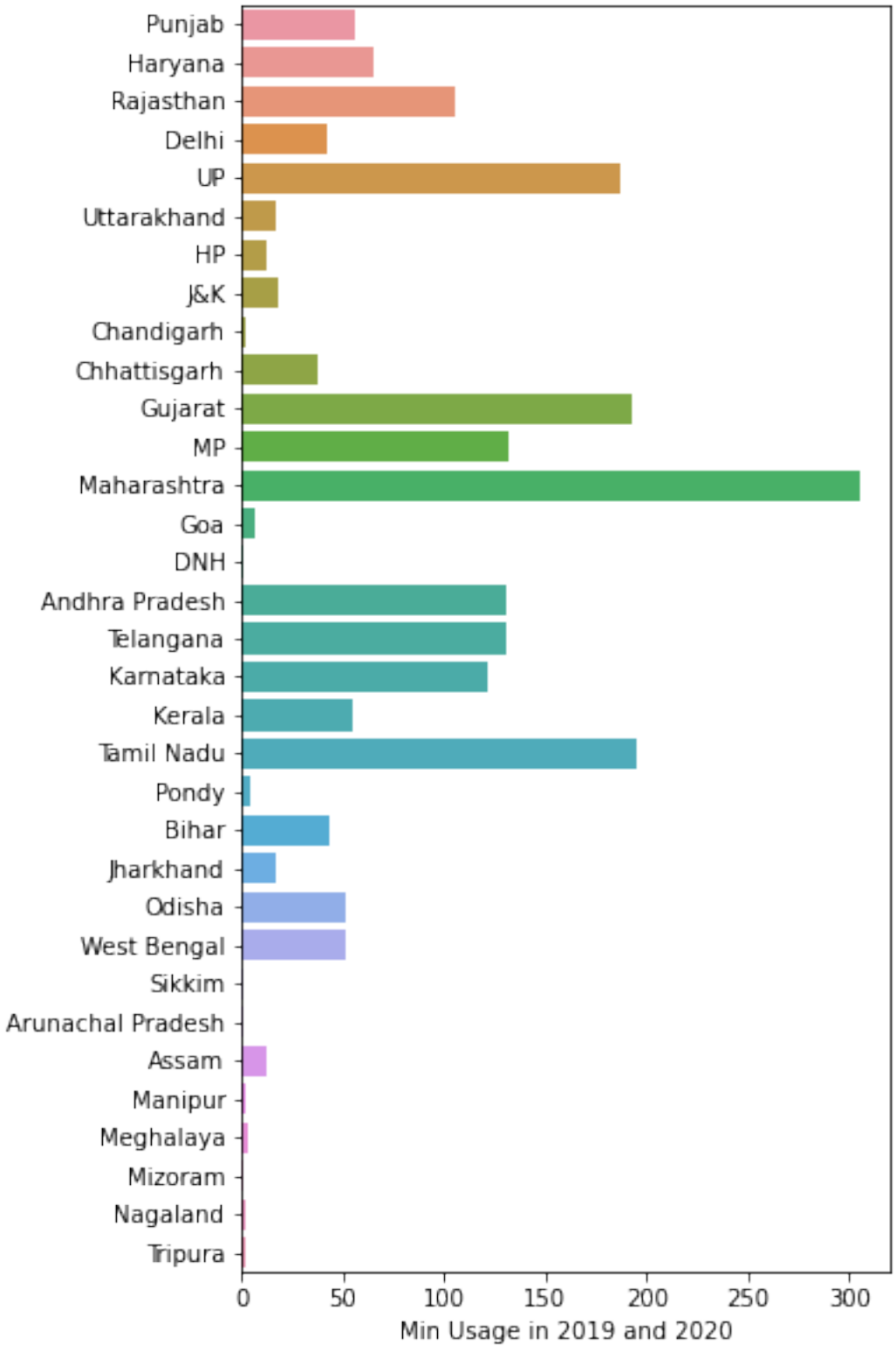
	Min Usage in 2019 and 2020	Date
Punjab	56.1	2019-06-02
Haryana	64.8	2019-06-02
Rajasthan	105.8	2019-05-31
Delhi	41.8	2019-01-30
UP	186.8	2019-12-26
Uttarakhand	16.8	2019-01-30
HP	11.8	2019-11-08
J&K	17.8	2020-04-01
Chandigarh	2.2	2019-01-30
Chhattisgarh	37.2	2019-02-26
Gujarat	192.3	2019-05-31
MP	131.8	2019-05-31
Maharashtra	305.6	2019-02-07
Goa	6.2	2019-05-29
DNH	1.3	2019-02-02
Andhra Pradesh	130.6	2020-03-26
Telangana	130.5	2019-03-18
Karnataka	121.0	2019-02-11
Kerala	55.0	2019-10-25
Tamil Nadu	195.7	2019-06-09
Pondy	4.0	2019-01-30
Bihar	43.5	2019-05-11
Jharkhand	17.4	2019-04-06
Odisha	51.1	2019-01-27
West Bengal	51.5	2019-08-12
Sikkim	0.3	2020-02-03
Arunachal Pradesh	1.1	2019-07-09
Assam	12.2	2020-03-27
Manipur	1.5	2019-09-21

```
Meghalaya                                       3.3  2020-03-26
Mizoram                                         1.2  2020-01-02
Nagaland                                        1.4  2019-07-09
Tripura                                         1.4  2020-05-14
```

VISUALIZATION OF ABOVE

```
plt.figure(figsize=(5, 10))
sns.barplot(x="Min Usage in 2019 and
2020",y=stateWiseMinUsage.index,data=stateWiseMinUsage)
```

```
<AxesSubplot:xlabel='Min Usage in 2019 and 2020'>
```


Punjab
Haryana
Rajasthan
Delhi
UP
Uttarakhand
HP
J&K
Chandigarh
Chhattisgarh
Gujarat
MP
Maharashtra
Goa
DNH
Andhra Pradesh
Telangana
Karnataka
Kerala
Tamil Nadu
Pondy
Bihar
Jharkhand
Odisha
West Bengal
Sikkim
Arunachal Pradesh
Assam
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
0
50
100
150
200
250
300
Min Usage in 2019 and 2020

State wise, which date had the maximum and minimum usage in 2019?

```
dictStateMax2019 = dict()
dictStateDateMax2019 = dict()
for i in (lpower1.States.unique()):
    #creating a df with only unique states
    onlyStates = lpower1[(lpower1.States == i)& (lpower1.year ==
2019)]

    #finding the max of usage from the list
    stateWiseUsageMax = max(onlyStates.Usage)

    #updating the dictornary with the state:max_usage
    dictStateMax2019.update({i:stateWiseUsageMax})

    #get index of the max usage statewise and add them into a lisy
    statesWiseMaxIndex = onlyStates.index[onlyStates.Usage ==
stateWiseUsageMax].tolist()

    #retrieve only the 1st value of the list
    newStatesWiseMaxIndex = statesWiseMaxIndex[0]

    #remove the time from the date_new column
    onlyStatesDFDatesNew = onlyStates.Dates.dt.date

    #store the dates in a dict of the max usage statewise

dictStateDateMax2019.update({i:onlyStatesDFDatesNew[newStatesWiseMaxIn
dex]})
    #print (onlyStatesDFDatesNew[newStatesWiseMaxIndex])

print ("Dictornary",dictStateMax2019)
print ("Dict", dictStateDateMax2019)
```

```
Dictornary {'Punjab': 286.0, 'Haryana': 224.5, 'Rajasthan': 278.0,
'Delhi': 139.1, 'UP': 469.0, 'Uttarakhand': 53.2, 'HP': 34.0, 'J&K':
54.1, 'Chandigarh': 6.8, 'Chhattisgarh': 111.6, 'Gujarat': 398.0,
'MP': 272.3, 'Maharashtra': 522.1, 'Goa': 14.0, 'DNH': 19.4, 'Andhra
Pradesh': 205.1, 'Telangana': 256.2, 'Karnataka': 273.3, 'Kerala':
89.4, 'Tamil Nadu': 365.3, 'Pondy': 9.7, 'Bihar': 117.9, 'Jharkhand':
28.9, 'Odisha': 109.6, 'West Bengal': 198.1, 'Sikkim': 2.8, 'Arunachal
Pradesh': 2.6, 'Assam': 38.0, 'Manipur': 3.2, 'Meghalaya': 6.8,
'Mizoram': 2.2, 'Nagaland': 2.7, 'Tripura': 6.6}
Dict {'Punjab': datetime.date(2019, 4, 19), 'Haryana':
datetime.date(2019, 4, 18), 'Rajasthan': datetime.date(2019, 12, 1),
'Delhi': datetime.date(2019, 12, 1), 'UP': datetime.date(2019, 2, 24),
'Uttarakhand': datetime.date(2019, 12, 4), 'HP': datetime.date(2019,
10, 31), 'J&K': datetime.date(2019, 1, 3), 'Chandigarh':
datetime.date(2019, 4, 18), 'Chhattisgarh': datetime.date(2019, 5,
```

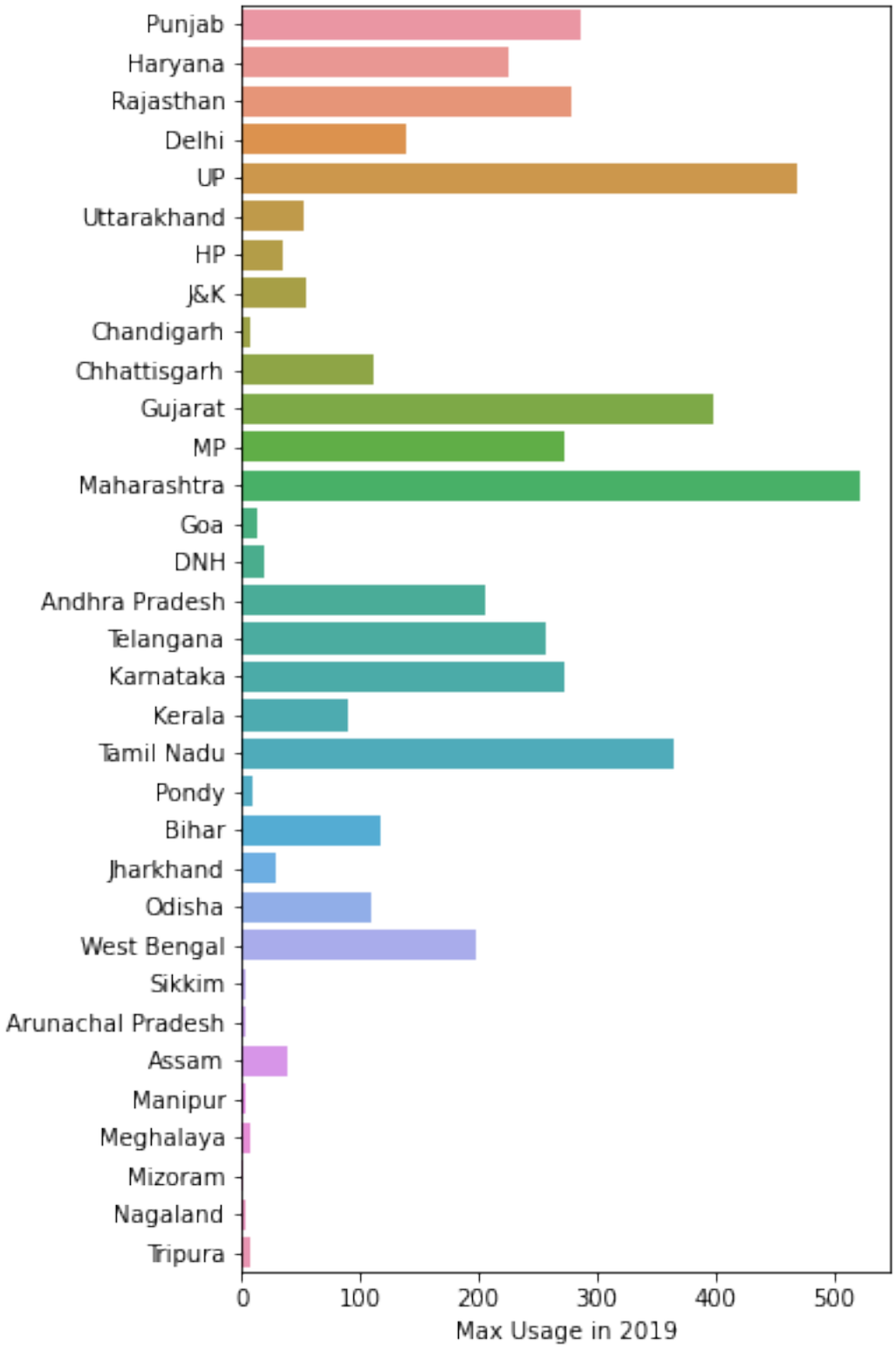
```
13), 'Gujarat': datetime.date(2019, 11, 30), 'MP': datetime.date(2019,
8, 17), 'Maharashtra': datetime.date(2019, 6, 20), 'Goa':
datetime.date(2019, 9, 20), 'DNH': datetime.date(2019, 4, 25), 'Andhra
Pradesh': datetime.date(2019, 9, 6), 'Telangana': datetime.date(2019,
9, 8), 'Karnataka': datetime.date(2019, 3, 30), 'Kerala':
datetime.date(2019, 6, 20), 'Tamil Nadu': datetime.date(2019, 6, 20),
'Pondy': datetime.date(2019, 8, 4), 'Bihar': datetime.date(2019, 3,
14), 'Jharkhand': datetime.date(2019, 10, 15), 'Odisha':
datetime.date(2019, 9, 1), 'West Bengal': datetime.date(2019, 2, 23),
'Sikkim': datetime.date(2019, 6, 29), 'Arunachal Pradesh':
datetime.date(2019, 7, 4), 'Assam': datetime.date(2019, 7, 3),
'Manipur': datetime.date(2019, 10, 21), 'Meghalaya':
datetime.date(2019, 4, 11), 'Mizoram': datetime.date(2019, 7, 13),
'Nagaland': datetime.date(2019, 3, 29), 'Tripura': datetime.date(2019,
4, 16)}

stateWiseMaxUsage2019 = pd.DataFrame.from_dict(dictStateMax2019,
orient="index")
stateWiseMaxUsage2019.rename(columns={0:'Max Usage in
2019'},inplace=True)

stateWiseMaxDate2019 = pd.DataFrame.from_dict(dictStateDateMax2019,
orient="index")
stateWiseMaxDate2019.rename(columns={0:'Date'},inplace=True)

pd.concat([stateWiseMaxUsage2019, stateWiseMaxDate2019], axis = 1)
```

	Max Usage in 2019	Date
Punjab	286.0	2019-04-19
Haryana	224.5	2019-04-18
Rajasthan	278.0	2019-12-01
Delhi	139.1	2019-12-01
UP	469.0	2019-02-24
Uttarakhand	53.2	2019-12-04
HP	34.0	2019-10-31
J&K	54.1	2019-01-03
Chandigarh	6.8	2019-04-18
Chhattisgarh	111.6	2019-05-13
Gujarat	398.0	2019-11-30
MP	272.3	2019-08-17
Maharashtra	522.1	2019-06-20
Goa	14.0	2019-09-20
DNH	19.4	2019-04-25
Andhra Pradesh	205.1	2019-09-06
Telangana	256.2	2019-09-08
Karnataka	273.3	2019-03-30
Kerala	89.4	2019-06-20
Tamil Nadu	365.3	2019-06-20
Pondy	9.7	2019-08-04
Bihar	117.9	2019-03-14

```
Jharkhand                        28.9  2019-10-15
Odisha                          109.6  2019-09-01
West Bengal                     198.1  2019-02-23
Sikkim                            2.8  2019-06-29
Arunachal Pradesh                 2.6  2019-07-04
Assam                            38.0  2019-07-03
Manipur                           3.2  2019-10-21
Meghalaya                         6.8  2019-04-11
Mizoram                           2.2  2019-07-13
Nagaland                          2.7  2019-03-29
Tripura                           6.6  2019-04-16
```

```
plt.figure(figsize=(5, 10))
sns.barplot(x="Max Usage in
2019",y=stateWiseMaxUsage2019.index,data=stateWiseMaxUsage2019)
```

```
<AxesSubplot:xlabel='Max Usage in 2019'>
```


Punjab
Haryana
Rajasthan
Delhi
UP
Uttarakhand
HP
J&K
Chandigarh
Chhattisgarh
Gujarat
MP
Maharashtra
Goa
DNH
Andhra Pradesh
Telangana
Karnataka
Kerala
Tamil Nadu
Pondy
Bihar
Jharkhand
Odisha
West Bengal
Sikkim
Arunachal Pradesh
Assam
Manipur
Meghalaya
Mizoram
Nagaland
Tripura
0
100
200
300
400
500
Max Usage in 2019

State wise, which date had the maximum and minimum usage in 2020?

```
dictStateMax2020 = dict()
dictStateDateMax2020 = dict()
for i in (lpower1.States.unique()):
    #creating a df with only unique states
    onlyStates = lpower1[(lpower1.States == i)& (lpower1.year ==
2020)]

    #finding the max of usage from the list
    stateWiseUsageMax = max(onlyStates.Usage)

    #updating the dictornary with the state:max_usage
    dictStateMax2020.update({i:stateWiseUsageMax})

    #get index of the max usage statewise and add them into a lisy
    statesWiseMaxIndex = onlyStates.index[onlyStates.Usage ==
stateWiseUsageMax].tolist()

    #retrieve only the 1st value of the list
    newStatesWiseMaxIndex = statesWiseMaxIndex[0]

    #remove the time from the date_new column
    onlyStatesDFDatesNew = onlyStates.Dates.dt.date

    #store the dates in a dict of the max usage statewise

dictStateDateMax2020.update({i:onlyStatesDFDatesNew[newStatesWiseMaxIn
dex]})
    #print (onlyStatesDFDatesNew[newStatesWiseMaxIndex])

print ("Dictornary",dictStateMax2020)
print ("Dict", dictStateDateMax2020)
```

```
Dictornary {'Punjab': 300.0, 'Haryana': 237.2, 'Rajasthan': 275.2,
'Delhi': 147.1, 'UP': 471.8, 'Uttarakhand': 48.5, 'HP': 31.8, 'J&K':
54.2, 'Chandigarh': 7.4, 'Chhattisgarh': 103.0, 'Gujarat': 400.8,
'MP': 270.1, 'Maharashtra': 504.1, 'Goa': 13.7, 'DNH': 19.5, 'Andhra
Pradesh': 205.0, 'Telangana': 254.1, 'Karnataka': 259.2, 'Kerala':
88.6, 'Tamil Nadu': 365.4, 'Pondy': 9.5, 'Bihar': 121.4, 'Jharkhand':
28.9, 'Odisha': 113.0, 'West Bengal': 198.5, 'Sikkim': 2.1, 'Arunachal
Pradesh': 2.7, 'Assam': 36.1, 'Manipur': 3.0, 'Meghalaya': 6.9,
'Mizoram': 2.1, 'Nagaland': 2.6, 'Tripura': 5.6}
Dict {'Punjab': datetime.date(2020, 10, 4), 'Haryana':
datetime.date(2020, 10, 4), 'Rajasthan': datetime.date(2020, 4, 30),
'Delhi': datetime.date(2020, 10, 3), 'UP': datetime.date(2020, 4, 28),
'Uttarakhand': datetime.date(2020, 2, 23), 'HP': datetime.date(2020,
10, 4), 'J&K': datetime.date(2020, 2, 21), 'Chandigarh':
datetime.date(2020, 10, 4), 'Chhattisgarh': datetime.date(2020, 12,
```

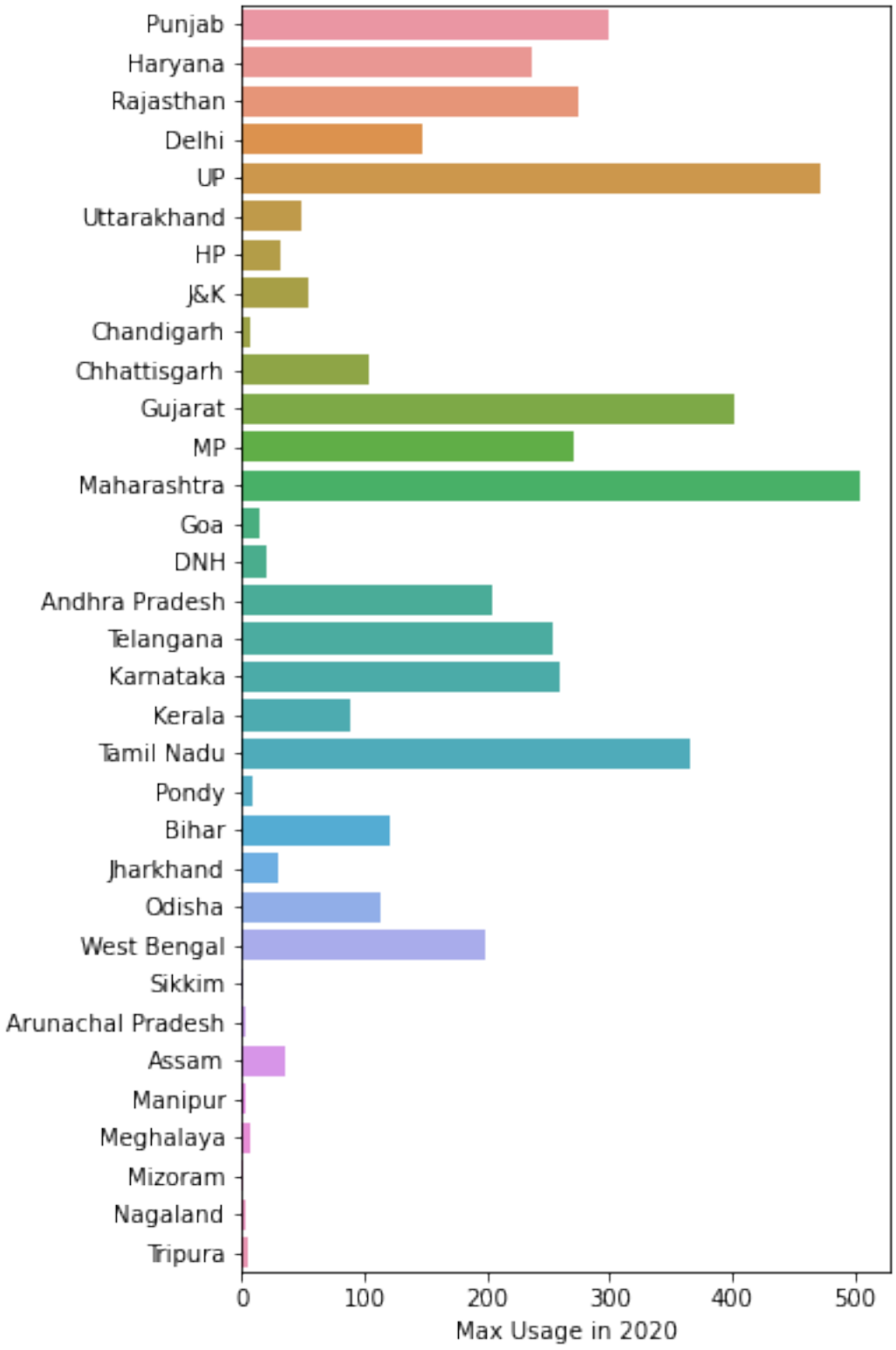
```
3), 'Gujarat': datetime.date(2020, 4, 30), 'MP': datetime.date(2020,
5, 17), 'Maharashtra': datetime.date(2020, 2, 24), 'Goa':
datetime.date(2020, 1, 27), 'DNH': datetime.date(2020, 9, 3), 'Andhra
Pradesh': datetime.date(2020, 2, 27), 'Telangana': datetime.date(2020,
9, 2), 'Karnataka': datetime.date(2020, 1, 16), 'Kerala':
datetime.date(2020, 1, 31), 'Tamil Nadu': datetime.date(2020, 1, 30),
'Pondy': datetime.date(2020, 3, 15), 'Bihar': datetime.date(2020, 7,
3), 'Jharkhand': datetime.date(2020, 2, 29), 'Odisha':
datetime.date(2020, 12, 3), 'West Bengal': datetime.date(2020, 2, 27),
'Sikkim': datetime.date(2020, 3, 2), 'Arunachal Pradesh':
datetime.date(2020, 5, 23), 'Assam': datetime.date(2020, 7, 4),
'Manipur': datetime.date(2020, 2, 21), 'Meghalaya':
datetime.date(2020, 5, 20), 'Mizoram': datetime.date(2020, 4, 3),
'Nagaland': datetime.date(2020, 10, 4), 'Tripura': datetime.date(2020,
3, 15)}

stateWiseMaxUsage2020 = pd.DataFrame.from_dict(dictStateMax2020,
orient="index")
stateWiseMaxUsage2020.rename(columns={0:'Max Usage in
2020'},inplace=True)

stateWiseMaxDate2020 = pd.DataFrame.from_dict(dictStateDateMax2020,
orient="index")
stateWiseMaxDate2020.rename(columns={0:'Date'},inplace=True)

pd.concat([stateWiseMaxUsage2020, stateWiseMaxDate2020], axis = 1)
```

	Max Usage in 2020	Date
Punjab	300.0	2020-10-04
Haryana	237.2	2020-10-04
Rajasthan	275.2	2020-04-30
Delhi	147.1	2020-10-03
UP	471.8	2020-04-28
Uttarakhand	48.5	2020-02-23
HP	31.8	2020-10-04
J&K	54.2	2020-02-21
Chandigarh	7.4	2020-10-04
Chhattisgarh	103.0	2020-12-03
Gujarat	400.8	2020-04-30
MP	270.1	2020-05-17
Maharashtra	504.1	2020-02-24
Goa	13.7	2020-01-27
DNH	19.5	2020-09-03
Andhra Pradesh	205.0	2020-02-27
Telangana	254.1	2020-09-02
Karnataka	259.2	2020-01-16
Kerala	88.6	2020-01-31
Tamil Nadu	365.4	2020-01-30
Pondy	9.5	2020-03-15
Bihar	121.4	2020-07-03

```
Jharkhand                        28.9  2020-02-29
Odisha                          113.0  2020-12-03
West Bengal                     198.5  2020-02-27
Sikkim                            2.1  2020-03-02
Arunachal Pradesh                 2.7  2020-05-23
Assam                            36.1  2020-07-04
Manipur                           3.0  2020-02-21
Meghalaya                         6.9  2020-05-20
Mizoram                           2.1  2020-04-03
Nagaland                          2.6  2020-10-04
Tripura                           5.6  2020-03-15
```

```
plt.figure(figsize=(5, 10))
sns.barplot(x="Max Usage in
2020",y=stateWiseMaxUsage2020.index,data=stateWiseMaxUsage2020)
```

```
<AxesSubplot:xlabel='Max Usage in 2020'>
```



Scatter Plot for some states

`lpowerWithDate`

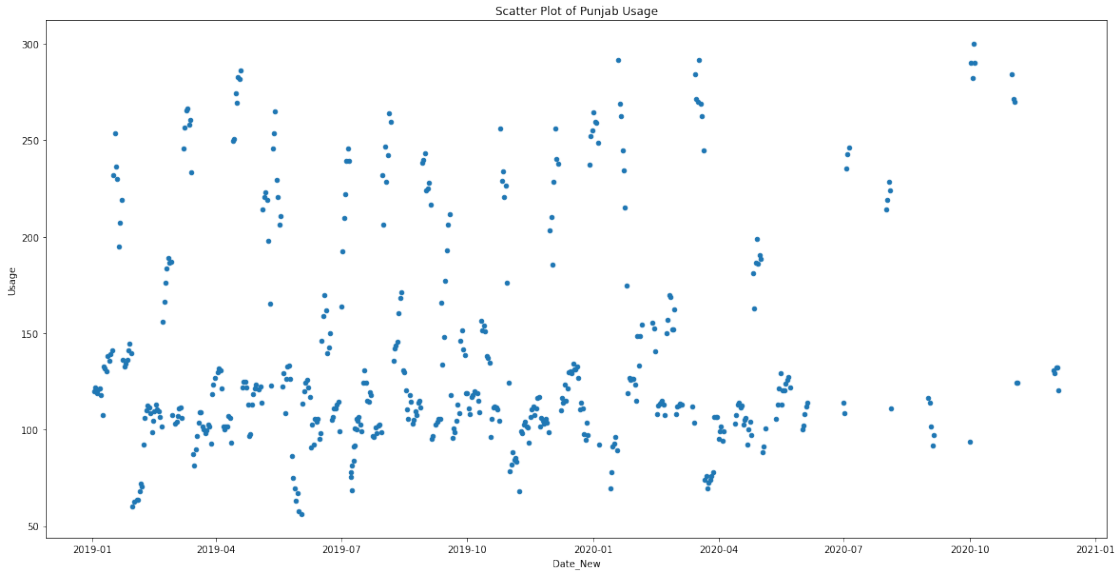
```
          States Regions  Usage   Date_New
0         Punjab      NR  119.9 2019-01-02
1        Haryana      NR  130.3 2019-01-02
2      Rajasthan      NR  234.1 2019-01-02
3          Delhi      NR   85.8 2019-01-02
4             UP      NR  313.9 2019-01-02
...          ...     ...    ...        ...
16594    Manipur     NER    2.5 2020-12-05
16595  Meghalaya     NER    5.8 2020-12-05
16596    Mizoram     NER    1.6 2020-12-05
16597   Nagaland     NER    2.1 2020-12-05
16598    Tripura     NER    3.3 2020-12-05

[16599 rows x 4 columns]
```

```
sdayPunjab = lpowerWithDate[lpowerWithDate['States']=='Punjab']
sdayPunjab
```

```
       States Regions  Usage   Date_New
0      Punjab      NR  119.9 2019-01-02
33     Punjab      NR  121.9 2019-01-03
66     Punjab      NR  118.8 2019-01-04
99     Punjab      NR  121.0 2019-01-05
132    Punjab      NR  121.4 2019-01-06
...       ...     ...    ...        ...
16434  Punjab      NR  130.8 2020-12-01
16467  Punjab      NR  129.4 2020-12-02
16500  Punjab      NR  132.1 2020-12-03
16533  Punjab      NR  132.1 2020-12-04
16566  Punjab      NR  120.4 2020-12-05

[503 rows x 4 columns]
```

```
sdayPunjab.plot.scatter(x='Date_New', y='Usage', figsize=(20,10),
title='Scatter Plot of Punjab Usage')
```

```
<AxesSubplot:title={'center':'Scatter Plot of Punjab Usage'},
xlabel='Date_New', ylabel='Usage'>
```



Total Usage in Each State for both 2019 and 2020

```
dictTotal = dict()
for i in lpower.States.unique():
    newDf = lpower[(lpower.States == i)]
    sumUsage = newDf.Usage.sum()
    dictTotal.update({i:sumUsage})
dictTotal
```

```
{'Punjab': 70996.2,
 'Haryana': 69581.8,
 'Rajasthan': 109877.0,
 'Delhi': 41940.5,
 'UP': 157960.3,
 'Uttarakhand': 18187.0,
 'HP': 13363.8,
 'J&K': 22264.8,
 'Chandigarh': 2083.2,
 'Chhattisgarh': 42190.2,
 'Gujarat': 162488.90000000002,
 'MP': 104766.40000000001,
 'Maharashtra': 217079.8,
 'Goa': 5579.900000000001,
 'DNH': 8264.6,
 'Andhra Pradesh': 88604.4,
 'Telangana': 94065.3,
 'Karnataka': 102665.70000000001,
 'Kerala': 36312.8,
 'Tamil Nadu': 151271.5,
 'Pondy': 3758.9,
 'Bihar': 41829.2,
 'Jharkhand': 11992.8,
```

```
 'Odisha': 40473.7,
 'West Bengal': 69770.20000000001,
 'Sikkim': 648.5999999999999,
 'Arunachal Pradesh': 1060.9,
 'Assam': 12554.9,
 'Manipur': 1254.8000000000002,
 'Meghalaya': 2838.8,
 'Mizoram': 858.3,
 'Nagaland': 1087.7,
 'Tripura': 2055.0}
```

```
stateWiseUsageDF = pd.DataFrame.from_dict(dictTotal, orient="index")
stateWiseUsageDF.rename(columns={0:'Total Usage in 2019 and
2020'},inplace=True)
stateWiseUsageDF
```

	Total Usage in 2019 and 2020
Punjab	70996.2
Haryana	69581.8
Rajasthan	109877.0
Delhi	41940.5
UP	157960.3
Uttarakhand	18187.0
HP	13363.8
J&K	22264.8
Chandigarh	2083.2
Chhattisgarh	42190.2
Gujarat	162488.9
MP	104766.4
Maharashtra	217079.8
Goa	5579.9
DNH	8264.6
Andhra Pradesh	88604.4
Telangana	94065.3
Karnataka	102665.7
Kerala	36312.8
Tamil Nadu	151271.5
Pondy	3758.9
Bihar	41829.2
Jharkhand	11992.8
Odisha	40473.7
West Bengal	69770.2
Sikkim	648.6
Arunachal Pradesh	1060.9
Assam	12554.9
Manipur	1254.8
Meghalaya	2838.8
Mizoram	858.3
Nagaland	1087.7
Tripura	2055.0

Training and Prediction of Punjabs Data

```
onlyPunjabData = lpower[lpower['States']=='Punjab']

predictPunjabUsage = onlyPunjabData.copy()
target = predictPunjabUsage.Usage
predictPunjabUsage.drop(["States","Regions",
"Usage"],axis=1,inplace=True)
predictPunjabUsage = predictPunjabUsage[["day", "month", "year"]]
predictPunjabUsage
```

```
       day  month  year
0        2      1  2019
33       3      1  2019
66       4      1  2019
99       5      1  2019
132      6      1  2019
...    ...    ...   ...
16434    1     12  2020
16467    2     12  2020
16500    3     12  2020
16533    4     12  2020
16566    5     12  2020

[503 rows x 3 columns]
```

```
target

0        119.9
33       121.9
66       118.8
99       121.0
132      121.4
         ...
16434    130.8
16467    129.4
16500    132.1
16533    132.1
16566    120.4
Name: Usage, Length: 503, dtype: float64
```

```
from sklearn.ensemble import RandomForestRegressor

my_model = RandomForestRegressor(n_estimators=100, criterion='mae',
random_state=0)
```

Importing raw data

```
rawData =
pd.read_csv('../input/raw-data-state-for-usage/raw_data.csv')
rawData
```

	day	month	year
0	1	1	2021
1	2	1	2021
2	3	1	2021
3	4	1	2021
4	5	1	2021
5	6	1	2021
6	7	1	2021
7	8	1	2021
8	9	1	2021
9	10	1	2021
10	11	1	2021
11	12	1	2021
12	13	1	2021
13	14	1	2021
14	15	1	2021
15	16	1	2021
16	17	1	2021
17	18	1	2021
18	19	1	2021
19	20	1	2021
20	21	1	2021
21	22	1	2021
22	23	1	2021
23	24	1	2021
24	25	1	2021
25	26	1	2021
26	27	1	2021
27	28	1	2021
28	29	1	2021
29	30	1	2021
30	31	1	2021
31	1	2	2021
32	2	2	2021
33	3	2	2021
34	4	2	2021
35	5	2	2021
36	6	2	2021
37	7	2	2021
38	8	2	2021
39	9	2	2021
40	10	2	2021
41	11	2	2021
42	12	2	2021
43	13	2	2021
44	14	2	2021
45	15	2	2021
46	16	2	2021
47	17	2	2021
48	18	2	2021

```
49   19      2  2021
50   20      2  2021
51   21      2  2021
52   22      2  2021
53   23      2  2021
54   24      2  2021
55   25      2  2021
56   26      2  2021
57   27      2  2021
58   28      2  2021
```

```
my_model.fit(predictPunjabUsage, target)
```

```
predictPunjabData = my_model.predict(rawData)
predictedPunjabValueDF = pd.DataFrame(predictPunjabData)
predictedPunjabValueDF.rename(columns={0:'Predicted
Ouputs'},inplace=True)
```

```
PredictedDataFrame = pd.concat([rawData, predictedPunjabValueDF],
axis=1)
PredictedDataFrame
```

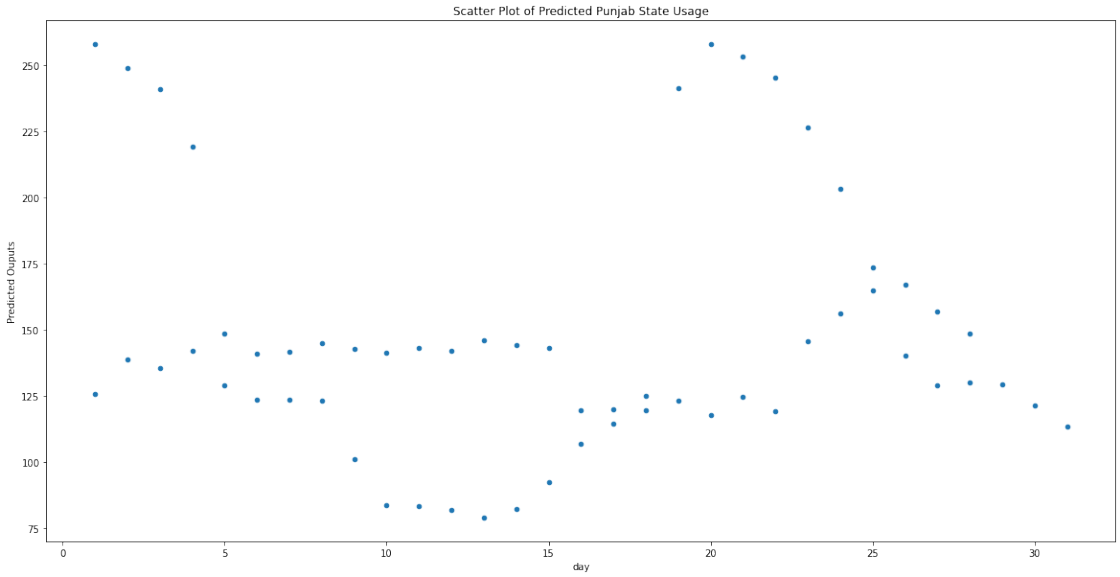
```
    day  month  year  Predicted Ouputs
0     1      1  2021          257.8535
1     2      1  2021          248.9815
2     3      1  2021          241.0405
3     4      1  2021          219.2575
4     5      1  2021          128.8305
5     6      1  2021          123.6105
6     7      1  2021          123.5975
7     8      1  2021          123.2945
8     9      1  2021          100.9535
9    10      1  2021           83.5275
10   11      1  2021           83.4725
11   12      1  2021           81.8715
12   13      1  2021           78.9405
13   14      1  2021           82.3665
14   15      1  2021           92.4995
15   16      1  2021          107.0305
16   17      1  2021          114.4245
17   18      1  2021          124.9575
18   19      1  2021          241.3255
19   20      1  2021          258.0085
20   21      1  2021          253.2385
21   22      1  2021          245.1125
22   23      1  2021          226.5895
23   24      1  2021          203.1335
24   25      1  2021          173.6305
25   26      1  2021          140.2665
26   27      1  2021          129.1405
```

```
27   28      1  2021          129.9315
28   29      1  2021          129.2255
29   30      1  2021          121.3705
30   31      1  2021          113.5045
31    1      2  2021          125.7435
32    2      2  2021          138.6805
33    3      2  2021          135.6665
34    4      2  2021          142.1250
35    5      2  2021          148.3990
36    6      2  2021          140.9555
37    7      2  2021          141.6485
38    8      2  2021          144.8285
39    9      2  2021          142.6255
40   10      2  2021          141.1685
41   11      2  2021          143.2805
42   12      2  2021          141.9205
43   13      2  2021          146.0725
44   14      2  2021          144.0655
45   15      2  2021          143.1135
46   16      2  2021          119.5635
47   17      2  2021          119.7725
48   18      2  2021          119.5095
49   19      2  2021          123.1545
50   20      2  2021          117.6845
51   21      2  2021          124.6145
52   22      2  2021          119.1370
53   23      2  2021          145.4955
54   24      2  2021          156.2875
55   25      2  2021          164.9505
56   26      2  2021          166.8995
57   27      2  2021          156.9015
58   28      2  2021          148.4255
```

Scatter Plot of Predicted Usage Values of Punjab Satte

```
PredictedDataFrame.plot.scatter(x='day', y='Predicted Ouputs',
figsize=(20,10), title='Scatter Plot of Predicted Punjab State Usage')
```

```
<AxesSubplot:title={'center':'Scatter Plot of Predicted Punjab State
Usage'}, xlabel='day', ylabel='Predicted Ouputs'>
```



Plot usage on India Map

Total usage (2019 and 2020 included) on India Map

```
import pandas as pd
import geopandas as gpd
import matplotlib.pyplot as plt
```

```
/opt/conda/lib/python3.7/site-packages/geopandas/_compat.py:115:
UserWarning: The Shapely GEOS version (3.9.1-CAPI-1.14.2) is
incompatible with the GEOS version PyGEOS was compiled with (3.10.1-
CAPI-1.16.0). Conversions between both will be slow.
  shapely_geos_version, geos_capi_version_string
```

```
lpower.head()
```

```
      States Regions  Usage  year  month  day
0     Punjab      NR  119.9  2019      1    2
1    Haryana      NR  130.3  2019      1    2
2  Rajasthan      NR  234.1  2019      1    2
3      Delhi      NR   85.8  2019      1    2
4         UP      NR  313.9  2019      1    2
```

```
dictUsage=dict()
for i in lpower.States.unique():
    stateUsageDF = lpower[(lpower['States']==i)]
    stateUsage = stateUsageDF["Usage"].sum()
    dictUsage.update({i:stateUsage})
dictUsage
```

```
{'Punjab': 70996.2,
 'Haryana': 69581.8,
```

```
 'Rajasthan': 109877.0,
 'Delhi': 41940.5,
 'UP': 157960.3,
 'Uttarakhand': 18187.0,
 'HP': 13363.8,
 'J&K': 22264.8,
 'Chandigarh': 2083.2,
 'Chhattisgarh': 42190.2,
 'Gujarat': 162488.90000000002,
 'MP': 104766.40000000001,
 'Maharashtra': 217079.8,
 'Goa': 5579.900000000001,
 'DNH': 8264.6,
 'Andhra Pradesh': 88604.4,
 'Telangana': 94065.3,
 'Karnataka': 102665.70000000001,
 'Kerala': 36312.8,
 'Tamil Nadu': 151271.5,
 'Pondy': 3758.9,
 'Bihar': 41829.2,
 'Jharkhand': 11992.8,
 'Odisha': 40473.7,
 'West Bengal': 69770.20000000001,
 'Sikkim': 648.5999999999999,
 'Arunachal Pradesh': 1060.9,
 'Assam': 12554.9,
 'Manipur': 1254.8000000000002,
 'Meghalaya': 2838.8,
 'Mizoram': 858.3,
 'Nagaland': 1087.7,
 'Tripura': 2055.0}

stateUsageDF = pd.DataFrame.from_dict(dictUsage, orient="index")
stateUsageDF.reset_index(level=0, inplace=True)
stateUsageDF.rename(columns={'index': 'States', 0:'Total Usage in 2019
and 2020'},inplace=True)
stateUsageDF['States'] =
stateUsageDF['States'].replace(['UP','HP','J&K','MP','DNH','Delhi'],
['Uttar Pradesh','Himachal Pradesh','Jammu & Kashmir','Madhya
Pradesh','Dadara & Nagar Havelli','NCT of Delhi'])
stateUsageDF
```

	States	Total Usage in 2019 and 2020
0	Punjab	70996.2
1	Haryana	69581.8
2	Rajasthan	109877.0
3	NCT of Delhi	41940.5
4	Uttar Pradesh	157960.3
5	Uttarakhand	18187.0
6	Himachal Pradesh	13363.8
7	Jammu & Kashmir	22264.8

```
8              Chandigarh                          2083.2
9            Chhattisgarh                         42190.2
10                Gujarat                        162488.9
11         Madhya Pradesh                        104766.4
12            Maharashtra                        217079.8
13                    Goa                          5579.9
14  Dadara & Nagar Havelli                         8264.6
15         Andhra Pradesh                        88604.4
16              Telangana                        94065.3
17              Karnataka                       102665.7
18                 Kerala                        36312.8
19             Tamil Nadu                       151271.5
20                  Pondy                         3758.9
21                  Bihar                        41829.2
22               Jharkhand                       11992.8
23                 Odisha                        40473.7
24            West Bengal                        69770.2
25                 Sikkim                          648.6
26       Arunachal Pradesh                        1060.9
27                   Assam                       12554.9
28                 Manipur                        1254.8
29               Meghalaya                        2838.8
30                 Mizoram                         858.3
31                Nagaland                        1087.7
32                 Tripura                        2055.0
```

```
shp_gdf = gpd.read_file('../input/indian-gis-data/India
States/Indian_states.shp')
shp_gdf
```

```
                      st_nm  \
0   Andaman & Nicobar Island
1         Arunanchal Pradesh
2                      Assam
3                      Bihar
4                 Chandigarh
5               Chhattisgarh
6     Dadara & Nagar Havelli
7                 Daman & Diu
8                        Goa
9                    Gujarat
10                   Haryana
11         Himachal Pradesh
12          Jammu & Kashmir
13                Jharkhand
14                Karnataka
15                   Kerala
16              Lakshadweep
17           Madhya Pradesh
18              Maharashtra
19                  Manipur
```

20	Meghalaya
21	Mizoram
22	Nagaland
23	NCT of Delhi
24	Puducherry
25	Punjab
26	Rajasthan
27	Sikkim
28	Tamil Nadu
29	Telangana
30	Tripura
31	Uttar Pradesh
32	Uttarakhand
33	West Bengal
34	Odisha
35	Andhra Pradesh

	geometry
0	MULTIPOLYGON (((93.71976 7.20707, 93.71909 7.2...
1	POLYGON ((96.16261 29.38078, 96.16860 29.37432...
2	MULTIPOLYGON (((89.74323 26.30362, 89.74290 26...
3	MULTIPOLYGON (((84.50720 24.26323, 84.50355 24...
4	POLYGON ((76.84147 30.75996, 76.83599 30.73623...
5	POLYGON ((83.33532 24.09885, 83.35346 24.09627...
6	POLYGON ((73.20657 20.12216, 73.20797 20.10650...
7	MULTIPOLYGON (((72.89335 20.44539, 72.89281 20...
8	MULTIPOLYGON (((74.11918 14.75344, 74.11350 14...
9	MULTIPOLYGON (((71.70375 20.99958, 71.70375 20...
10	POLYGON ((76.85065 30.87512, 76.86594 30.86691...
11	POLYGON ((76.79634 33.25490, 76.80351 33.25275...
12	POLYGON ((74.73451 37.02068, 74.73647 37.01937...
13	POLYGON ((87.60582 25.31512, 87.61279 25.31184...
14	MULTIPOLYGON (((74.69694 13.32782, 74.69562 13...
15	POLYGON ((74.99575 12.79227, 75.00006 12.78777...
16	MULTIPOLYGON (((74.10131 11.20431, 74.09908 11...
17	MULTIPOLYGON (((74.17932 22.39059, 74.17776 22...
18	MULTIPOLYGON (((73.46270 16.03710, 73.46178 16...
19	POLYGON ((94.57602 25.64221, 94.57487 25.63858...
20	POLYGON ((91.85632 26.10353, 91.86717 26.09906...
21	POLYGON ((92.80022 24.41630, 92.80310 24.41603...
22	POLYGON ((95.21458 26.93095, 95.21719 26.92818...
23	POLYGON ((77.09361 28.86940, 77.10973 28.86722...
24	MULTIPOLYGON (((79.76528 10.99681, 79.76963 10...
25	POLYGON ((75.88469 32.48841, 75.90303 32.47169...
26	POLYGON ((73.89849 29.97896, 73.90021 29.97140...
27	POLYGON ((88.65381 28.09883, 88.66265 28.08956...
28	MULTIPOLYGON (((78.19188 8.72730, 78.18996 8.7...
29	POLYGON ((81.05614 17.79097, 81.05834 17.75464...
30	POLYGON ((92.22108 24.50131, 92.22771 24.49862...
31	MULTIPOLYGON (((80.44802 24.99631, 80.44080 24...

```
32  POLYGON ((79.21047 31.34846, 79.21386 31.34680...
33  MULTIPOLYGON (((88.01861 21.57278, 88.01889 21...
34  MULTIPOLYGON (((86.38937 19.96351, 86.38840 19...
35  MULTIPOLYGON (((81.10380 17.82269, 81.10610 17...
```

```
merged =
shp_gdf.set_index('st_nm').join(stateUsageDF.set_index('States'))
merged.dropna()
```

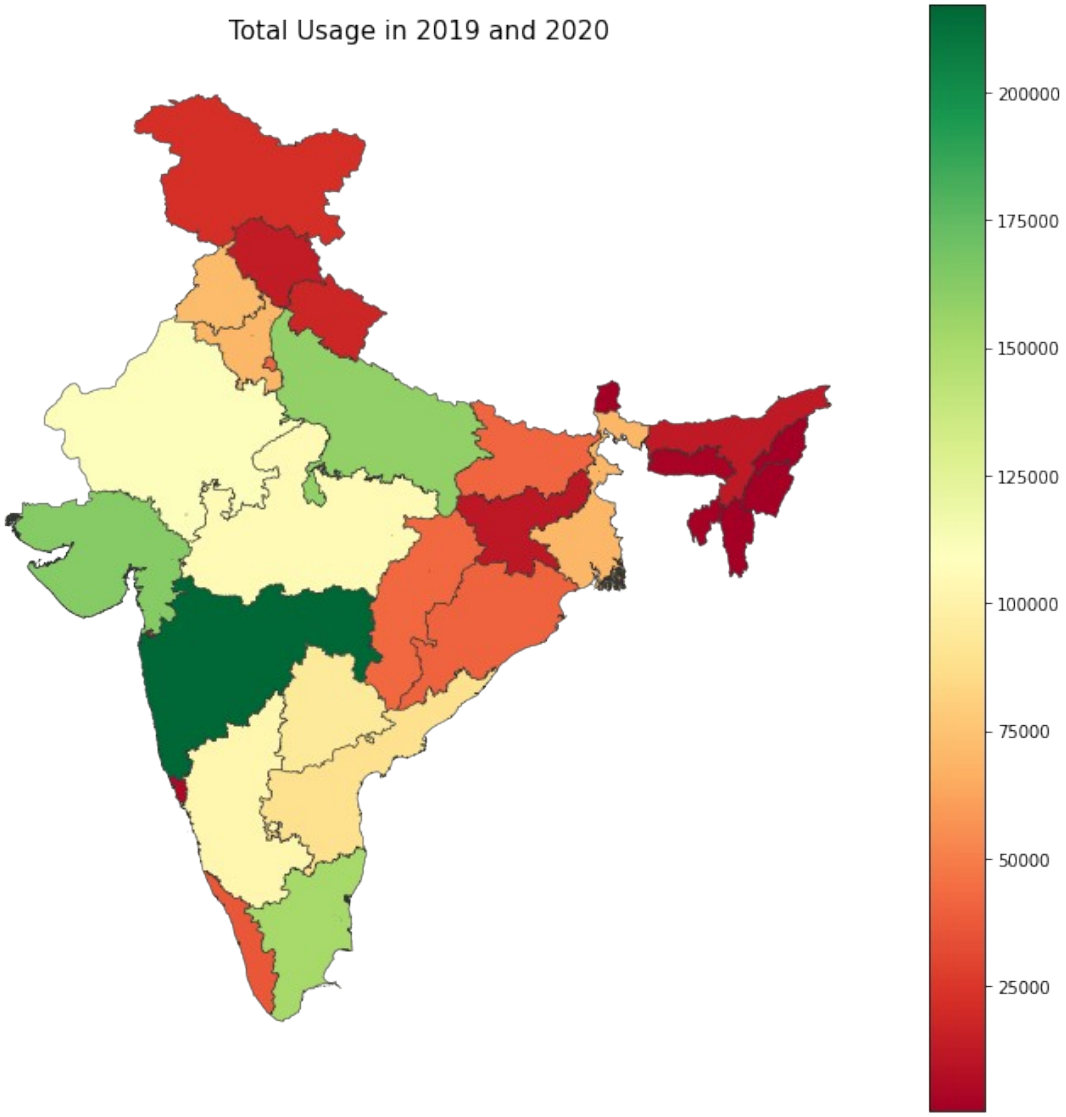
```
                                                 geometry  \
st_nm

Assam                  MULTIPOLYGON (((89.74323 26.30362, 89.74290
26...
Bihar                  MULTIPOLYGON (((84.50720 24.26323, 84.50355
24...
Chandigarh             POLYGON ((76.84147 30.75996, 76.83599
30.73623...
Chhattisgarh           POLYGON ((83.33532 24.09885, 83.35346
24.09627...
Dadara & Nagar Havelli  POLYGON ((73.20657 20.12216, 73.20797
20.10650...
Goa                    MULTIPOLYGON (((74.11918 14.75344, 74.11350
14...
Gujarat                MULTIPOLYGON (((71.70375 20.99958, 71.70375
20...
Haryana                POLYGON ((76.85065 30.87512, 76.86594
30.86691...
Himachal Pradesh       POLYGON ((76.79634 33.25490, 76.80351
33.25275...
Jammu & Kashmir        POLYGON ((74.73451 37.02068, 74.73647
37.01937...
Jharkhand              POLYGON ((87.60582 25.31512, 87.61279
25.31184...
Karnataka              MULTIPOLYGON (((74.69694 13.32782, 74.69562
13...
Kerala                 POLYGON ((74.99575 12.79227, 75.00006
12.78777...
Madhya Pradesh         MULTIPOLYGON (((74.17932 22.39059, 74.17776
22...
Maharashtra            MULTIPOLYGON (((73.46270 16.03710, 73.46178
16...
Manipur                POLYGON ((94.57602 25.64221, 94.57487
25.63858...
Meghalaya              POLYGON ((91.85632 26.10353, 91.86717
26.09906...
Mizoram                POLYGON ((92.80022 24.41630, 92.80310
24.41603...
Nagaland               POLYGON ((95.21458 26.93095, 95.21719
```

26.92818...	
NCT of Delhi	POLYGON ((77.09361 28.86940, 77.10973 28.86722...
Punjab	POLYGON ((75.88469 32.48841, 75.90303 32.47169...
Rajasthan	POLYGON ((73.89849 29.97896, 73.90021 29.97140...
Sikkim	POLYGON ((88.65381 28.09883, 88.66265 28.08956...
Tamil Nadu	MULTIPOLYGON (((78.19188 8.72730, 78.18996 8.7...
Telangana	POLYGON ((81.05614 17.79097, 81.05834 17.75464...
Tripura	POLYGON ((92.22108 24.50131, 92.22771 24.49862...
Uttar Pradesh	MULTIPOLYGON (((80.44802 24.99631, 80.44080 24...
Uttarakhand	POLYGON ((79.21047 31.34846, 79.21386 31.34680...
West Bengal	MULTIPOLYGON (((88.01861 21.57278, 88.01889 21...
Odisha	MULTIPOLYGON (((86.38937 19.96351, 86.38840 19...
Andhra Pradesh	MULTIPOLYGON (((81.10380 17.82269, 81.10610 17...

st_nm	Total Usage in 2019 and 2020
Assam	12554.9
Bihar	41829.2
Chandigarh	2083.2
Chhattisgarh	42190.2
Dadara & Nagar Havelli	8264.6
Goa	5579.9
Gujarat	162488.9
Haryana	69581.8
Himachal Pradesh	13363.8
Jammu & Kashmir	22264.8
Jharkhand	11992.8
Karnataka	102665.7
Kerala	36312.8
Madhya Pradesh	104766.4
Maharashtra	217079.8
Manipur	1254.8
Meghalaya	2838.8
Mizoram	858.3
Nagaland	1087.7
NCT of Delhi	41940.5
Punjab	70996.2
Rajasthan	109877.0

```
Sikkim                                          648.6
Tamil Nadu                                   151271.5
Telangana                                     94065.3
Tripura                                        2055.0
Uttar Pradesh                                157960.3
Uttarakhand                                   18187.0
West Bengal                                   69770.2
Odisha                                        40473.7
Andhra Pradesh                                88604.4
```

```
fig, ax = plt.subplots(1, figsize=(12, 12))
ax.axis('off')
ax.set_title('Total Usage in 2019 and 2020',
             fontdict={'fontsize': '15', 'fontweight' : '3'})
fig = merged.plot(column='Total Usage in 2019 and 2020',
cmap='RdYlGn', linewidth=0.5, ax=ax, edgecolor='0.2',legend=True)
```



Bubble Plot

```
lpowerLonLat = pd.read_csv("/kaggle/input/state-wise-power-consumption-in-india/long_data_.csv")
print(lpowerLonLat.dtypes)
```

```
States        object
Regions       object
latitude     float64
longitude    float64
Dates         object
Usage        float64
dtype: object
```

```
lpowerLonLat["LongLat"] = lpowerLonLat["latitude"].astype(str) +" "+ lpowerLonLat["longitude"].astype(str)
lpowerLonLat.drop(["Regions","Dates", "States", "latitude", "longitude"],axis=1,inplace=True)
lpowerLonLat
```

```
       Usage                  LongLat
0      119.9  31.51997398 75.98000281
1      130.3  28.45000633 77.01999101
2      234.1  26.44999921 74.63998124
3       85.8   28.6699929 77.23000403
4      313.9  27.59998069 78.05000565
...      ...                      ...
16594    2.5  24.79997072 93.95001705
16595    5.8   25.57049217 91.8800142
16596    1.6  23.71039899 92.72001461
16597    2.1   25.6669979 94.11657019
16598    3.3  23.83540428 91.27999914

[16599 rows x 2 columns]
```

```
dictLonLat = dict()
for i in lpowerLonLat.LongLat.unique():
    newDf = lpowerLonLat[(lpowerLonLat.LongLat == i)]
    sumUsage = newDf.Usage.sum()
    dictLonLat.update({i:sumUsage})
dictLonLat
```

```
{'31.51997398 75.98000281': 70996.2,
 '28.45000633 77.01999101': 69581.8,
 '26.44999921 74.63998124': 109877.0,
 '28.6699929 77.23000403': 41940.5,
 '27.59998069 78.05000565': 157960.3,
 '30.32040895 78.05000565': 18187.0,
 '31.10002545 77.16659704': 13363.8,
 '33.45 76.24': 22264.8,
 '30.71999697 76.78000565': 2083.2,
 '22.09042035 82.15998734': 42190.2,
```

```
 '22.2587 71.1924': 162488.90000000002,
 '21.30039105 76.13001949': 104766.40000000001,
 '19.25023195 73.16017493': 217079.8,
 '15.491997 73.81800065': 5579.900000000001,
 '20.26657819 73.0166178': 8264.6,
 '14.7504291 78.57002559': 88604.4,
 '18.1124 79.0193': 94065.3,
 '12.57038129 76.91999711': 102665.70000000001,
 '8.900372741 76.56999263': 36312.8,
 '12.92038576 79.15004187': 151271.5,
 '11.93499371 79.83000037': 3758.9,
 '25.78541445 87.4799727': 41829.2,
 '23.80039349 86.41998572': 11992.8,
 '19.82042971 85.90001746': 40473.7,
 '22.58039044 88.32994665': 69770.20000000001,
 '27.3333303 88.6166475': 648.5999999999999,
 '27.10039878 93.61660071': 1060.9,
 '26.7499809 94.21666744': 12554.9,
 '24.79997072 93.95001705': 1254.8000000000002,
 '25.57049217 91.8800142': 2838.8,
 '23.71039899 92.72001461': 858.3,
 '25.6669979 94.11657019': 1087.7,
 '23.83540428 91.27999914': 2055.0}
```

```
longlatUsageDF = pd.DataFrame.from_dict(dictLonLat, orient="index")
longlatUsageDF.reset_index(level=0, inplace=True)
longlatUsageDF.rename(columns={'index': 'LongLat', 0:'Total Usage in
2019 and 2020'},inplace=True)
longlatUsageDF
```

	LongLat	Total Usage in 2019 and 2020
0	31.51997398 75.98000281	70996.2
1	28.45000633 77.01999101	69581.8
2	26.44999921 74.63998124	109877.0
3	28.6699929 77.23000403	41940.5
4	27.59998069 78.05000565	157960.3
5	30.32040895 78.05000565	18187.0
6	31.10002545 77.16659704	13363.8
7	33.45 76.24	22264.8
8	30.71999697 76.78000565	2083.2
9	22.09042035 82.15998734	42190.2
10	22.2587 71.1924	162488.9
11	21.30039105 76.13001949	104766.4
12	19.25023195 73.16017493	217079.8
13	15.491997 73.81800065	5579.9
14	20.26657819 73.0166178	8264.6
15	14.7504291 78.57002559	88604.4
16	18.1124 79.0193	94065.3
17	12.57038129 76.91999711	102665.7
18	8.900372741 76.56999263	36312.8
19	12.92038576 79.15004187	151271.5

```
20  11.93499371 79.83000037                        3758.9
21   25.78541445 87.4799727                       41829.2
22  23.80039349 86.41998572                       11992.8
23  19.82042971 85.90001746                       40473.7
24  22.58039044 88.32994665                       69770.2
25    27.3333303 88.6166475                         648.6
26  27.10039878 93.61660071                        1060.9
27   26.7499809 94.21666744                       12554.9
28  24.79997072 93.95001705                        1254.8
29   25.57049217 91.8800142                        2838.8
30  23.71039899 92.72001461                         858.3
31   25.6669979 94.11657019                        1087.7
32  23.83540428 91.27999914                        2055.0
```

```
new = longlatUsageDF["LongLat"].str.split(" ", n = 1, expand = True)
longlatUsageDF["latitude"]= new[0]
longlatUsageDF["longitude"]= new[1]
longlatUsageDF.drop(["LongLat"],axis=1,inplace=True)
longlatUsageDF
```

```
    Total Usage in 2019 and 2020     latitude    longitude
0                         70996.2  31.51997398  75.98000281
1                         69581.8  28.45000633  77.01999101
2                        109877.0  26.44999921  74.63998124
3                         41940.5   28.6699929  77.23000403
4                        157960.3  27.59998069  78.05000565
5                         18187.0  30.32040895  78.05000565
6                         13363.8  31.10002545  77.16659704
7                         22264.8        33.45        76.24
8                          2083.2  30.71999697  76.78000565
9                         42190.2  22.09042035  82.15998734
10                       162488.9      22.2587      71.1924
11                       104766.4  21.30039105  76.13001949
12                       217079.8  19.25023195  73.16017493
13                         5579.9    15.491997  73.81800065
14                         8264.6  20.26657819   73.0166178
15                        88604.4   14.7504291  78.57002559
16                        94065.3      18.1124      79.0193
17                       102665.7  12.57038129  76.91999711
18                        36312.8  8.900372741  76.56999263
19                       151271.5  12.92038576  79.15004187
20                         3758.9  11.93499371  79.83000037
21                        41829.2  25.78541445   87.4799727
22                        11992.8  23.80039349  86.41998572
23                        40473.7  19.82042971  85.90001746
24                        69770.2  22.58039044  88.32994665
25                          648.6   27.3333303   88.6166475
26                         1060.9  27.10039878  93.61660071
27                        12554.9   26.7499809  94.21666744
28                         1254.8  24.79997072  93.95001705
29                         2838.8  25.57049217   91.8800142
```

```
30                         858.3  23.71039899  92.72001461
31                        1087.7   25.6669979  94.11657019
32                        2055.0  23.83540428  91.27999914
```

```
longlatUsageDF["longitude"] =
longlatUsageDF["longitude"].astype(str).astype(float)
longlatUsageDF["latitude"] =
longlatUsageDF["latitude"].astype(str).astype(float)
longlatUsageDF
```

```
    Total Usage in 2019 and 2020   latitude  longitude
0                         70996.2  31.519974  75.980003
1                         69581.8  28.450006  77.019991
2                        109877.0  26.449999  74.639981
3                         41940.5  28.669993  77.230004
4                        157960.3  27.599981  78.050006
5                         18187.0  30.320409  78.050006
6                         13363.8  31.100025  77.166597
7                         22264.8  33.450000  76.240000
8                          2083.2  30.719997  76.780006
9                         42190.2  22.090420  82.159987
10                       162488.9  22.258700  71.192400
11                       104766.4  21.300391  76.130019
12                       217079.8  19.250232  73.160175
13                         5579.9  15.491997  73.818001
14                         8264.6  20.266578  73.016618
15                        88604.4  14.750429  78.570026
16                        94065.3  18.112400  79.019300
17                       102665.7  12.570381  76.919997
18                        36312.8   8.900373  76.569993
19                       151271.5  12.920386  79.150042
20                         3758.9  11.934994  79.830000
21                        41829.2  25.785414  87.479973
22                        11992.8  23.800393  86.419986
23                        40473.7  19.820430  85.900017
24                        69770.2  22.580390  88.329947
25                          648.6  27.333330  88.616647
26                         1060.9  27.100399  93.616601
27                        12554.9  26.749981  94.216667
28                         1254.8  24.799971  93.950017
29                         2838.8  25.570492  91.880014
30                          858.3  23.710399  92.720015
31                         1087.7  25.666998  94.116570
32                         2055.0  23.835404  91.279999
```

```
# import libraries
import geopandas as gpd
from shapely.geometry import Point, Polygon
import matplotlib.pyplot as plt

# import street map
```

```
street_map = gpd.read_file('../input/indian-gis-data/India
States/Indian_states.shp')
street_map
```

```
                        st_nm  \
0   Andaman & Nicobar Island
1         Arunanchal Pradesh
2                      Assam
3                      Bihar
4                 Chandigarh
5               Chhattisgarh
6     Dadara & Nagar Havelli
7                 Daman & Diu
8                         Goa
9                     Gujarat
10                    Haryana
11           Himachal Pradesh
12            Jammu & Kashmir
13                  Jharkhand
14                  Karnataka
15                     Kerala
16                Lakshadweep
17             Madhya Pradesh
18                Maharashtra
19                    Manipur
20                  Meghalaya
21                    Mizoram
22                   Nagaland
23               NCT of Delhi
24                 Puducherry
25                     Punjab
26                  Rajasthan
27                     Sikkim
28                 Tamil Nadu
29                  Telangana
30                    Tripura
31              Uttar Pradesh
32                Uttarakhand
33                West Bengal
34                     Odisha
35              Andhra Pradesh

                                                 geometry
0   MULTIPOLYGON (((93.71976 7.20707, 93.71909 7.2...
1   POLYGON ((96.16261 29.38078, 96.16860 29.37432...
2   MULTIPOLYGON (((89.74323 26.30362, 89.74290 26...
3   MULTIPOLYGON (((84.50720 24.26323, 84.50355 24...
4   POLYGON ((76.84147 30.75996, 76.83599 30.73623...
5   POLYGON ((83.33532 24.09885, 83.35346 24.09627...
6   POLYGON ((73.20657 20.12216, 73.20797 20.10650...
```

```
7   MULTIPOLYGON (((72.89335 20.44539, 72.89281 20...
8   MULTIPOLYGON (((74.11918 14.75344, 74.11350 14...
9   MULTIPOLYGON (((71.70375 20.99958, 71.70375 20...
10  POLYGON ((76.85065 30.87512, 76.86594 30.86691...
11  POLYGON ((76.79634 33.25490, 76.80351 33.25275...
12  POLYGON ((74.73451 37.02068, 74.73647 37.01937...
13  POLYGON ((87.60582 25.31512, 87.61279 25.31184...
14  MULTIPOLYGON (((74.69694 13.32782, 74.69562 13...
15  POLYGON ((74.99575 12.79227, 75.00006 12.78777...
16  MULTIPOLYGON (((74.10131 11.20431, 74.09908 11...
17  MULTIPOLYGON (((74.17932 22.39059, 74.17776 22...
18  MULTIPOLYGON (((73.46270 16.03710, 73.46178 16...
19  POLYGON ((94.57602 25.64221, 94.57487 25.63858...
20  POLYGON ((91.85632 26.10353, 91.86717 26.09906...
21  POLYGON ((92.80022 24.41630, 92.80310 24.41603...
22  POLYGON ((95.21458 26.93095, 95.21719 26.92818...
23  POLYGON ((77.09361 28.86940, 77.10973 28.86722...
24  MULTIPOLYGON (((79.76528 10.99681, 79.76963 10...
25  POLYGON ((75.88469 32.48841, 75.90303 32.47169...
26  POLYGON ((73.89849 29.97896, 73.90021 29.97140...
27  POLYGON ((88.65381 28.09883, 88.66265 28.08956...
28  MULTIPOLYGON (((78.19188 8.72730, 78.18996 8.7...
29  POLYGON ((81.05614 17.79097, 81.05834 17.75464...
30  POLYGON ((92.22108 24.50131, 92.22771 24.49862...
31  MULTIPOLYGON (((80.44802 24.99631, 80.44080 24...
32  POLYGON ((79.21047 31.34846, 79.21386 31.34680...
33  MULTIPOLYGON (((88.01861 21.57278, 88.01889 21...
34  MULTIPOLYGON (((86.38937 19.96351, 86.38840 19...
35  MULTIPOLYGON (((81.10380 17.82269, 81.10610 17...
```

```
# designate coordinate system
crs = {'init':'epsg:4326'}
# zip x and y coordinates into single feature
geometry = [Point(xy) for xy in zip(longlatUsageDF['longitude'],
longlatUsageDF['latitude'])]
# create GeoPandas dataframe
geo_df = gpd.GeoDataFrame(longlatUsageDF,
 crs = crs,
 geometry = geometry)
geo_df
```

```
/opt/conda/lib/python3.7/site-packages/pyproj/crs/crs.py:68:
FutureWarning: '+init=<authority>:<code>' syntax is deprecated.
'<authority>:<code>' is the preferred initialization method. When
making the change, be mindful of axis order changes:
https://pyproj4.github.io/pyproj/stable/gotchas.html#axis-order-
changes-in-proj-6
  return _prepare_from_string(" ".join(pjargs))
```

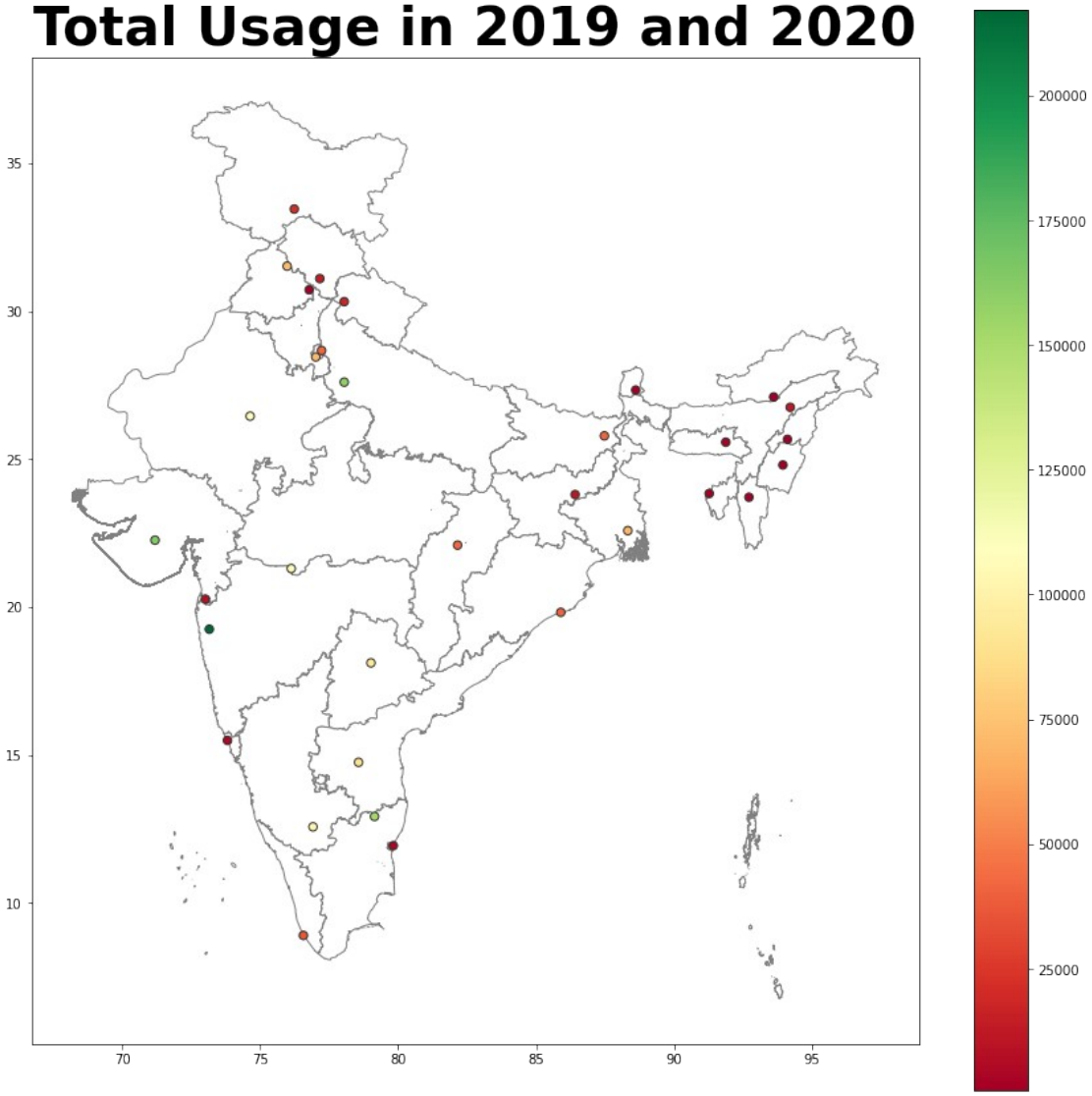
```
    Total Usage in 2019 and 2020   latitude  longitude  \
0                        70996.2  31.519974  75.980003
```

1	69581.8	28.450006	77.019991
2	109877.0	26.449999	74.639981
3	41940.5	28.669993	77.230004
4	157960.3	27.599981	78.050006
5	18187.0	30.320409	78.050006
6	13363.8	31.100025	77.166597
7	22264.8	33.450000	76.240000
8	2083.2	30.719997	76.780006
9	42190.2	22.090420	82.159987
10	162488.9	22.258700	71.192400
11	104766.4	21.300391	76.130019
12	217079.8	19.250232	73.160175
13	5579.9	15.491997	73.818001
14	8264.6	20.266578	73.016618
15	88604.4	14.750429	78.570026
16	94065.3	18.112400	79.019300
17	102665.7	12.570381	76.919997
18	36312.8	8.900373	76.569993
19	151271.5	12.920386	79.150042
20	3758.9	11.934994	79.830000
21	41829.2	25.785414	87.479973
22	11992.8	23.800393	86.419986
23	40473.7	19.820430	85.900017
24	69770.2	22.580390	88.329947
25	648.6	27.333330	88.616647
26	1060.9	27.100399	93.616601
27	12554.9	26.749981	94.216667
28	1254.8	24.799971	93.950017
29	2838.8	25.570492	91.880014
30	858.3	23.710399	92.720015
31	1087.7	25.666998	94.116570
32	2055.0	23.835404	91.279999

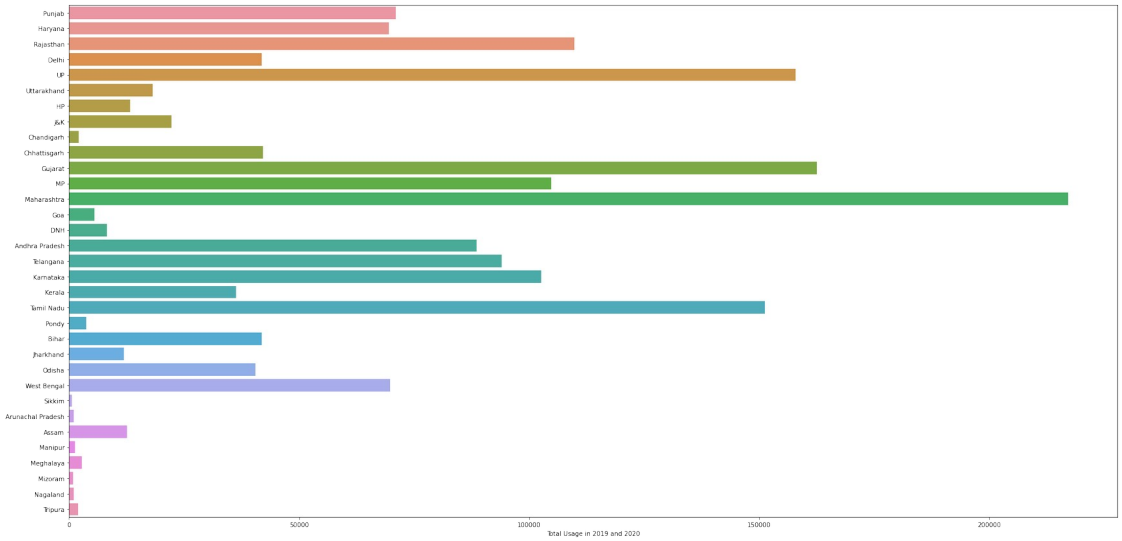
	geometry
0	POINT (75.98000 31.51997)
1	POINT (77.01999 28.45001)
2	POINT (74.63998 26.45000)
3	POINT (77.23000 28.66999)
4	POINT (78.05001 27.59998)
5	POINT (78.05001 30.32041)
6	POINT (77.16660 31.10003)
7	POINT (76.24000 33.45000)
8	POINT (76.78001 30.72000)
9	POINT (82.15999 22.09042)
10	POINT (71.19240 22.25870)
11	POINT (76.13002 21.30039)
12	POINT (73.16017 19.25023)
13	POINT (73.81800 15.49200)
14	POINT (73.01662 20.26658)
15	POINT (78.57003 14.75043)

```
16  POINT (79.01930 18.11240)
17  POINT (76.92000 12.57038)
18   POINT (76.56999 8.90037)
19  POINT (79.15004 12.92039)
20  POINT (79.83000 11.93499)
21  POINT (87.47997 25.78541)
22  POINT (86.41999 23.80039)
23  POINT (85.90002 19.82043)
24  POINT (88.32995 22.58039)
25  POINT (88.61665 27.33333)
26  POINT (93.61660 27.10040)
27  POINT (94.21667 26.74998)
28  POINT (93.95002 24.79997)
29  POINT (91.88001 25.57049)
30  POINT (92.72001 23.71040)
31  POINT (94.11657 25.66700)
32  POINT (91.28000 23.83540)
```

```
# create figure and axes, assign to subplot
fig, ax = plt.subplots(figsize=(15,15))
# add .shp mapfile to axes
street_map.plot(ax=ax, alpha=1, color="white", edgecolor='0.5')
# add geodataframe to axes
# assign ‘price’ variable to represent coordinates on graph
# add legend
# make datapoints transparent using alpha
# assign size of points using markersize
geo_df.plot(column='Total Usage in 2019 and 2020',ax=ax,
legend=True,markersize=40, cmap='RdYlGn', linewidth=1,
edgecolor='0.2')
# add title to graph
plt.title('Total Usage in 2019 and 2020',
fontsize=40,fontweight='bold')
# set latitiude and longitude boundaries for map display
# show map
plt.show()
```




```
plt.figure(figsize=(30, 15))
sns.barplot(x="Total Usage in 2019 and
2020",y=stateWiseUsageDF.index,data=stateWiseUsageDF)
plt.show()
sns.set(font_scale=1.4)
```




```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from datetime import datetime

data = pd.read_csv('dataset_tk.csv')

data.head(2)
```

```
      Unnamed: 0  Punjab  Haryana  Rajasthan  Delhi     UP
Uttarakhand    HP  \
0  02-01-19 0:00   119.9    130.3      234.1   85.8  313.9
40.7  30.0
1  03-01-19 0:00   121.9    133.5      240.2   85.5  311.8
39.3  30.1

    J&K  Chandigarh  ...  Odisha  West Bengal  Sikkim  Arunachal
Pradesh  \
0  52.5         5.0  ...    70.2        108.2     2.0
2.1
1  54.1         4.9  ...    67.9        110.2     1.9
2.2

   Assam  Manipur  Meghalaya  Mizoram  Nagaland  Tripura
0   21.7      2.7        6.1      1.9       2.2      3.4
1   23.4      2.4        6.5      1.8       2.2      3.6

[2 rows x 34 columns]
```

```
data.rename(columns={"Unnamed: 0":"Date"},inplace=True)
```

```
# to convert string Date time into Python Date time object.
data['Date']=pd.to_datetime(data["Date"],dayfirst=True)
data["year"]=data["Date"].dt.year
data["month"]=data["Date"].dt.month
data["day"]=data["Date"].dt.day
data.drop(["Date"],axis=1,inplace=True)
data.head(2)
```

```
   Punjab  Haryana  Rajasthan  Delhi     UP  Uttarakhand    HP
J&K  \
0   119.9    130.3      234.1   85.8  313.9         40.7  30.0  52.5

1   121.9    133.5      240.2   85.5  311.8         39.3  30.1  54.1


   Chandigarh  Chhattisgarh  ...  Arunachal Pradesh  Assam  Manipur  \
0         5.0          78.7  ...                2.1   21.7      2.7
1         4.9          78.8  ...                2.2   23.4      2.4

   Meghalaya  Mizoram  Nagaland  Tripura  year  month  day
0        6.1      1.9       2.2      3.4  2019      1    2
1        6.5      1.8       2.2      3.6  2019      1    3

[2 rows x 36 columns]
```

```
data.columns
```

```
Index(['Punjab', 'Haryana', 'Rajasthan', 'Delhi', 'UP', 'Uttarakhand',
'HP',
       'J&K', 'Chandigarh', 'Chhattisgarh', 'Gujarat', 'MP',
'Maharashtra',
       'Goa', 'DNH', 'Andhra Pradesh', 'Telangana', 'Karnataka',
'Kerala',
       'Tamil Nadu', 'Pondy', 'Bihar', 'Jharkhand', 'Odisha', 'West
Bengal',
       'Sikkim', 'Arunachal Pradesh', 'Assam', 'Manipur', 'Meghalaya',
       'Mizoram', 'Nagaland', 'Tripura', 'year', 'month', 'day'],
      dtype='object')
```

```
long_data=pd.read_csv("long_data_.csv")
long_data['Dates']=pd.to_datetime(long_data["Dates"],dayfirst=True)
long_data["year"]=long_data["Dates"].dt.year
long_data["month"]=long_data["Dates"].dt.month
long_data["day"]=long_data["Dates"].dt.day
long_data.drop(["latitude","longitude","Dates"],axis=1,inplace=True)
```

```
long_data.head()
```

```
      States Regions  Usage  year  month  day
0     Punjab      NR  119.9  2019      1    2
1    Haryana      NR  130.3  2019      1    2
```

```
2  Rajasthan      NR  234.1  2019      1    2
3      Delhi      NR   85.8  2019      1    2
4         UP      NR  313.9  2019      1    2
```

```
long_data.head()
```

```
      States Regions  Usage  year  month  day
0     Punjab      NR  119.9  2019      1    2
1    Haryana      NR  130.3  2019      1    2
2  Rajasthan      NR  234.1  2019      1    2
3      Delhi      NR   85.8  2019      1    2
4         UP      NR  313.9  2019      1    2
```

```
# creating empty dictionary to update the totalusage region wise in it
in the form of key value pair
d1 = dict()
for i in (long_data['Regions'].unique()):
    a=long_data[(long_data["Regions"]==i)&(long_data["year"]==2020)]#
grouping the scattered data of 2020 region wise
    b = a.Usage.sum()
    d1.update({i:b})
print("Regionwise data of 2020")
print(d1)


d2=dict()
for i in (long_data['Regions'].unique()):
    a=long_data[(long_data["Regions"]==i)&(long_data["year"]==2019)]#
grouping the scattered data of 2019 region wise
    b = a.Usage.sum()
    d2.update({i:b})
print("Regionwise data of 2019")
print(d2)
```

```
Regionwise data of 2020
{'NR': 147559.8, 'WR': 155089.3, 'SR': 137883.39999999997, 'ER':
46799.4, 'NER': 6190.7}
Regionwise data of 2019
{'NR': 358694.8, 'WR': 385280.5, 'SR': 338795.20000000007, 'ER':
117915.1, 'NER': 15519.7}
```

Regionwise Max and Min consumption in 2020

```
print(f" Maximum power consumed in 2020 is--> {d1[max(d1)]} by
{max(d1)} region\n Minmum power consumed in 2020 is--> {d1[min(d1)]}
by {min(d1)} region  ")
```

```
 Maximum power consumed in 2020 is--> 155089.3 by WR region
 Minmum power consumed in 2020 is--> 46799.4 by ER region
```

Western region comprises of

1. Maharashtra is the financial capital of India and is second most industralised state.

2. During fiscal year 2020, the electricity demand in the Indian state of Chhattisgarh increased by approximately 11 percent

```
# Analysis: In terms of regional demand, while there has been an
improvement in electricity consumption in the northern, western
#and eastern regions in September'20 from a month ago, the southern
and north-eastern regions witnessed a decline. The
#western region, which is home to the most industrialised states of
the country registered a 13% monthly increase in power
#consumption, affirming to the higher activity here. The northern and
eastern regions saw electricity consumption increase
#by 8% and 4% respectively from that in August'20. The lower power
consumption in the southern states (2.4% lower than
#in August'20) indicates that industrial activity here has been
lacklustre despite the easing of the lockdown and restrictions.
```

Visualizing the consumption pattern

```
# creating the table out of dict1 and dict2
tab1=pd.DataFrame.from_dict(d1,orient="index")
tab2=pd.DataFrame.from_dict(d2,orient="index")

tab1.head()
```

```
            0
NR   147559.8
WR   155089.3
SR   137883.4
ER    46799.4
NER    6190.7
```

```
tab2.head()
```

```
            0
NR   358694.8
WR   385280.5
SR   338795.2
ER   117915.1
NER   15519.7
```

```
# Renaming the columns of table1

tab1.rename(columns={0:"Consumption(2020)"},inplace=True)

tab1.head()
```

```
     Consumption(2020)
NR            147559.8
WR            155089.3
SR            137883.4
```

```
ER             46799.4
NER             6190.7
```

```
tab2.rename(columns={0:"Consumption(2019)"},inplace=True)
tab2.head()
```

```
     Consumption(2019)
NR            358694.8
WR            385280.5
SR            338795.2
ER            117915.1
NER            15519.7
```

```
plt.figure(figsize=(10, 5))
```

```
<Figure size 720x360 with 0 Axes>
```

```
<Figure size 720x360 with 0 Axes>
```

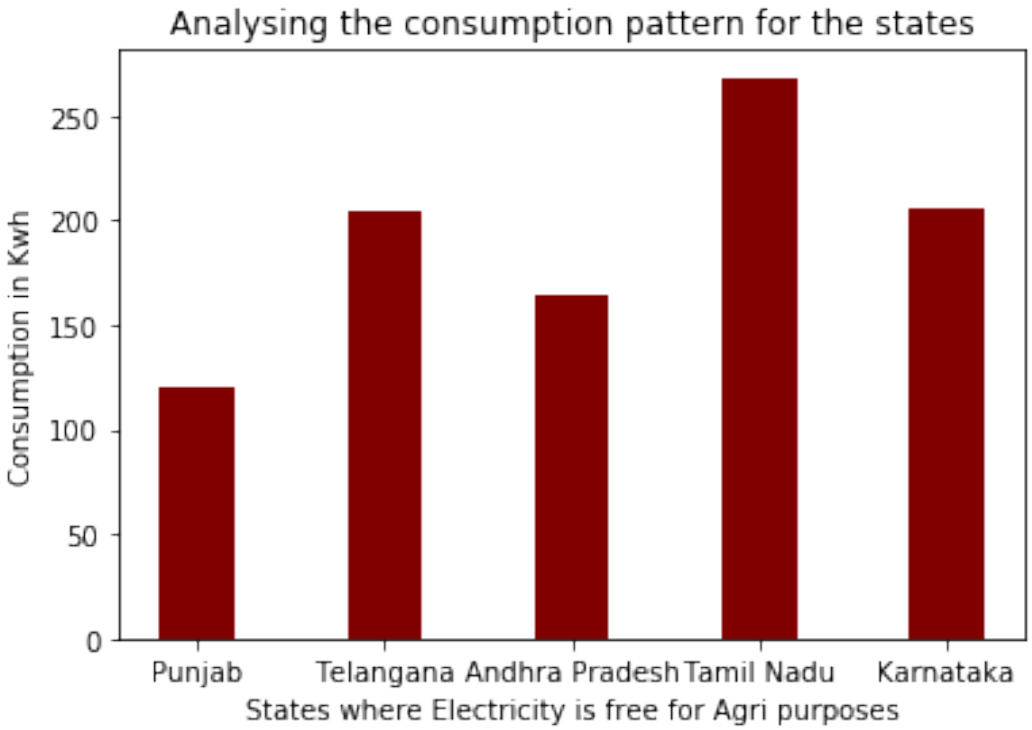
```
usagein2020=dict()

for i in (long_data.States.unique()):
    a=long_data[(long_data["States"]==i)&(long_data["year"]==2020)]
    b=a.Usage.sum()
    usagein2020.update({i:b})
# print(usage2020)
# print("***************2019****************")
usagein2019=dict()
for i in (long_data.States.unique()):
    a=long_data[(long_data["States"]==i)&(long_data["year"]==2019)]
    b=a.Usage.sum()
    usagein2019.update({i:b})

Punjabusagein2019=dict()
l1=['Punjab','Telangana','Andhra Pradesh','Tamil Nadu','Karnataka']
for i in l1:
    d1=long_data[(long_data.States==i)&(long_data.year==2019)]
    totalusage=d1.Usage.sum()
    Punjabusagein2019.update({i:totalusage})
print(Punjabusagein2019)
```

```
{'Punjab': 119.9, 'Telangana': 204.2, 'Andhra Pradesh': 164.6, 'Tamil
Nadu': 268.3, 'Karnataka': 206.3}
```

```
Punjabusagein2019
```

```
{'Punjab': 119.9,
 'Telangana': 204.2,
 'Andhra Pradesh': 164.6,
 'Tamil Nadu': 268.3,
 'Karnataka': 206.3}
```

```
keys = Punjabusagein2019.keys()
values = Punjabusagein2019.values()
plt.bar(keys, values,color ='maroon',width = 0.4)
plt.xlabel("States where Electricity is free for Agri purposes")
plt.ylabel("Consumption in Kwh")
plt.title("Analysing the consumption pattern for the states")
plt.show()
```



Analysis: Though the electricity is free for Agricultural purposes in the above 5 states, the Southern states outperform the only Northern state i.e. Punjab in terms of electricity consumption.

```
tab3=pd.DataFrame.from_dict(usagein2020,orient="index")
tab4=pd.DataFrame.from_dict(usagein2019,orient="index")

tab3.rename(columns={0:'Total usage in 2020'},inplace=True)
tab4.rename(columns={0:'Total usage in 2019'},inplace=True)

tab3.sort_values(by=['Total usage in
2020'],ascending=False,inplace=True)
tab4.sort_values(by=['Total usage in
2019'],ascending=False,inplace=True)

print('Top 10 states that consume maximum power in 2020')
tab3.head(10)
```

```
Top 10 states that consume maximum power in 2020
```

	Total usage in 2020
Punjab	0.0
Sikkim	0.0
Tamil Nadu	0.0
Pondy	0.0
Bihar	0.0
Jharkhand	0.0
Odisha	0.0
West Bengal	0.0
Arunachal Pradesh	0.0
Haryana	0.0

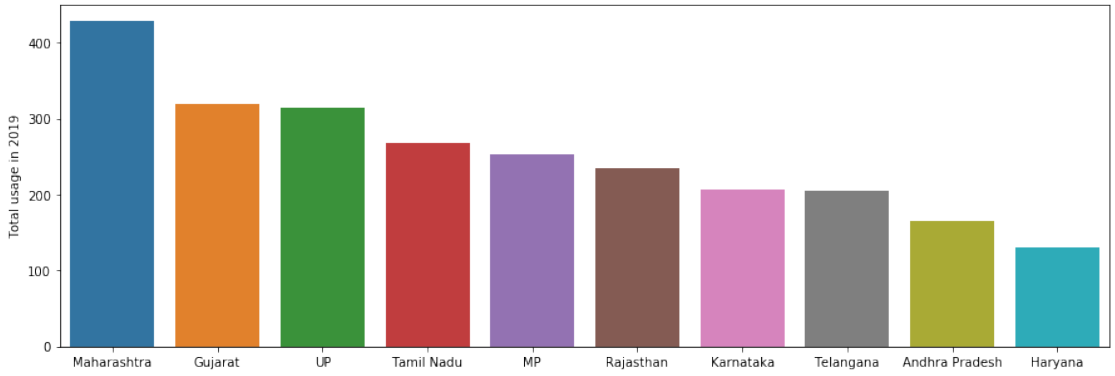
```
print('Top 10 states that consume maximum power in 2019')
tab4.head(10)
```

```
Top 10 states that consume maximum power in 2019
```

	Total usage in 2019
Maharashtra	428.6
Gujarat	319.5
UP	313.9
Tamil Nadu	268.3
MP	253.0
Rajasthan	234.1
Karnataka	206.3
Telangana	204.2
Andhra Pradesh	164.6
Haryana	130.3

```
tab5=tab4.head(10)
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2019",x=tab5.index,data=tab5)
print("Top 10 states that consumed maximum power in 2019")
```

```
Top 10 states that consumed maximum power in 2019
```



Let's Understand the Consumption pattern

4. Finding the states which consume least power yearly

```
print('Top 10 states that consumed least power in 2020')
tab7=tab3.tail(10)
tab7
```

```
Top 10 states that consumed least power in 2020
```

	Total usage in 2020
Gujarat	0.0
Chhattisgarh	0.0
Chandigarh	0.0
J&K	0.0
HP	0.0
Uttarakhand	0.0
UP	0.0
Delhi	0.0
Rajasthan	0.0
NaN	0.0

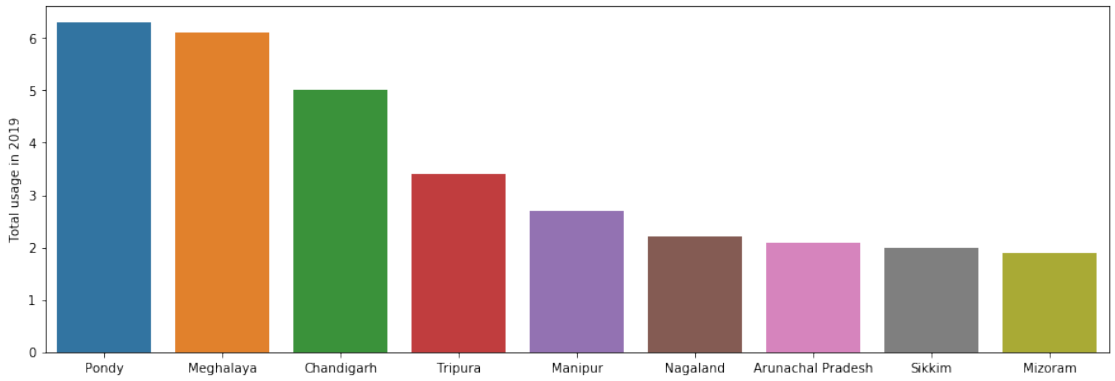
```
print('Top 10 states that consumed least power in 2020')
tab8=tab4.tail(10)
tab8
```

```
Top 10 states that consumed least power in 2020
```

	Total usage in 2019
Pondy	6.3
Meghalaya	6.1
Chandigarh	5.0
Tripura	3.4
Manipur	2.7
Nagaland	2.2
Arunachal Pradesh	2.1
Sikkim	2.0
Mizoram	1.9
NaN	0.0

```
plt.figure(figsize=(15, 5))
sns.barplot(y="Total usage in 2019",x=tab8.index,data=tab8)
print("Top 10 states that consume least power in 2019")
```

```
Top 10 states that consume least power in 2019
```



Understanding how COVID-19 has impacted the consumption pattern in 2019 and 2020

```
# Monthwise total consumption in 2019, storing it in dictionary
dict2019
dict2019=dict()
for i in range(1,13):
    k=long_data[(long_data["month"]==i)&(long_data["year"]==2019)]
    n=k["Usage"].sum()
    dict2019.update({i:n})
print(dict2019)
```

```
{1: 101305.6, 2: 87276.4, 3: 99833.6, 4: 103150.79999999999, 5:
101728.0, 6: 96775.59999999999, 7: 118600.3, 8: 105273.9, 9:
102346.70000000001, 10: 102442.6, 11: 93288.9, 12: 104182.9}
```

```
# Monthwise total consumption in 2020, storing it in dictionary
dict2020
dict2020=dict()
for i in range(1,13):
    k=long_data[(long_data["month"]==i)&(long_data["year"]==2020)]
    n=k["Usage"].sum()
    dict2020.update({i:n})
print(dict2020)
```

```
{1: 85319.2, 2: 76385.4, 3: 77012.1, 4: 78242.3, 5: 53559.3, 6:
15661.199999999997, 7: 17130.7, 8: 18134.4, 9: 17178.4, 10:
18536.600000000002, 11: 18082.0, 12: 18281.0}
```

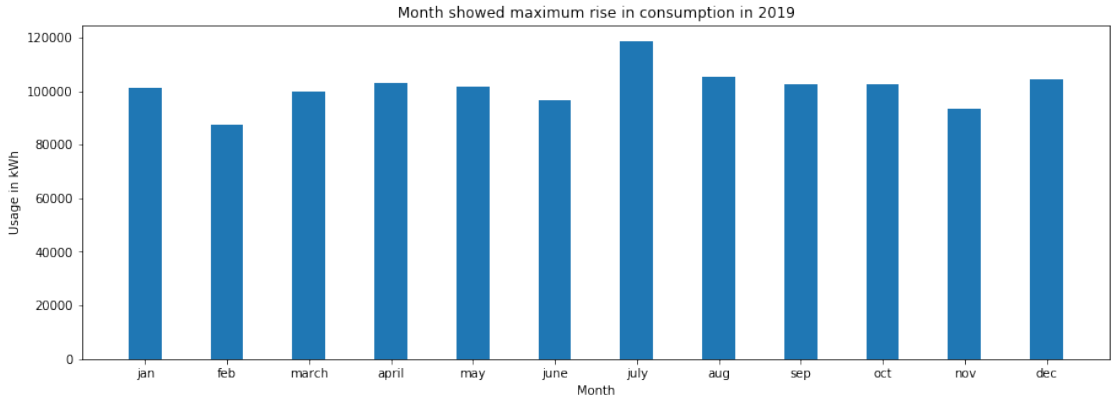
```
# List 1 ----> For 2019 consumption data
# List2 -----> For 2020 consumption data

list1 = list(dict2019.values())
list2 = list(dict2020.values())

month=["jan","feb",'march',"april","may","june","july","aug","sep","oc
t","nov","dec"]

A=max(list1)
B=list1.index(A)
C=month[B]
```

```
x=max(list2)
y=list2.index(x)
z=month[y]

print(f"maximum rise in consumption is in month of {C} 2019")
print(f"maximum rise in consumption is in month of {z} 2020")
```

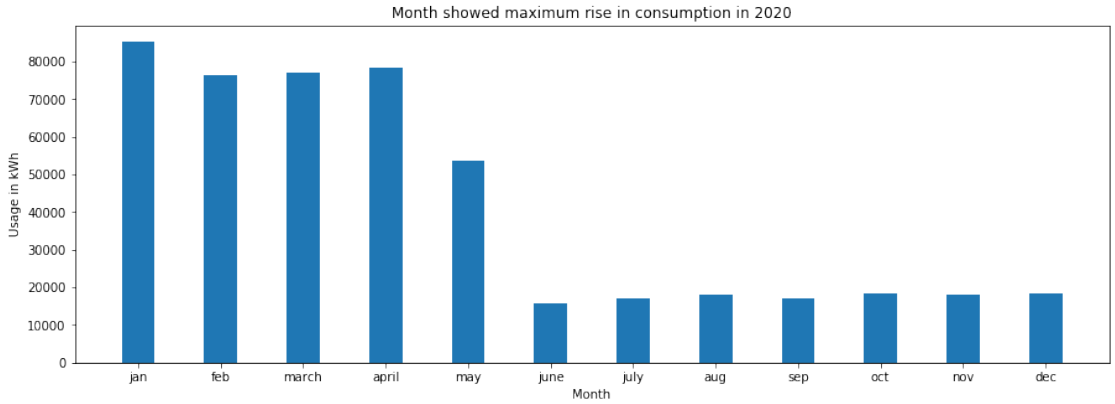
```
maximum rise in consumption is in month of july 2019
maximum rise in consumption is in month of jan 2020
```

Visualizng the Maximum Consumption in 2019 and 2020

```
plt.figure(figsize=(15,5))
plt.bar(month,list1,width=0.4)

plt.ylabel('Usage in kWh')
plt.xlabel('Month')
plt.title('Month showed maximum rise in consumption in 2019')
#plt.text(list1,list1[values])
plt.show()
```




```
plt.figure(figsize=(15,5))
plt.bar(month,list2,width=0.4)

plt.ylabel('Usage in kWh')
plt.xlabel('Month')
plt.title('Month showed maximum rise in consumption in 2020')
plt.show()
```




```
print(f"Total consumption in March-May 2019 is
{list1[2]+list1[3]+list1[4]}Kwh ")
print(f"Total consumption in March-May 2020 is
{list2[2]+list2[3]+list2[4]}Kwh")
```

```
Total consumption in March-May 2019 is 304712.4Kwh
Total consumption in March-May 2020 is 208813.7Kwh
```

```
num1=float((list1[2]+list1[3]+list1[4]))
num2=float((list2[2]+list2[3]+list2[4]))
list3=[]
list4=[]
list4.append(num1)
list4.append(num2)
list3.append('Before lockdown')
list3.append('During lockdown')


plt.figure(figsize = (5, 5))
plt.bar(list3, list4, color ='orange',
        width = 0.4)

plt.xlabel("Time period")
plt.ylabel("Usages")
plt.title("Comparing the electricity usage during March-May
2019(Before Lock down) and March-May 2020 (During Lockdown)")
plt.show()
```

Comparing the electricity usage during March-May 2019(Before Lock down) and March-May 2020 (During Lockdown)