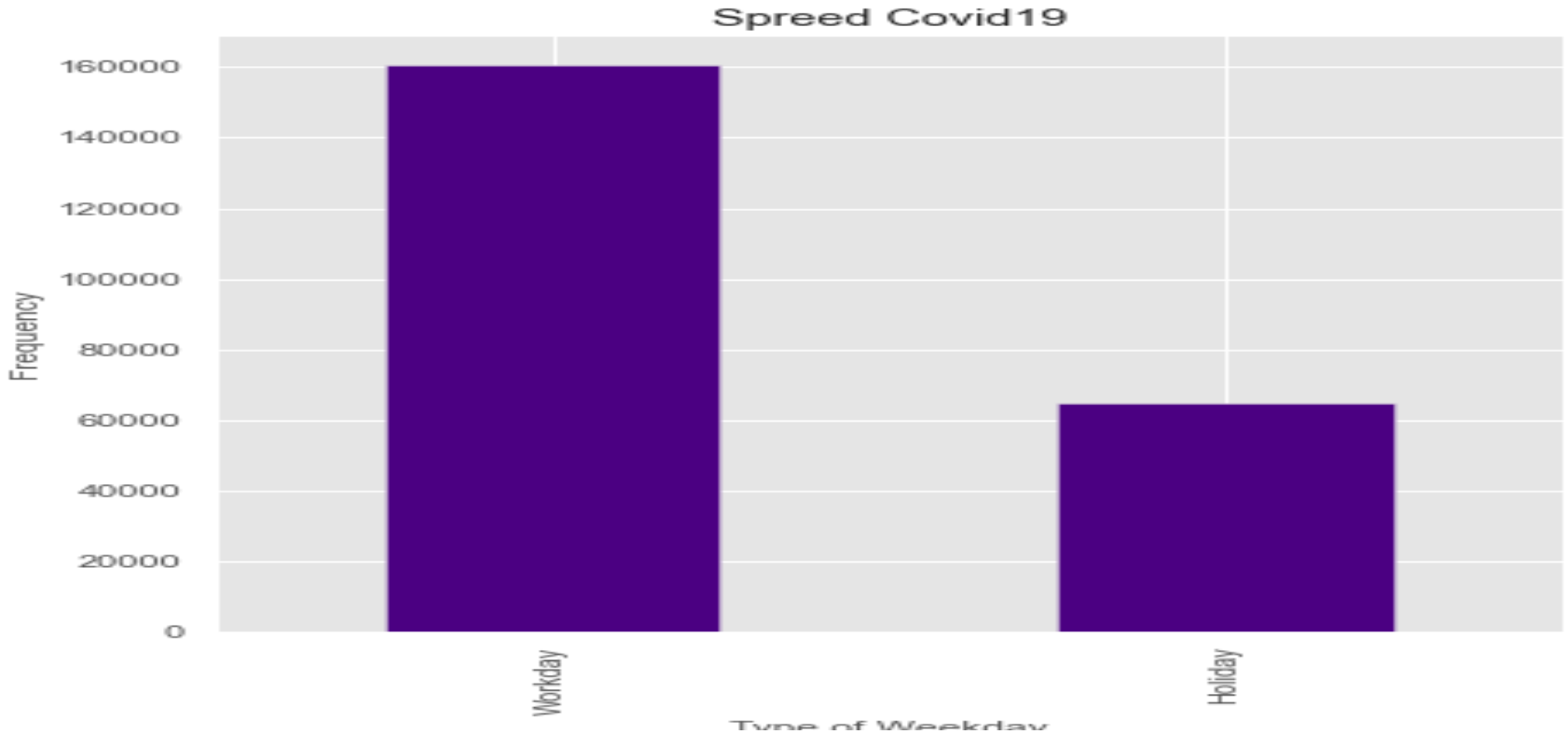
MVP: Analysis of Classification Spread of COVID-19 between Regions and cities

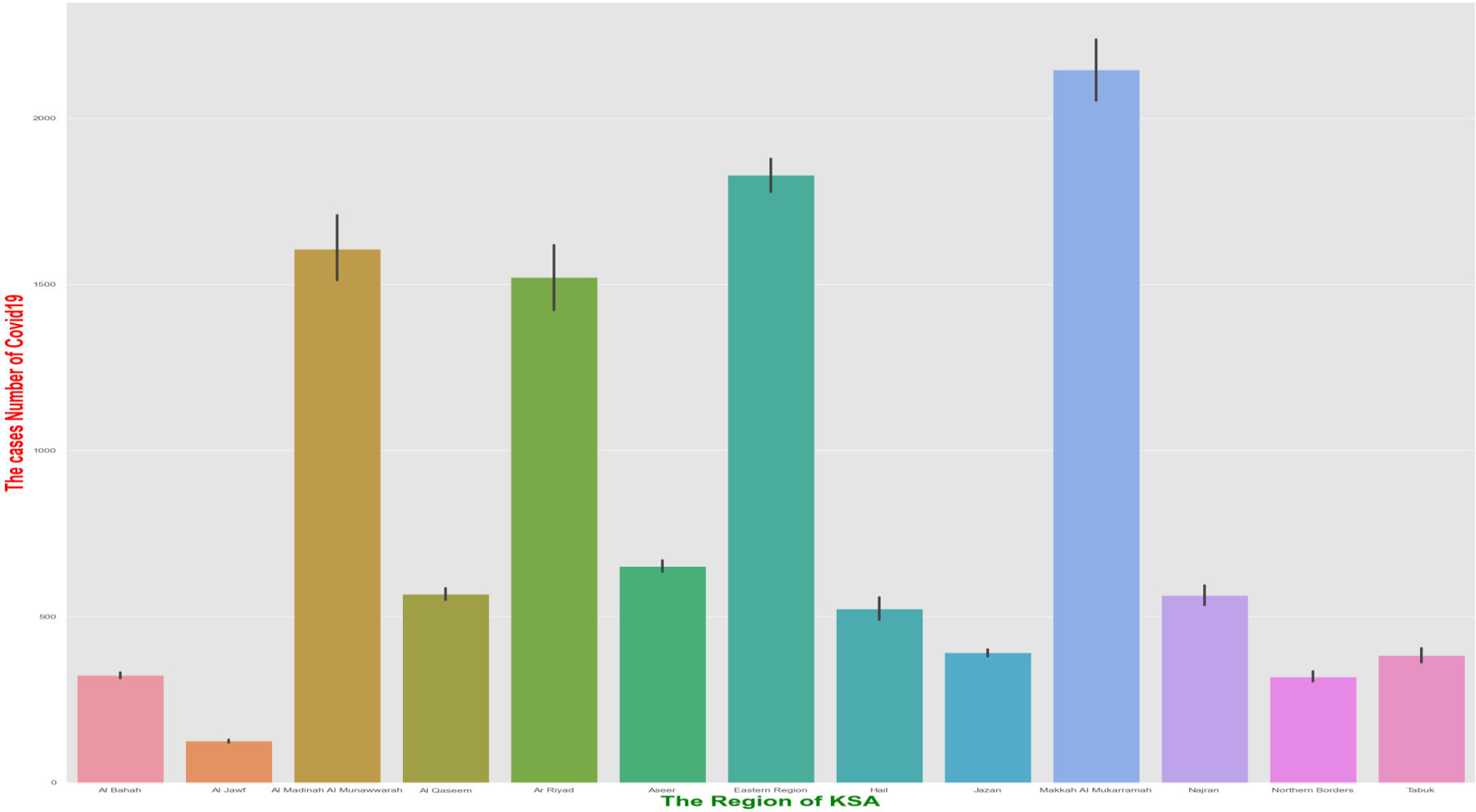
I used the Jupiter notebook platform for programming and data visualization. On other hand, for some data visualization, I used GIS software with the IDW method.



Here I noticed that there is an increase in the spread of COVID-19 cases in the working days compared to the holidays.

Histogram code:

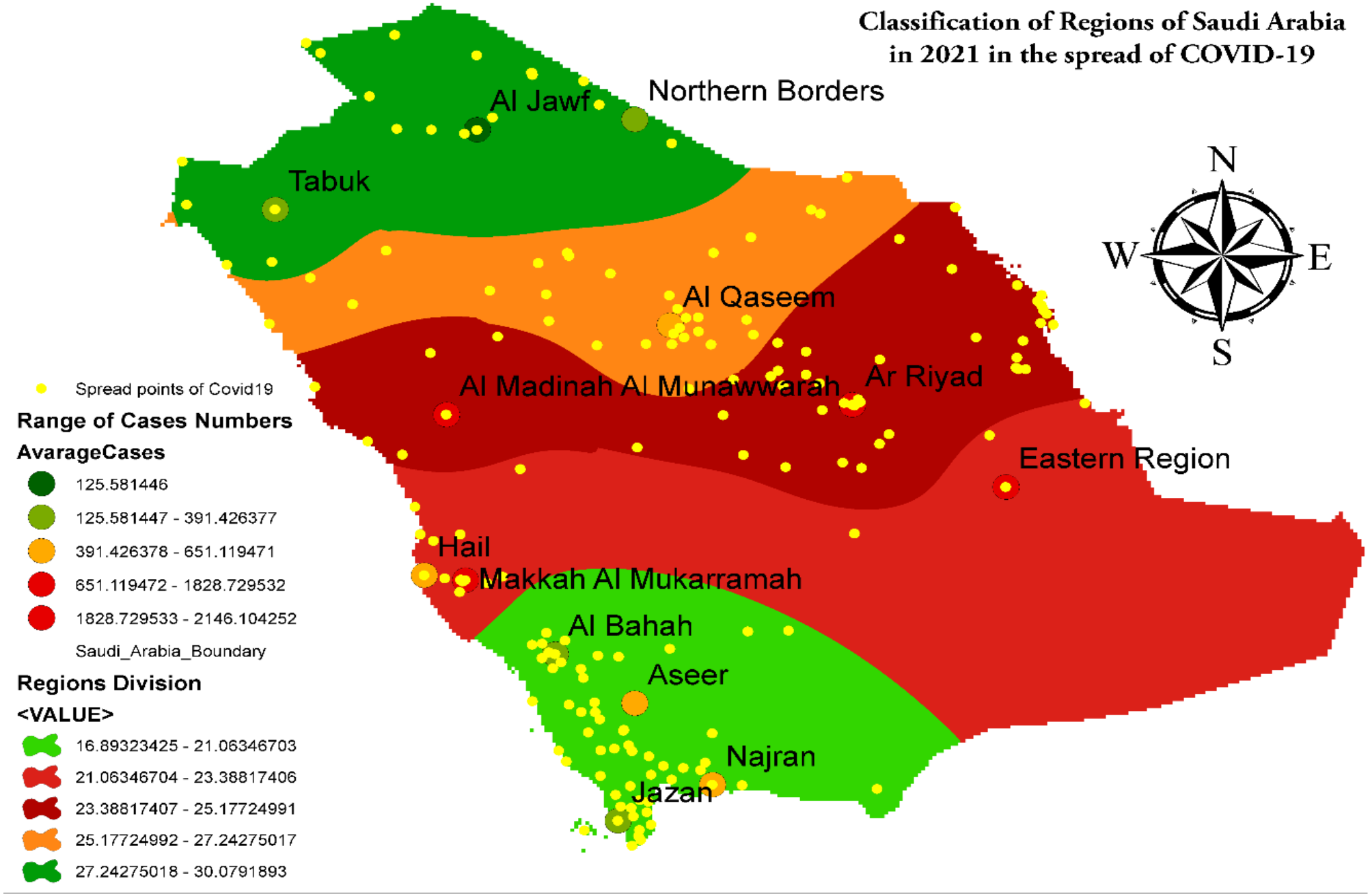
```
In [126]: data['WorkHoliday'].value_counts().plot.bar(figsize = (7, 7), title = 'Spreed Covid19', color = 'crimson')
          plt.xlabel('Type of Weekday')
          plt.ylabel('Frequency');
          plt.savefig('p11.png')
```


The cases Number of Covid19
2000
1500
1000
500
0
Al Bahah
Al Jawf
Al Madinah Al Munawwarah
Al Qaseem
Ar Riyad
Aseer
Eastern Region
Hail
Jazan
Makkah Al Mukarramah
Najran
Northern Borders
Tabuk
The Region of KSA

I noticed an increase in the number of cases of COVID-19 in main-busy cities and regions such as Riyadh, Makkah and Madinah compared to other cities such as Al-Jawf, and Al Bahah this is the answer to our question in our proposal so, the urbanization contributes greatly to the increase in COVID-19 cases between regions and cities.

Histogram code:

In [55]:
```
figure(figsize=(26, 26), dpi=100)
sns.barplot(x = 'Region',y='CasesNumber',data=data);
plt.xlabel('The Region of KSA',fontsize = 25, weight = 'bold',color='green');
plt.ylabel('The cases Number of Covid19',fontsize = 25, weight = 'bold',color='red');
plt.savefig('p2.png')
plt.show()
```

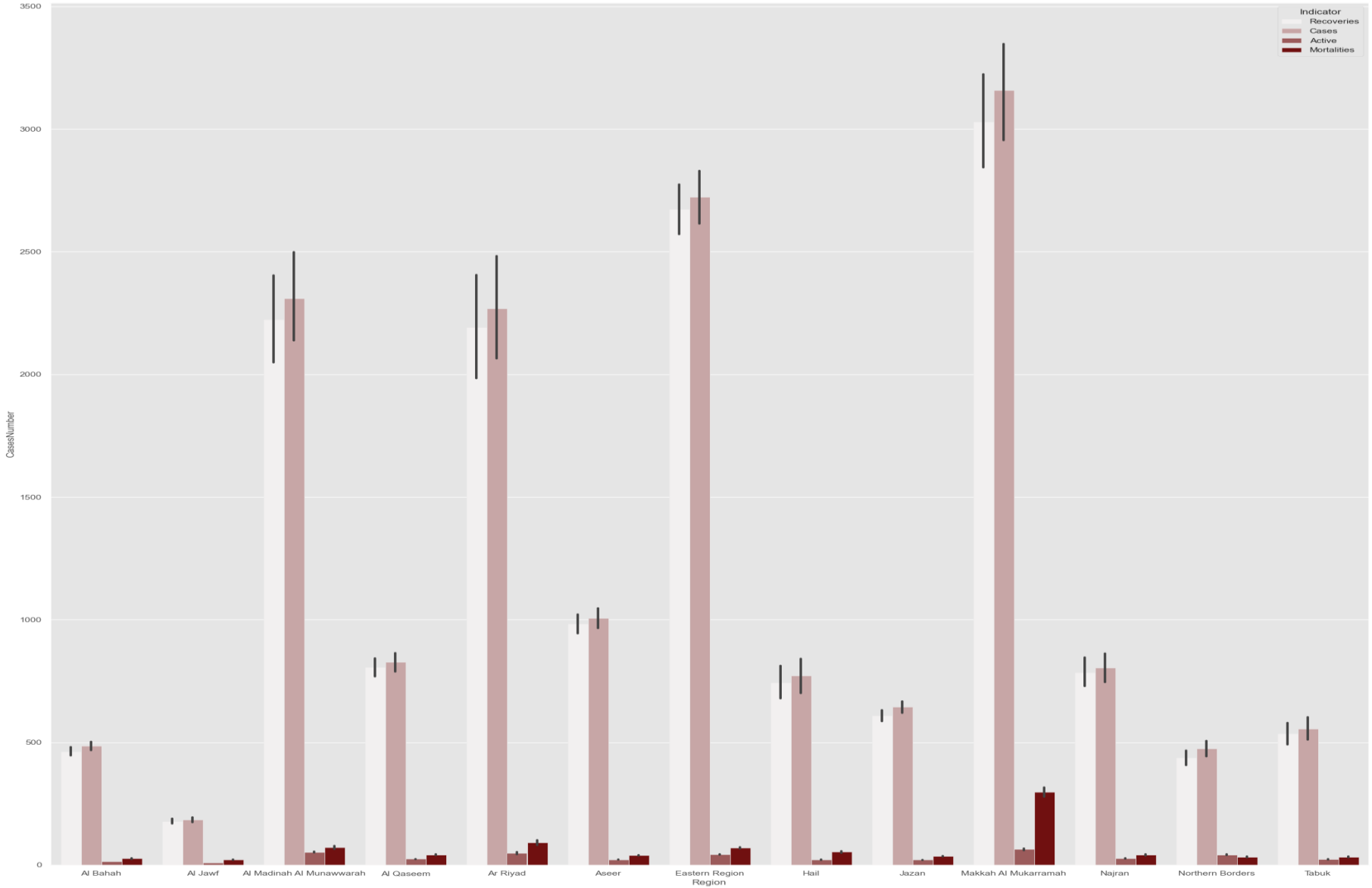

Classification of Regions of Saudi Arabia
in 2021 in the spread of COVID-19
Northern Borders
Al Jawf
Tabuk
Al Qaseem
Al Madinah Al Munawwarah
Ar Riyad
Eastern Region
Hail
Makkah Al Mukarramah
Al Bahah
Aseer
Najran
Jazan
N
W
E
S
Spread points of Covid19
Range of Cases Numbers
AvarageCases
125.581446
125.581447 - 391.426377
391.426378 - 651.119471
651.119472 - 1828.729532
1828.729533 - 2146.104252
Saudi_Arabia_Boundary
Regions Division
<VALUE>
16.89323425 - 21.06346703
21.06346704 - 23.38817406
23.38817407 - 25.17724991
25.17724992 - 27.24275017
27.24275018 - 30.0791893

The GIS software used here in this project is ARC GIS.ARC Map 10.8 version is used for the further procedure of mapping. I created an excel sheet as seen in the below table that includes: the average cases of COVID19 and classification of the spread of COVID19 (HIGH or LOW) that I got data from my dataset with the latitude and longitudinal details of regions that are also added to the GIS software.

The added point view file is converted into a shapefile forming points of sampling stations. The spatial analyst module of ArcGIS is used for the generation of GIS map themes showing the level and spatial distribution of spreads COVID19 over the sampling stations. Spatial maps were generated spread of COVID19 that affects each region in Saudi Arabia by utilizing the IDW method.

Region	**Latitude**	**Longitude**	**Average Cases**	**SpreedCovid19**
Makkah Al Mukarramah	21.416891	39.899047	2146.104252	HIGH
Hail	21.503443	39.179366	523.4830744	LOW
Al Madinah Al Munawwarah	24.524654	39.569184	1606.414247	HIGH
Ar Riyad	24.713552	46.675296	1520.615695	HIGH
Al Qaseem	26.207826	43.483738	567.083108	LOW
Tabuk	28.383508	36.566191	382.664282	LOW
Jazan	16.889359	42.570567	391.4263766	LOW
Eastern Region	23.166969	49.365315	1828.729532	HIGH
Al Jawf	29.8874	40.1043	125.5814459	LOW
Aseer	19.0969	42.8638	651.1194713	LOW
Al Bahah	20.021741	41.471273	323.274197	LOW
Najran	17.5656	44.2289	564.2001503	LOW
Northern Borders	30.0799	42.8638	318.7942955	LOW

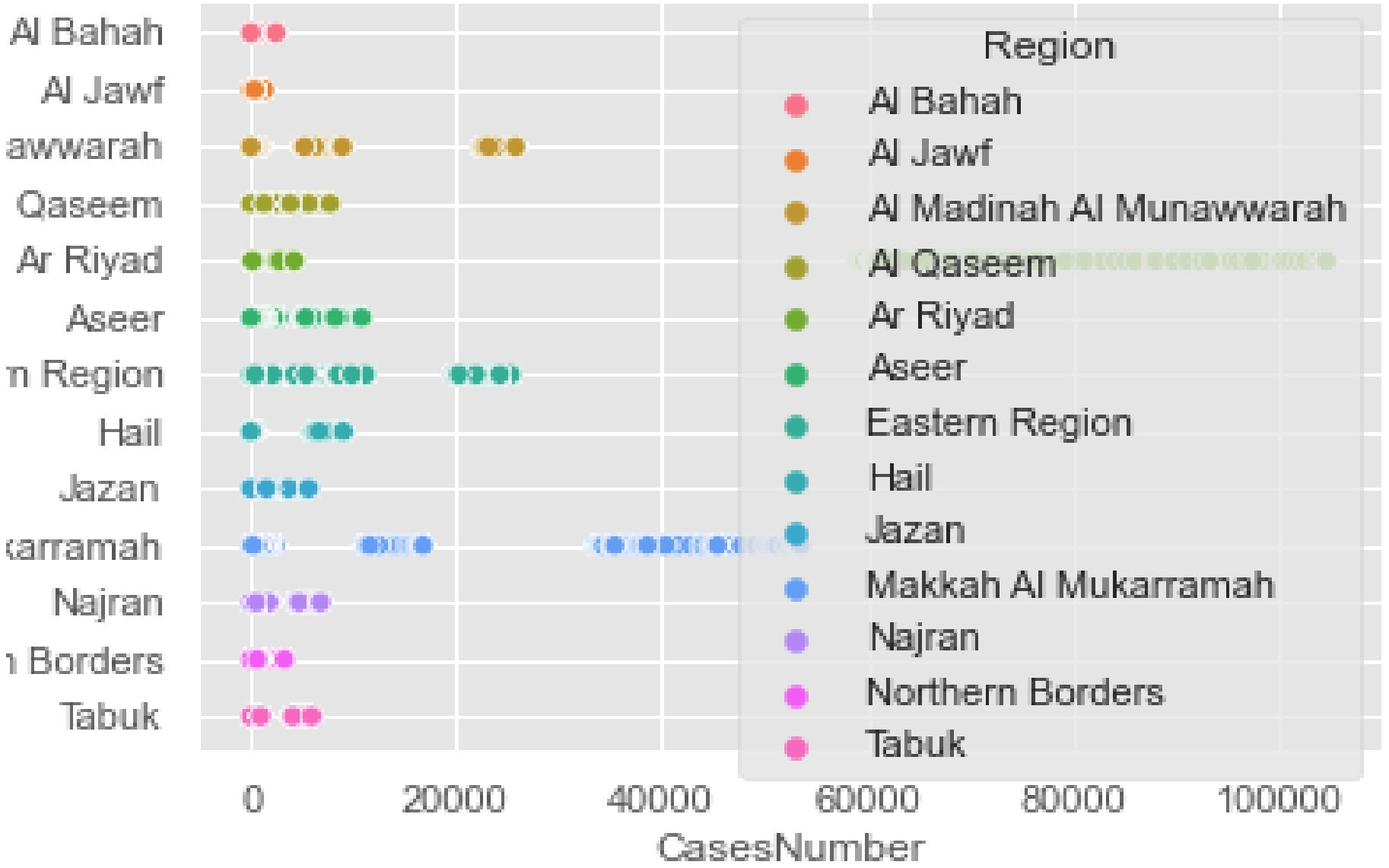
As we seen in the figure above, I divided regions of KSA based on the average number of spread COVID19. The degree of Red and Orange Colors represent high in spreading COVID19, but the degree of Green Color represents Low in spreading COVID19.and Yellow degree represents COVID19 Cases.


Indicator
Recoveries
Cases
Active
Mortalities
CasesNumber
3500
3000
2500
2000
1500
1000
500
0
Al Bahah
Al Jawf
Al Madinah
Al Munawwarah
Al Qaseem
Ar Riyad
Aseer
Eastern Region
Hail
Jazan
Makkah Al Mukarramah
Najran
Northern Borders
Tabuk
Region

I noticed an increase in the number of COVID-19 cases and deaths in main-busy cities and regions such as Riyadh, Makkah, and Madinah compared to other cities such as Al Jawf, Najran and Al Baha.

Histogram code:

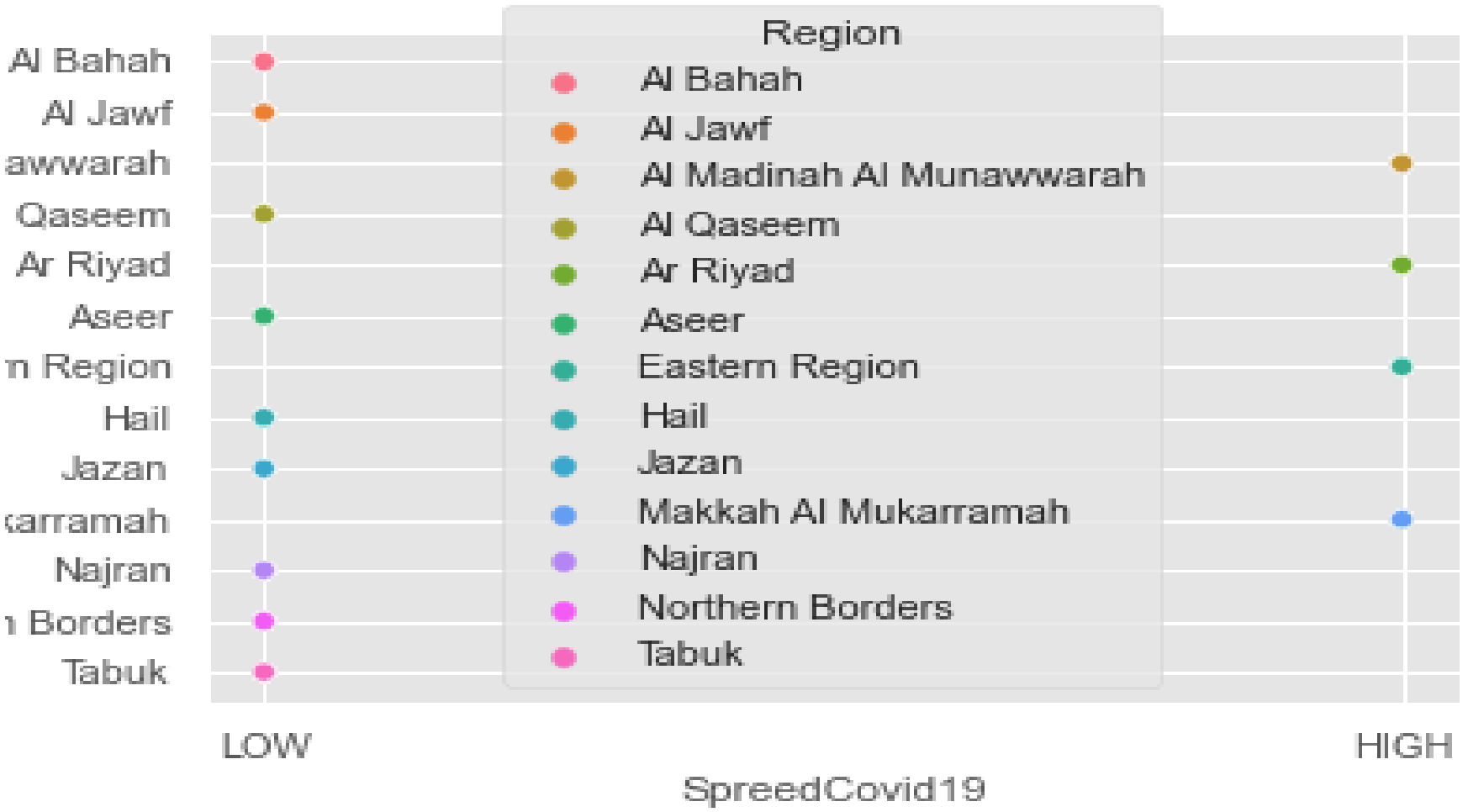
```
In [56]: figure(figsize=(26, 26), dpi=100)
         sns.barplot(x="Region", y="CasesNumber", hue="Indicator", data=data, color='maroon')
         plt.savefig('p3.png')
```


Al Bahah
Al Jawf
awwarah
Qaseem
Ar Riyad
Aseer
n Region
Hail
Jazan
carramah
Najran
n Borders
Tabuk
0
20000
40000
60000
80000
100000
CasesNumber
Region
Al Bahah
Al Jawf
Al Madinah Al Munawwarah
Al Qaseem
Ar Riyad
Aseer
Eastern Region
Hail
Jazan
Makkah Al Mukarramah
Najran
Northern Borders
Tabuk

I noticed an increase in the number of cases of COVID-19 in main-busy cities and regions such as Riyadh, Makkah and Madinah compared to other cities such as Al-Jawf, Jazan ,and Al Bahah this is the answer to our question in our proposal so, the urbanization contributes greatly to the increase in COVID-19 cases between regions and cities.

Scatterplot code:

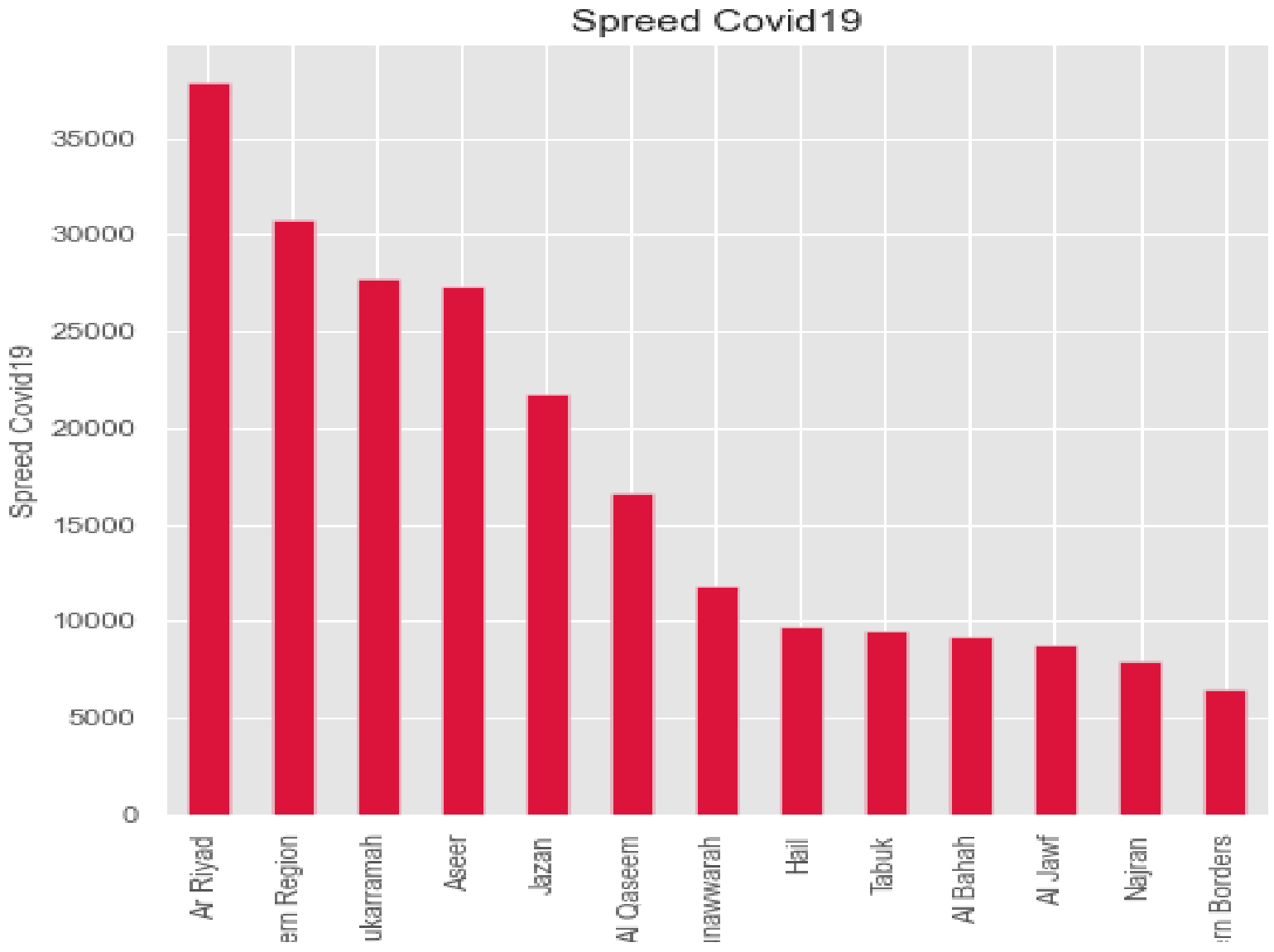
```
In [57]: sns.scatterplot(data=data, x="CasesNumber", y="Region", hue="Region")
         plt.savefig('p4.png')
```


Region
Al Bahah
Al Jawf
Al Madinah Al Munawwarah
Al Qaseem
Ar Riyad
Aseer
Eastern Region
Hail
Jazan
Makkah Al Mukarramah
Najran
Northern Borders
Tabuk
Al Bahah
Al Jawf
awwarah
Qaseem
Ar Riyad
Aseer
n Region
Hail
Jazan
arramah
Najran
n Borders
Tabuk
LOW
HIGH
SpreedCovid19

I have noticed that the spread of Covid 19 in the main-busy regions/cities is high, such as Riyadh, Makkah, and Madinah, while other non-main-busy regions/cities have a "low" spread, such as Al-Jawf, Najran, and Al-Baha.

The code:

In [127]:
```
data['Region'].value_counts().plot.bar(figsize = (7, 7), title = 'Spreed Covid19', color = 'crimson')
plt.xlabel('Region')
plt.ylabel('Spreed Covid19');
plt.savefig('p6.png')
```


Spreed Covid19
Spreed Covid19
35000
30000
25000
20000
15000
10000
5000
0
Ar Riyad
em Region
ukarramah
Aseer
Jazan
Al Qaseem
inawwarah
Hail
Tabuk
Al Bahah
Al Jawf
Najran
rn Borders

Bar plot to counting the cities and regions according to the highest until the lowest number of COVID-19 Spread, compared to the average number of cases.

The code:

```
In [127]: data['Region'].value_counts().plot.bar(figsize = (7, 7), title = 'Spreed Covid19', color = 'crimson')
          plt.xlabel('Region')
          plt.ylabel('Spreed Covid19');
          plt.savefig('p6.png')
```

Vie using data visualization; I conclude that there is an increase in the spread of COVID-19 cases in the working days compared to the holidays. In addition, there is an increase in the number of cases of COVID-19 and deaths in main-busy cities and regions such as Ar Riyadh, Makkah Al Mukarramah, and Al Madinah Al Munawwarah compared to other cities such as Al-Jawf, and Al Bahah. Finally, I noticed that the spread of Covid 19 in the main-busy regions/cities is high, such as Riyadh, Makkah, and Madinah, while other non-main-busy regions/cities have a "low" spread, such as Al-Jawf, Najran, and Al-Baha.