

In [12]:

```

1 # data
2 import numpy as np
3 import pandas as pd
4
5 # visualization
6 import matplotlib.pyplot as plt
7 import seaborn as sns
8 import plotly.express as px
9 import plotly.graph_objects as go
10
11 # warning
12 import warnings
13 warnings.filterwarnings('ignore')

```

In [13]:

```

1 df = pd.read_excel("main.xlsx")
2 df.info()

```

```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11500 entries, 0 to 11499
Data columns (total 14 columns):
 #   Column                Non-Null Count  Dtype
---  -
 0   자치구(구)            11500 non-null object
 1   날짜                  11500 non-null int64
 2   1hr 최대 강수량       11500 non-null float64
 3   일평균 강수량         11500 non-null float64
 4   경사도                11500 non-null float64
 5   고도(해발고도)       11500 non-null float64
 6   불투수면              11500 non-null float64
 7   녹지 면적율           11500 non-null float64
 8   하천 면적율           11500 non-null float64
 9   복개하천 개수        11500 non-null int64
10   맨홀개수              11500 non-null int64
11   빗물받이 개수        11500 non-null int64
12   빗물 펌프 개수       11500 non-null int64
13   하수관로 비율         11500 non-null object
dtypes: float64(7), int64(5), object(2)
memory usage: 1.2+ MB

```

In [59]:

```

1 df1 = df.drop_duplicates('고도(해발고도)')
2 df1
3 df2 = df1[['자치구(구)', '고도(해발고도)']]
4 df2

```

Out [59]:

	자치구(구)	고도(해발고도)
0	종로	146.699945
92	중	53.612472
184	용산	34.320069
276	성동	22.095518
368	광진	41.891077
460	동대문	21.788907
552	중랑	62.913088
644	성북	120.526722
736	강북	187.072540
828	도봉	114.665267
920	노원	92.393657
1012	은평	100.477627
1104	서대문	68.896230
1196	마포	19.953597
1288	양천	22.807270
1380	강서	13.649094
1472	구로	26.073147
1564	금천	57.899442
1656	영등포	11.489841
1748	동작	37.605641
1840	관악	139.631242
1932	서초	80.859897
2024	강남	35.586721
2116	송파	21.890085
2208	강동	25.698091

In [63]:

```
1 new_df = df2.copy()
2 new_df['자치구(구)'] = new_df['자치구(구)'] + '구'
3
4 new_df
```

Out[63]:

	자치구(구)	고도(해발고도)
0	종로구	146.699945
92	중구	53.612472
184	용산구	34.320069
276	성동구	22.095518
368	광진구	41.891077
460	동대문구	21.788907
552	종랑구	62.913088
644	성북구	120.526722
736	강북구	187.072540
828	도봉구	114.665267
920	노원구	92.393657
1012	은평구	100.477627
1104	서대문구	68.896230
1196	마포구	19.953597
1288	양천구	22.807270
1380	강서구	13.649094
1472	구로구	26.073147
1564	금천구	57.899442
1656	영등포구	11.489841
1748	동작구	37.605641
1840	관악구	139.631242
1932	서초구	80.859897
2024	강남구	35.586721
2116	송파구	21.890085
2208	강동구	25.698091

In [65]:

```
1 # 위도경도 매핑
2
3 locs = {
4     '종로구': (37.595176, 126.977262),
5     '중구': (37.560229, 126.995971),
6     '용산구': (37.531486, 126.980292),
7     '성동구': (37.550983, 127.041041),
8     '광진구': (37.546714, 127.085754),
9     '동대문구': (37.581916, 127.054846),
10    '중랑구': (37.597810, 127.092896),
11    '성북구': (37.605636, 127.017551),
12    '강북구': (37.643463, 127.011188),
13    '도봉구': (37.6691, 127.0324),
14    '노원구': (37.6524, 127.075),
15    '은평구': (37.619161, 126.927011),
16    '서대문구': (37.5778, 126.9391),
17    '마포구': (37.5593, 126.9083),
18    '양천구': (37.5248, 126.8553),
19    '강서구': (37.5612, 126.8229),
20    '구로구': (37.4944, 126.8564),
21    '금천구': (37.4605, 126.9008),
22    '영등포구': (37.5223, 126.9102),
23    '동작구': (37.4988, 126.9516),
24    '관악구': (37.4673, 126.9454),
25    '서초구': (37.4733, 127.0312),
26    '강남구': (37.4966, 127.063),
27    '송파구': (37.5056, 127.1153),
28    '강동구': (37.5504, 127.147),
29 }
30
31 locs
```

Out [65]:

```
{'종로구': (37.595176, 126.977262),  
'중구': (37.560229, 126.995971),  
'용산구': (37.531486, 126.980292),  
'성동구': (37.550983, 127.041041),  
'광진구': (37.546714, 127.085754),  
'동대문구': (37.581916, 127.054846),  
'중랑구': (37.59781, 127.092896),  
'성북구': (37.605636, 127.017551),  
'강북구': (37.643463, 127.011188),  
'도봉구': (37.6691, 127.0324),  
'노원구': (37.6524, 127.075),  
'은평구': (37.619161, 126.927011),  
'서대문구': (37.5778, 126.9391),  
'마포구': (37.5593, 126.9083),  
'양천구': (37.5248, 126.8553),  
'강서구': (37.5612, 126.8229),  
'구로구': (37.4944, 126.8564),  
'금천구': (37.4605, 126.9008),  
'영등포구': (37.5223, 126.9102),  
'동작구': (37.4988, 126.9516),  
'관악구': (37.4673, 126.9454),  
'서초구': (37.4733, 127.0312),  
'강남구': (37.4966, 127.063),  
'송파구': (37.5056, 127.1153),  
'강동구': (37.5504, 127.147)}
```

In [67]:

```
1 import folium
2
3 geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/2013/json/'
4
5
6
7 m = folium.Map(location=[37.5642135, 127.0016985])
8
9 folium.Choropleth(geo_data = geo_json,
10                  name = 'choropleth',
11                  data = new_df,
12                  columns=['자치구(구)', '고도(해발고도)'],
13                  key_on = 'feature.properties.name',
14                  fill_color = 'YlGn',
15                  fill_opacity = 0.7,
16                  line_opacity = 0.2,
17 ).add_to(m)
18
19 folium.LayerControl().add_to(m)
20
21 for key, value in locs.items():
22     text = f"{key}: {new_df.loc[new_df['자치구(구)'] == key, '고도(해발고도)'].values[0]}"
23     folium.Marker(
24         location=value,
25         icon=folium.DivIcon(
26             icon_size=(0, 0),
27             icon_anchor=(0, 0),
28             html=f"<div style='font-size: 0.8rem; color: black; background-color: rgba(255, 255, 255, 0.5); padding: 2px 5px; border: 1px solid black; border-radius: 3px; display: inline-block;'>{text}</div>"
29         )
30     ).add_to(m)
31
32 m
```

Out [67]:

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