In [1]:

```python
import pandas as pd
import matplotlib.pyplot as plt
import plotly.express as px
import seaborn as sns

file_path = r'C:\Users\Asus\Effective_Climate_Factors.csv'
df1 = pd.read_csv(file_path)
df1['year'] = df1['year'].str.replace(',', '')
df1['date'] = df1['year'].astype(str) + ',' + df1['month'] + '-' + df1['day'].astype(s
df1['date'] = pd.to_datetime(df1['date'], format='%Y,%b-%d')
df1=df1.set_index(df1['date'])
df1=df1[['t_mean','t_min','t_max','rain','snow','ww_max']]
columns_to_convert=['t_mean','t_min','t_max','rain','snow','ww_max']
df1[columns_to_convert] = df1[columns_to_convert].apply(pd.to_numeric, errors='coerce'
new_column_names = {
    't_mean': 'mean_temperature',
    't_min': 'min_temperature',
    't_max': 'max_temperature',
    'rain': 'precipitation_rain',
    'snow': 'precipitation_snow',
    'ww_max': 'max_wind_speed'
}

def detect_outliers_zscore(data, threshold=3):
    z_scores = np.abs((data - np.mean(data)) / np.std(data))
    return z_scores > threshold

df1 = df1.rename(columns=new_column_names)
df1.head()
```

Out[1]:

	mean_temperature	min_temperature	max_temperature	precipitation_rain	precipitation_snow
date					
1951-01-01	3.1	2.0	9.0	0.0	0.0
1951-01-02	1.8	-3.0	8.0	0.0	0.0
1951-01-03	2.4	-2.0	8.0	19.0	0.0
1951-01-04	2.5	2.0	4.0	1.0	0.0
1951-01-05	-0.1	0.0	2.0	5.0	0.0

In [2]:

```python
file_path = r'C:\Users\Asus\Urmia_Lake_Water_Level_Dataset.csv'
df2 = pd.read_csv(file_path)
df2['date'] = df2['Date\n(Gregorian callendar)']
df2['date'] = pd.to_datetime(df2['date'], format='%m/%d/%Y')
df2=df2.set_index(df2['date'])
df2=df2[['Water Level\n(m above sea level)']]
df2=df2.rename(columns={'Water Level\n(m above sea level)':'water_level'})
df2.head()
```

Out[2]:

	water_level
date	
1965-11-24	1273.82
1965-11-25	1273.82
1965-11-26	1273.83
1965-11-27	1273.83
1965-11-28	1273.82

In [3]:

```
intersection_df = df1.merge(df2, on='date', how='inner')
intersection_df
```

Out[3]:

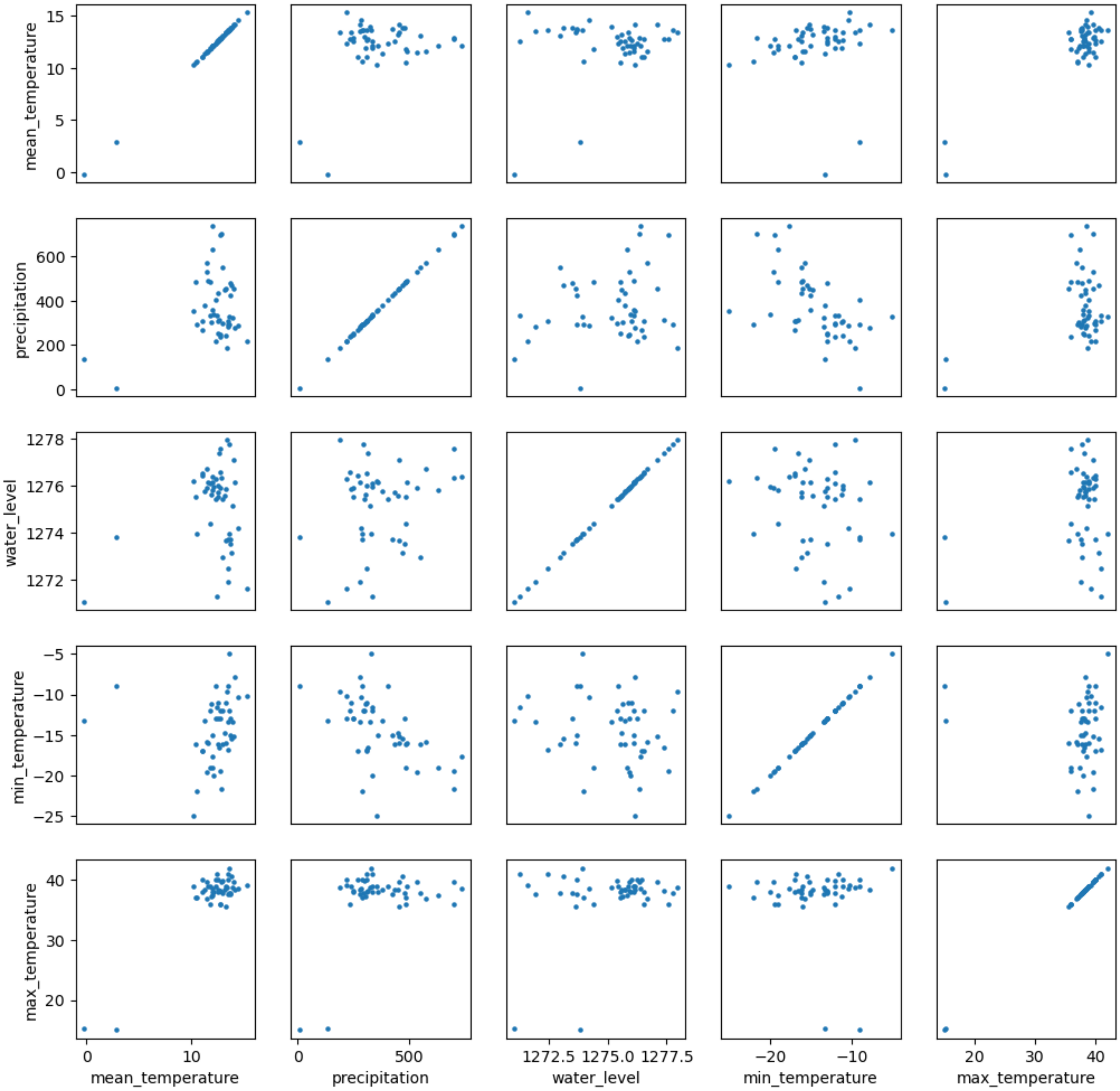
	mean_temperature	min_temperature	max_temperature	precipitation_rain	precipitation_snow
date					
1965-11-24	6.2	-1.0	13.0	0.0	0.0
1965-11-25	6.9	1.0	14.0	0.0	0.0
1965-11-26	7.5	-1.0	15.0	0.0	0.0
1965-11-27	6.3	8.0	10.0	2.0	0.0
1965-11-28	3.4	-2.0	8.0	0.0	0.0
...	...	...	...	...	...
2012-03-15	7.0	5.2	11.0	3.0	0.0
2012-03-16	1.4	3.4	4.4	2.3	0.0
2012-03-17	-5.1	-7.8	-3.2	5.0	13.0
2012-03-18	-4.4	-12.4	1.4	0.0	2.0
2012-03-19	0.2	-6.4	6.8	0.0	1.0

16918 rows × 7 columns

In [4]:

```
intersection_df['precipitation'] = intersection_df['precipitation_rain'] + intersectic
groupped_df = intersection_df.groupby(intersection_df.index.to_period('Y')).agg(
    {'precipitation': 'sum', 'mean_temperature': 'mean', 'water_level': 'mean','min_te
).reset_index()
```

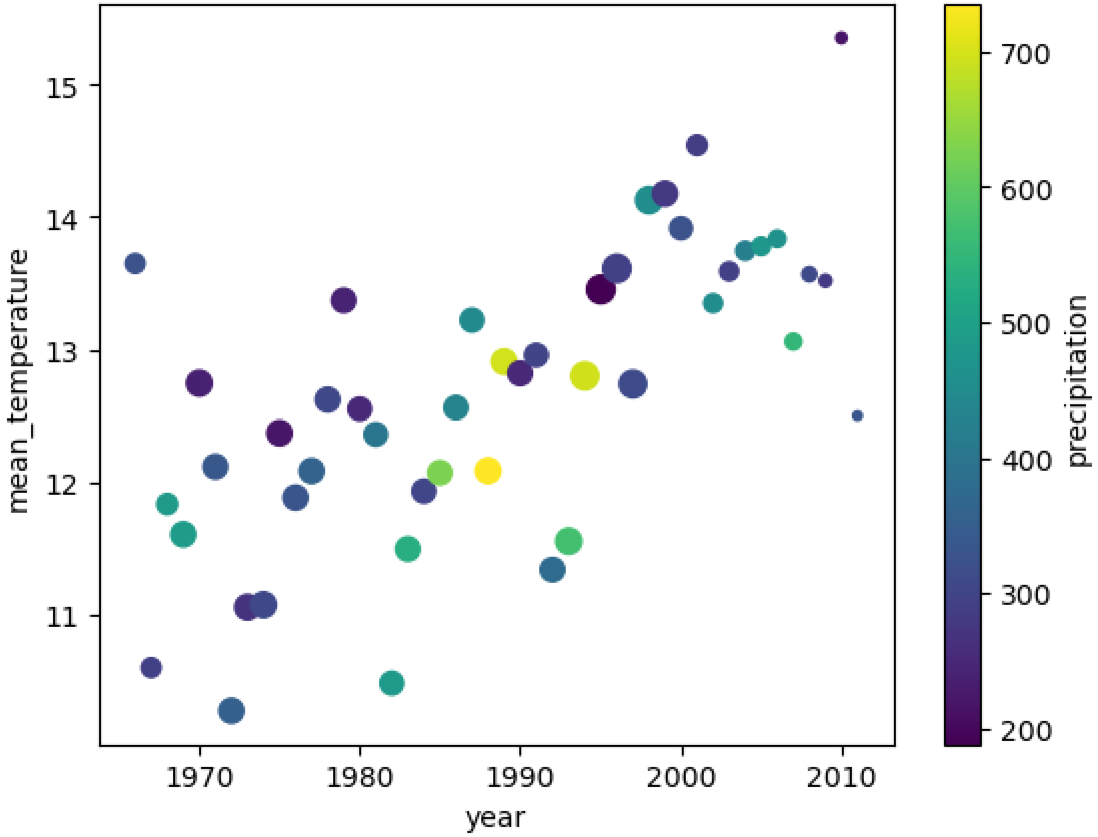
```
cols = ['mean_temperature','precipitation','water_level','min_temperature','max_temper
fig, axs = plt.subplots(len(cols), len(cols), figsize=(12,12))
for i in range(len(cols)):
    for j in range(len(cols)):
        axs[i,j].scatter(groupped_df[cols[j]], groupped_df[cols[i]], s=5)
        axs[i,j].get_xaxis().set_visible(False)
        axs[i,j].get_yaxis().set_visible(False)
        if i == len(cols) - 1:
            axs[i,j].get_xaxis().set_visible(True)
            axs[i,j].set_xlabel(cols[j])
        if j == 0:
            axs[i,j].get_yaxis().set_visible(True)
            axs[i,j].set_ylabel(cols[i])
```



In [5]:

```
groupped_df['year'] = groupped_df['date'].dt.year
groupped_df=groupped_df.iloc[1:-1]
min_water_level = groupped_df['water_level'].min()
max_water_level = groupped_df['water_level'].max()
normalized_water_level = (
    10 + (groupped_df['water_level'] - min_water_level) * (100 - 10) / (max_water_leve
)
```

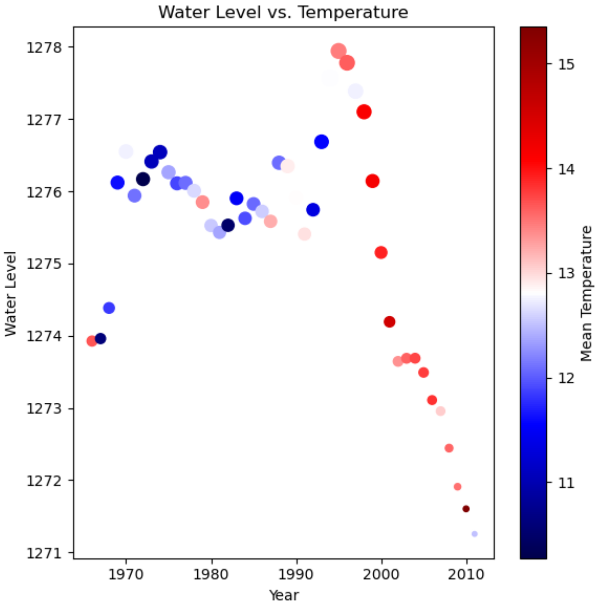
```
ax1=groupped_df.plot.scatter( 'year','mean_temperature', c='precipitation',s=normalize
colorbar=ax1.collections[0].colorbar
```

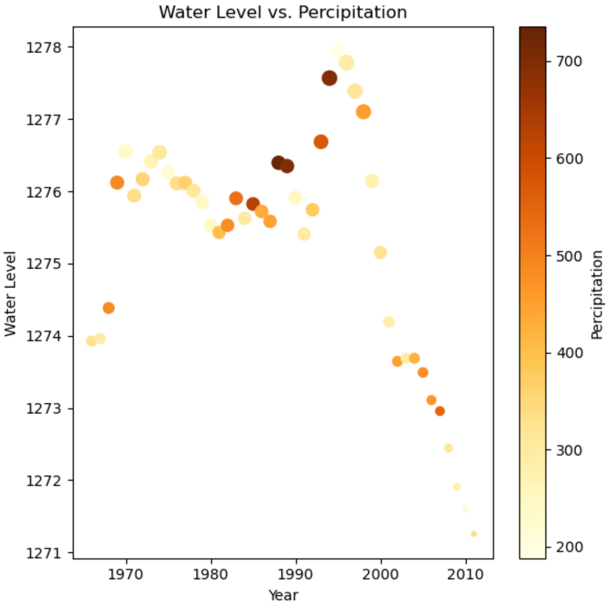


In [6]:

```
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 6))
ax1=groupped_df.plot.scatter('year', 'water_level', c='mean_temperature',s=normalized_
colorbar=ax1.collections[0].colorbar
colorbar.set_label('Mean Temperature')
ax1.set_title('Water Level vs. Temperature')
ax1.set_xlabel('Year')
ax1.set_ylabel('Water Level')

ax2=groupped_df.plot.scatter('year', 'water_level', c='precipitation',s=normalized_wat
colorbar=ax2.collections[0].colorbar
colorbar.set_label('Percipitation')
ax2.set_title('Water Level vs. Percipitation')
ax2.set_xlabel('Year');
ax2.set_ylabel('Water Level');
plt.tight_layout()
plt.show()
```


Water Level vs. Temperature
Water Level
1278
1277
1276
1275
1274
1273
1272
1271
Year
1970
1980
1990
2000
2010
Mean Temperature
15
14
13
12
11


Water Level vs. Percipitation
Water Level
1278
1277
1276
1275
1274
1273
1272
1271
Year
1970
1980
1990
2000
2010
Percipitation
700
600
500
400
300
200