Explore Weather Trends

In this project, you will analyze local and global temperature data and compare the temperature trends where you live to overall global temperature trends.

Extracting data from database

- select * from global_data;
- Select year,avg_temp from city_data where city='Ranchi' AND country='India';
- Select year,avg_temp from city_data where city='Delhi' AND country='India';

Collecting Data :

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
df_ranchi=pd.read_csv('ranchi_use.csv')
df_globaldata=pd.read_csv('global_data.csv')
df_delhi=pd.read_csv('delhi.csv')
```

Exploring City Data

In [3]:

```
df_ranchi.head(1)
```

Out[3]:

	year	avg_temp
0	1796	24.01

In [4]:

```
df_ranchi.tail(1)
```

Out[4]:

	year	avg_temp
217	2013	25.98

The above two operations conclude that city data is given for the years 1849-2013.

In [5]:

```
df_ranchi.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 218 entries, 0 to 217
Data columns (total 2 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   year      218 non-null    int64  
 1   avg_temp  211 non-null    float64
dtypes: float64(1), int64(1)
memory usage: 3.5 KB
```

Checking Global Data

In [6]:

```
df_globaldata.head(1)
```

Out[6]:

	year	avg_temp
0	1750	8.72

In [7]:

```
df_globaldata.tail(1)
```

Out[7]:

	year	avg_temp
265	2015	9.83

The above two operations conclude that global data is given for the years 1750-2015.

In [8]:

```
df_globaldata.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 266 entries, 0 to 265
Data columns (total 2 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   year      266 non-null    int64  
 1   avg_temp  266 non-null    float64
dtypes: float64(1), int64(1)
memory usage: 4.2 KB
```

In [9]:

```
#For better comparison the global and local dataframes should lie within same period of obs
#Creating a new dataframe for this:
df_global=df_globaldata.query('year > 1848 & year < 2014')
```

Calculating Rolling mean (or Moving average)

And handling missing data:

(with a window size of 10 years for better visualisation of data)

In [10]:

```
#setting window size
size=10
#calculating rolling mean
df_global["movingtemp"] = df_globaldata["avg_temp"].rolling(window = size).mean()
```

Handling missing data for Ranchi:

In [11]:

```
mean_ranchi= df_ranchi.avg_temp.mean()
mean_ranchi
```

Out[11]:

```
24.17175355450237
```

In [12]:

```
df_ranchi.avg_temp.fillna(mean_ranchi,inplace=True)
```

In [13]:

```
#setting the window size
size=10
#calculate the rolling mean
df_ranchi['movingtemp']=df_ranchi['avg_temp'].rolling(window=size).mean()
#resetting the index of Ranchi dataframe for accurate results:
df_ranchi.reset_index(inplace = True, drop = True)
```

In [14]:

```
df_ranchi.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 218 entries, 0 to 217
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   year        218 non-null    int64  
 1   avg_temp    218 non-null    float64
 2   movingtemp  209 non-null    float64
dtypes: float64(2), int64(1)
memory usage: 5.2 KB
```

Handling missing data for Delhi:

In [15]:

```
mean_delhi= df_delhi.avg_temp.mean()
mean_delhi
```

Out[15]:

```
25.16626865671642
```

In [16]:

```
df_delhi.avg_temp.fillna(mean_delhi,inplace=True)
```

In [17]:

```
#setting the window size
size=10
#calculate the rolling mean
df_delhi['movingtemp']=df_delhi['avg_temp'].rolling(window=size).mean()
#resetting the index of Delhi dataframe for accurate results:
df_delhi.reset_index(inplace = True, drop = True)
```

In [18]:

```
df_delhi.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 218 entries, 0 to 217
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   year        218 non-null    int64  
 1   avg_temp    218 non-null    float64
 2   movingtemp  209 non-null    float64
dtypes: float64(2), int64(1)
memory usage: 5.2 KB
```

Plotting Line Graph

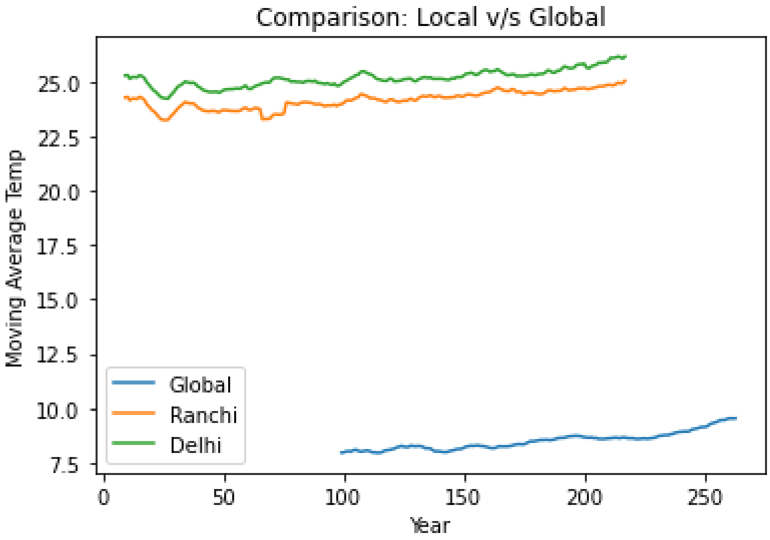
Comparing local and global trend:

In [19]:

```
plt.plot(df_global.movingtemp,label="Global")
plt.plot(df_ranchi.movingtemp,label="Ranchi")
plt.plot(df_delhi.movingtemp,label="Delhi")
# Set the x axis label of the current axis.
plt.xlabel('Year')
# Set the y axis label of the current axis.
plt.ylabel('Moving Average Temp')
# Set a title of the current axes.
plt.title('Comparison: Local v/s Global')
plt.legend()
```

Out[19]:

```
<matplotlib.legend.Legend at 0x11d349e8>
```



Plotting temperature difference:

In [20]:

```
df_ranchi['diff_G']=df_ranchi['avg_temp']-df_global['avg_temp']
df_delhi['diff_G']=df_delhi['avg_temp']-df_global['avg_temp']
df_delhi['diff_R']=df_delhi['avg_temp']-df_ranchi['avg_temp']
```

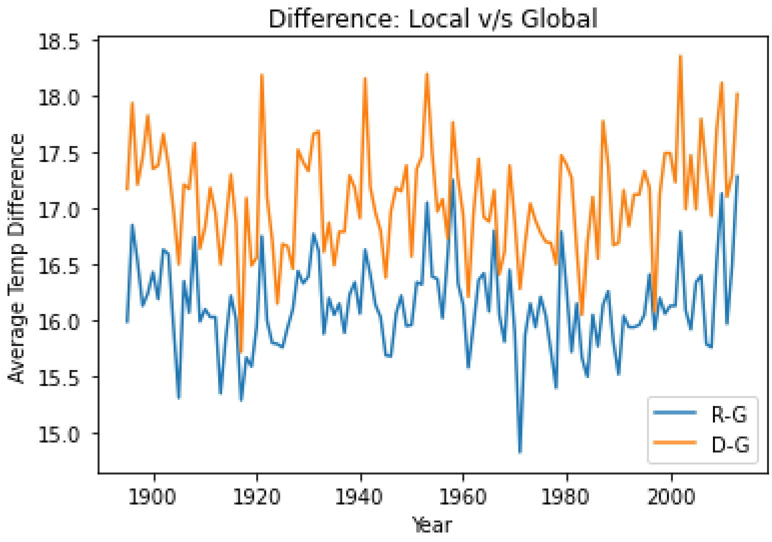
Plotting Local-Global temperature difference:

In [21]:

```
plt.plot(df_ranchi.year,df_ranchi['diff_G'],label='R-G')
plt.plot(df_delhi.year,df_delhi['diff_G'],label='D-G')
# Set the x axis label of the current axis.
plt.xlabel('Year')
# Set the y axis label of the current axis.
plt.ylabel('Average Temp Difference')
# Set a title of the current axes.
plt.title('Difference: Local v/s Global')
plt.legend()
```

Out[21]:

```
<matplotlib.legend.Legend at 0x12d979d0>
```



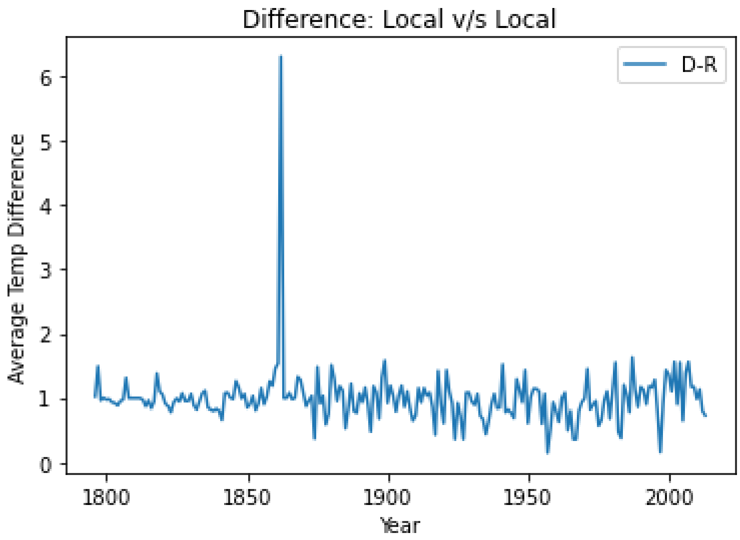
Plotting local-local temperature difference:

```
In [22]:
```

```
plt.plot(df_delhi.year,df_delhi['diff_R'],label='D-R')
# Set the x axis label of the current axis.
plt.xlabel('Year')
# Set the y axis label of the current axis.
plt.ylabel('Average Temp Difference')
# Set a title of the current axes.
plt.title('Difference: Local v/s Local')
plt.legend()
```

```
Out[22]:

<matplotlib.legend.Legend at 0x12dc8c58>
```



Calculating correlation coefficient:

Global vs Ranchi:

In [23]:

```
df_global['avg_temp'].corr(df_ranchi['avg_temp'])
```

Out[23]:

```
0.3810337379721006
```

Global vs Delhi:

In [24]:

```
df_global['avg_temp'].corr(df_delhi['avg_temp'])
```

Out[24]:

```
0.36352144051290736
```

Ranchi vs Delhi:

In [25]:

```
df_ranchi['avg_temp'].corr(df_delhi['avg_temp'])
```

Out[25]:

```
0.7281892619502837
```

Observations:

- The average temperature for Global and local have shown a linear increase in the observed years.
- The moving average temperature for Ranchi and Delhi is much greater than Global.
- Delhi and Ranchi show very similar trend for moving average temperature
- The average temperature difference for : Ranchi and Global is around 17 degrees. Delhi and Global is around 16 degrees. Ranchi and Delhi is around 1 degree.
- The correalation coeffiecient for global vs local (Ranchi and Delhi) is around 0.37 and for Delhi vs Ranchi is around 0.73