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

```python
df=pd.read_csv('C:\\Users\\bhavya\\Documents\\codanics\\challenge-1\\temperature_change_data.csv')
df.head()
```

```css
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
0	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1961	1961	°C	-0.751	Fc	Calculated data
1	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1962	1962	°C	0.985	Fc	Calculated data
2	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1963	1963	°C	1.931	Fc	Calculated data
3	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1964	1964	°C	-2.056	Fc	Calculated data
4	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1965	1965	°C	-0.669	Fc	Calculated data

```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 67625 entries, 0 to 67624
Data columns (total 14 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Domain Code       67625 non-null  object
 1   Domain            67625 non-null  object
 2   Area Code (ISO3)  67625 non-null  object
 3   Area              67625 non-null  object
 4   Element Code      67625 non-null  int64
 5   Element           67625 non-null  object
 6   Months Code       67625 non-null  int64
 7   Months            67625 non-null  object
 8   Year Code         67625 non-null  int64
 9   Year              67625 non-null  int64
 10  Unit              67625 non-null  object
 11  Value             65331 non-null  float64
 12  Flag              67625 non-null  object
 13  Flag Description  67625 non-null  object
dtypes: float64(1), int64(4), object(9)
memory usage: 7.2+ MB
```

```python
df.describe()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Element Code	Months Code	Year Code	Year	Value
count	67625.0	67625.000000	67625.000000	67625.000000	65331.000000
mean	7271.0	7018.000000	1991.306248	1991.306248	0.491524
std	0.0	1.414224	17.333343	17.333343	0.820116
min	7271.0	7016.000000	1961.000000	1961.000000	-5.979000
25%	7271.0	7017.000000	1976.000000	1976.000000	-0.011000
50%	7271.0	7018.000000	1992.000000	1992.000000	0.410000
75%	7271.0	7019.000000	2006.000000	2006.000000	0.932000
max	7271.0	7020.000000	2020.000000	2020.000000	8.206000

```
df.shape
```

```
(67625, 14)
```

```
df.isna().sum()
```

```
Domain Code         0
Domain              0
Area Code (ISO3)    0
Area                0
Element Code        0
Element             0
Months Code         0
Months              0
Year Code           0
Year                0
Unit                0
Value            2294
Flag                0
Flag Description    0
dtype: int64
```

```
df.isna().sum()/df.shape[0] *100
```

```
Domain Code        0.000000
Domain             0.000000
Area Code (ISO3)   0.000000
Area               0.000000
Element Code       0.000000
Element            0.000000
Months Code        0.000000
Months             0.000000
Year Code          0.000000
Year               0.000000
Unit               0.000000
Value              3.392237
Flag               0.000000
Flag Description   0.000000
dtype: float64
```

```
df.dropna(inplace=True)
```

```
df.isna().sum()
```

```
Domain Code         0
Domain              0
Area Code (ISO3)    0
Area                0
Element Code        0
Element             0
Months Code         0
Months              0
Year Code           0
Year                0
Unit                0
Value               0
Flag                0
Flag Description    0
dtype: int64
```

```
df.head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
0	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1961	1961	°C	-0.751	Fc	Calculated data
1	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1962	1962	°C	0.985	Fc	Calculated data
2	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1963	1963	°C	1.931	Fc	Calculated data
3	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1964	1964	°C	-2.056	Fc	Calculated data
4	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7016	Dec–Jan–Feb	1965	1965	°C	-0.669	Fc	Calculated data

```
df[['Area','Value','Year']]
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Area	Value	Year
0	Afghanistan	-0.751	1961

	Area	Value	Year
1	Afghanistan	0.985	1962
2	Afghanistan	1.931	1963
3	Afghanistan	-2.056	1964
4	Afghanistan	-0.669	1965
...	...	...	...
67620	Zimbabwe	1.470	2016
67621	Zimbabwe	0.443	2017
67622	Zimbabwe	0.747	2018
67623	Zimbabwe	1.359	2019
67624	Zimbabwe	0.820	2020

65331 rows × 3 columns

```
df['Area'].value_counts()
```

```
Afghanistan          300
Myanmar              300
Mali                 300
Malta                300
Mauritania           300
                     ...
Montenegro            75
Serbia                75
Serbia and Montenegro 70
South Sudan           50
Sudan                 50
Name: Area, Length: 247, dtype: int64
```

```
df_selected = df[df["Area"].isin(["India", "Pakistan", "Bangladesh"])]
```

```
df_selected.head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
4790	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec– Jan–Feb	1961	1961	°C	-0.041	Fc	Calculated data
4791	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec– Jan–Feb	1962	1962	°C	-1.002	Fc	Calculated data
4792	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec– Jan–Feb	1963	1963	°C	0.261	Fc	Calculated data
4793	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec– Jan–Feb	1964	1964	°C	0.113	Fc	Calculated data

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
4794	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1965	1965	°C	0.101	Fc	Calculated data

```
df_selected.groupby(by="Area").mean()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Element Code	Months Code	Year Code	Year	Value
Area					
Bangladesh	7271.0	7018.0	1990.5	1990.5	0.279613
India	7271.0	7018.0	1990.5	1990.5	0.274867
Pakistan	7271.0	7018.0	1990.5	1990.5	0.271827

```
df_selected.groupby(by="Area").agg(["min", "max", "mean"])
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead tr th {
    text-align: left;
}

.dataframe thead tr:last-of-type th {
    text-align: right;
}
```

	Element Code			Months Code			Year Code			Year			Value		
	min	max	mean	min	max	mean	min	max	mean	min	max	mean	min	max	mean
Area															
Bangladesh	7271	7271	7271.0	7016	7020	7018.0	1961	2020	1990.5	1961	2020	1990.5	-1.352	1.981	0.279613
India	7271	7271	7271.0	7016	7020	7018.0	1961	2020	1990.5	1961	2020	1990.5	-1.116	1.824	0.274867
Pakistan	7271	7271	7271.0	7016	7020	7018.0	1961	2020	1990.5	1961	2020	1990.5	-1.626	3.129	0.271827

```
IN_avg_temps = df_selected[df_selected["Area"]=="India"]["Value"]
PK_avg_temps = df_selected[df_selected["Area"]=="Pakistan"]["Value"]
BD_avg_temps = df_selected[df_selected["Area"]=="Bangladesh"]["Value"]
```

```
sns.distplot(IN_avg_temps)
sns.distplot(PK_avg_temps)
sns.distplot(BD_avg_temps)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
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  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```
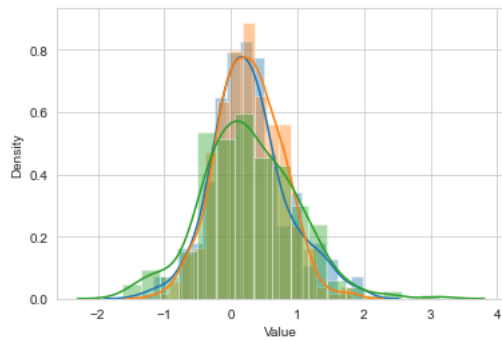
```
<AxesSubplot:xlabel='Value', ylabel='Density'>
```



```
df_selected["Area"].value_counts().index
```

```
Index(['Bangladesh', 'India', 'Pakistan'], dtype='object')
```

```
countries=df_selected['Area'].unique()
```

```
for country in countries:
    sns.distplot(df_selected[df_selected["Area"]==country]["Value"])
```
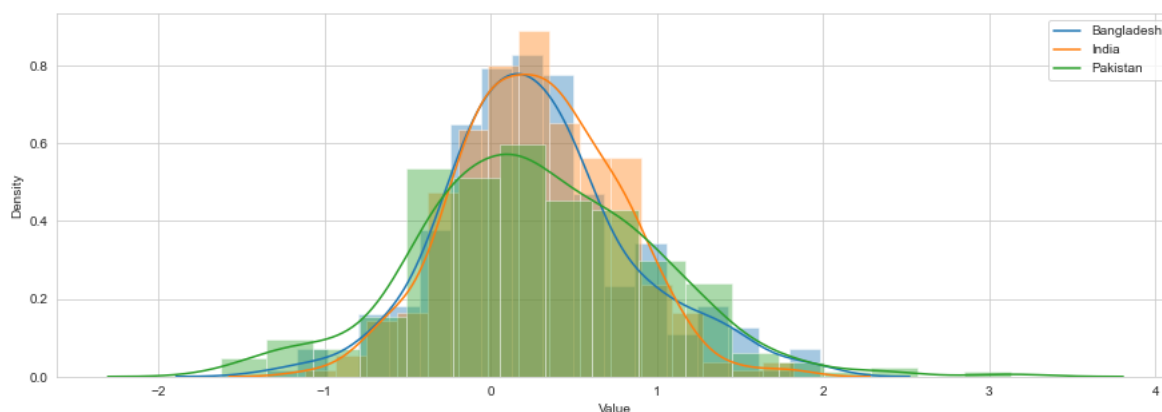
```
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```
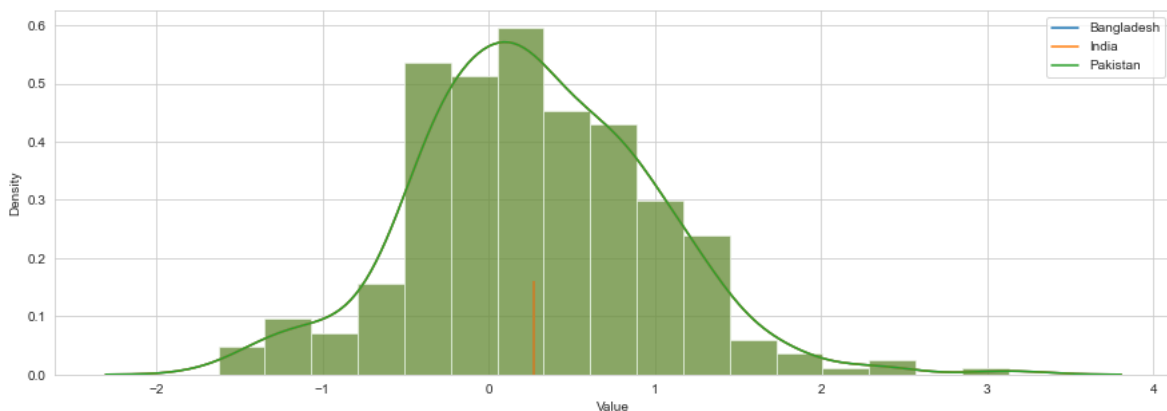
```
sns.set_style("whitegrid")
plt.figure(figsize=(15,5))

for country in countries:
    sns.distplot(df_selected[df_selected["Area"]==country]["Value"])

plt.legend(countries)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
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flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)



<matplotlib.legend.Legend at 0xf814c397f0>
```



```
sns.set_style("whitegrid")
plt.figure(figsize=(15,5))
color= ["green","blue","orange"]

for color,ulke in zip(color,countries):
    sns.distplot(df_selected[df_selected["Area"]==country]["Value"])
    countries_mean = df_selected[df_selected["Area"]==country]["Value"].mean()
    plt.vlines(countries_mean, 0, 0.16, color=color)

plt.legend(countries)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
c:\Users\bhavya\anaconda39\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function
and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

```
<matplotlib.legend.Legend at 0xf814e652e0>
```



```
df_selected.head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
4790	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1961	1961	°C	-0.041	Fc	Calculated data
4791	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1962	1962	°C	-1.002	Fc	Calculated data
4792	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1963	1963	°C	0.261	Fc	Calculated data
4793	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1964	1964	°C	0.113	Fc	Calculated data
4794	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7016	Dec–Jan–Feb	1965	1965	°C	0.101	Fc	Calculated data

```
df = df[df["Months"]=="Meteorological year"]
x = ["Area Code (ISO3)", "Domain Code","Domain","Element Code","Months Code","Year Code", "Months", "Flag Description", "Flag"]
df.rename(columns = {"Area": "Country"}, inplace = True)
```

```
#Transforming the dataset for use later in the project
df_group = df.groupby(["Country", "Year"])["Value"].mean().reset_index()
df.head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```
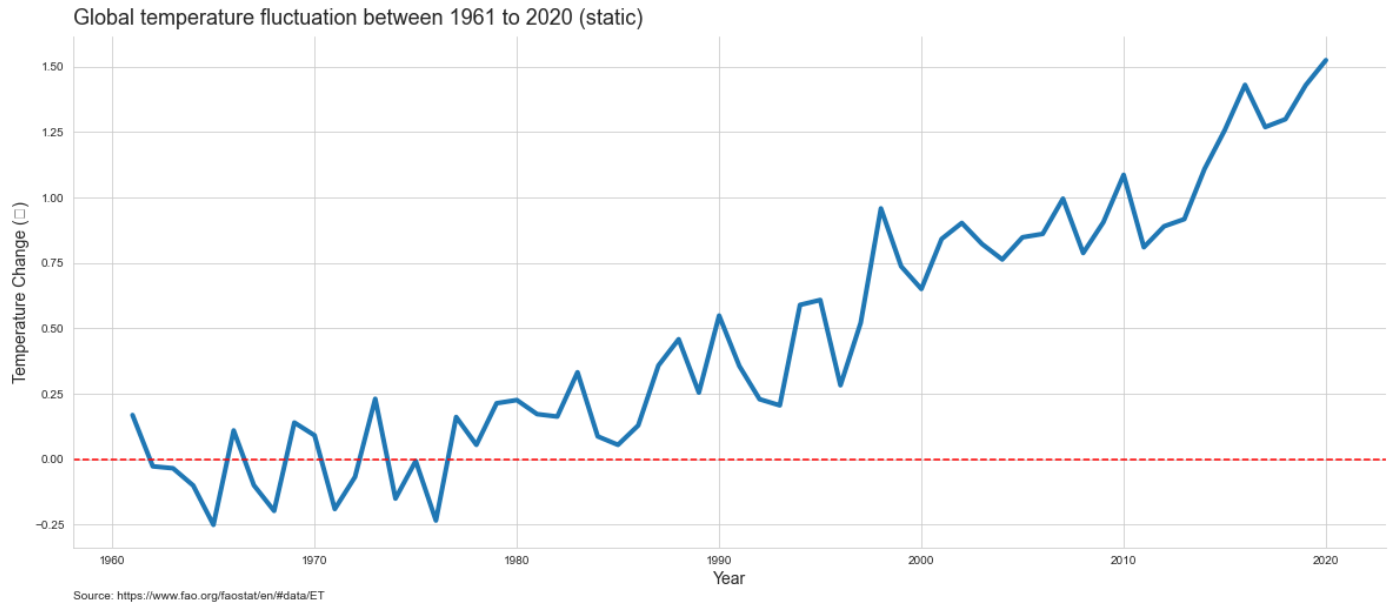
	Domain Code	Domain	Area Code (ISO3)	Country	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Descrip
240	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7020	Meteorological year	1961	1961	°C	-0.121	Fc	Calculat data
241	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7020	Meteorological year	1962	1962	°C	-0.171	Fc	Calculat data
242	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7020	Meteorological year	1963	1963	°C	0.841	Fc	Calculat data
243	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7020	Meteorological year	1964	1964	°C	-0.779	Fc	Calculat data
244	ET	Temperature change	AFG	Afghanistan	7271	Temperature change	7020	Meteorological year	1965	1965	°C	-0.254	Fc	Calculat data

```
#Construct visualisation
plt.figure(figsize=(20,8))
sns.lineplot(x = "Year",  y = "Value", data = Global, lw = 4)

#Customisation
plt.axhline(0, ls = "--", color = "red")
plt.title("Global temperature fluctuation between 1961 to 2020 (static)", fontsize = 18, loc='left', y = 1.01)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```
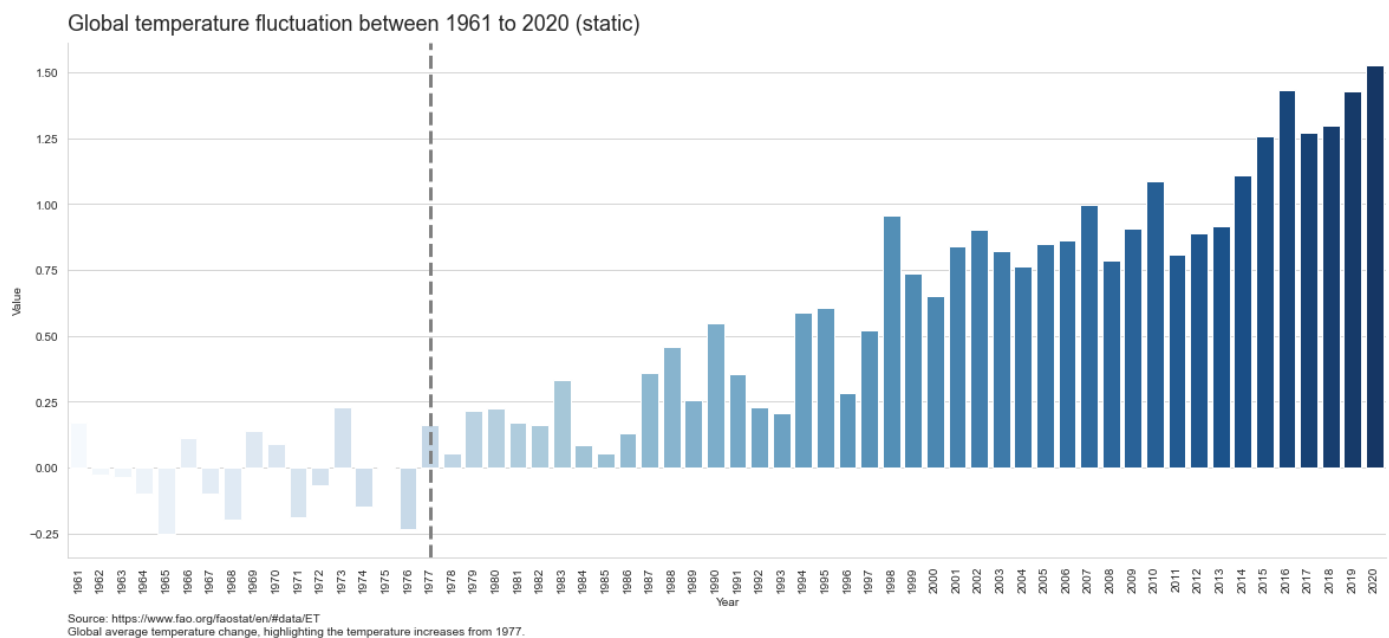
Global temperature fluctuation between 1961 to 2020 (static)

Source: https://www.fao.org/faostat/en/#data/ET

```
#Construct visualisation
plt.figure(figsize=(20,8))
fig = sns.barplot(x ="Year", y = "Value", data = Global, palette = "Blues")

#Customisation
plt.axvline(16, ls = "--", color = "grey", lw= 3)
fig.tick_params(axis='x', rotation=90)
plt.title("Global temperature fluctuation between 1961 to 2020 (static)", fontsize = 18, loc='left',   y = 1.01)

plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET \nGlobal average temperature change, highlighting the temperature
increases from 1977. ', (0,-.15), xycoords ='axes fraction' )

sns.despine(top = True, right = True, left = False, bottom = False)
```


Global temperature fluctuation between 1961 to 2020 (static)

Source: https://www.fao.org/faostat/en/#data/ET
Global average temperature change, highlighting the temperature increases from 1977.

```
#Construct visualisation
plt.figure(figsize=(20,3))
sns.boxplot( x = "Value", data =Global, color = "seagreen")

#Customisation
plt.title("Distribution of the global temperature fluctuations", fontsize = 18,loc='left',   y = 1.01)
plt.title("Distribution of the global temperature fluctuations", fontsize = 18,loc='left')
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.3), xycoords ='axes fraction' )

sns.despine(top = True, right = True, left = True, bottom = False)
```

Distribution of the global temperature fluctuations

Source: https://www.fao.org/faostat/en/#data/ET
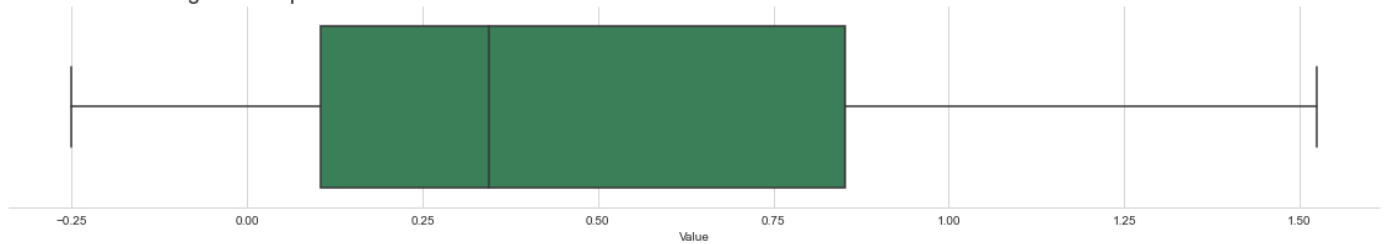
```
#Restructure data for visualisation
df_group["Country"].replace("United Kingdom of Great Britain and Northern Ireland", "UK", inplace= True)
df_group["Country"].replace("United States of America", "USA", inplace= True)

g7_countries = ( "UK", "USA", "Canada", "Japan", "Germany", "France", "Italy")

g7 = df_group[df_group['Country'].isin(g7_countries)]
G7Overview = g7.groupby("Year")["Value"].mean().reset_index()
```

```
#Construct visualisation
plt.figure(figsize=(20,8))
sns.lineplot( x="Year", y= "Value", data = G7Overview, lw = 3)

#Customisation
plt.axhline(0, ls = "--", color = "red")

plt.title("Temperature fluctuations for the G7 nations between 1961 to 2020 (static)", fontsize = 18, loc='left', y = 1.01)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
sns.despine(top = True, right = True, left = False, bottom = False)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )

plt.show()
```
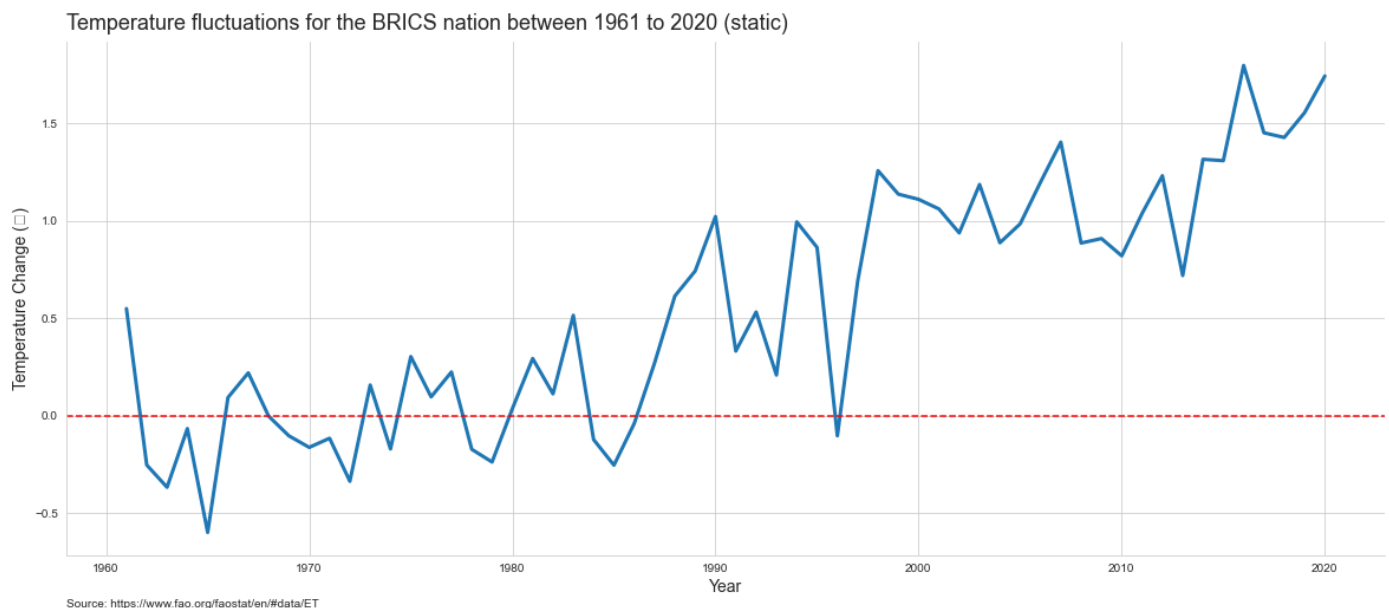
```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Temperature fluctuations for the G7 nations between 1961 to 2020 (static)

Source: https://www.fao.org/faostat/en/#data/ET

```
#Restructure data for visualisation

BRICS_countries= ( "Brazil", "Russia", "India", "China", "South Africa")

BRICS = df_group[df_group['Country'].isin(BRICS_countries)]
BRICS_Overview = g7.groupby("Year")["Value"].mean().reset_index()
```

```
#Construct visualisation
plt.figure(figsize=(20,8))
sns.lineplot( x="Year", y= "Value", data = G7Overview, lw = 3)

#Customisation
plt.axhline(0, ls = "--", color = "red")

plt.title("Temperature fluctuations for the BRICS nation between 1961 to 2020 (static)", fontsize = 18, loc='left', y = 1.01)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
sns.despine(top = True, right = True, left = False, bottom = False)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )

plt.show()
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Temperature fluctuations for the BRICS nation between 1961 to 2020 (static)

```
#Restructure data for visualisation
data = BRICS[BRICS["Country"].isin(("India", "China"))]

#Construct visualisation
plt.figure(figsize=(20,8))
sns.lineplot(data = data, x="Year", y = "Value", hue = "Country", lw=3, palette = "Paired")

#Customisation
plt.title("Temperature fluctuation for India and China between 1961 to 2020", fontsize = 18, loc='left', y = 1.01)
plt.axhline(0, ls = "--", color = "red")
plt.legend(title = "Country", bbox_to_anchor=(1.01, 1), loc='upper left', borderaxespad=0)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
plt.legend(loc="upper center", ncol = len(data["Country"]) )
```
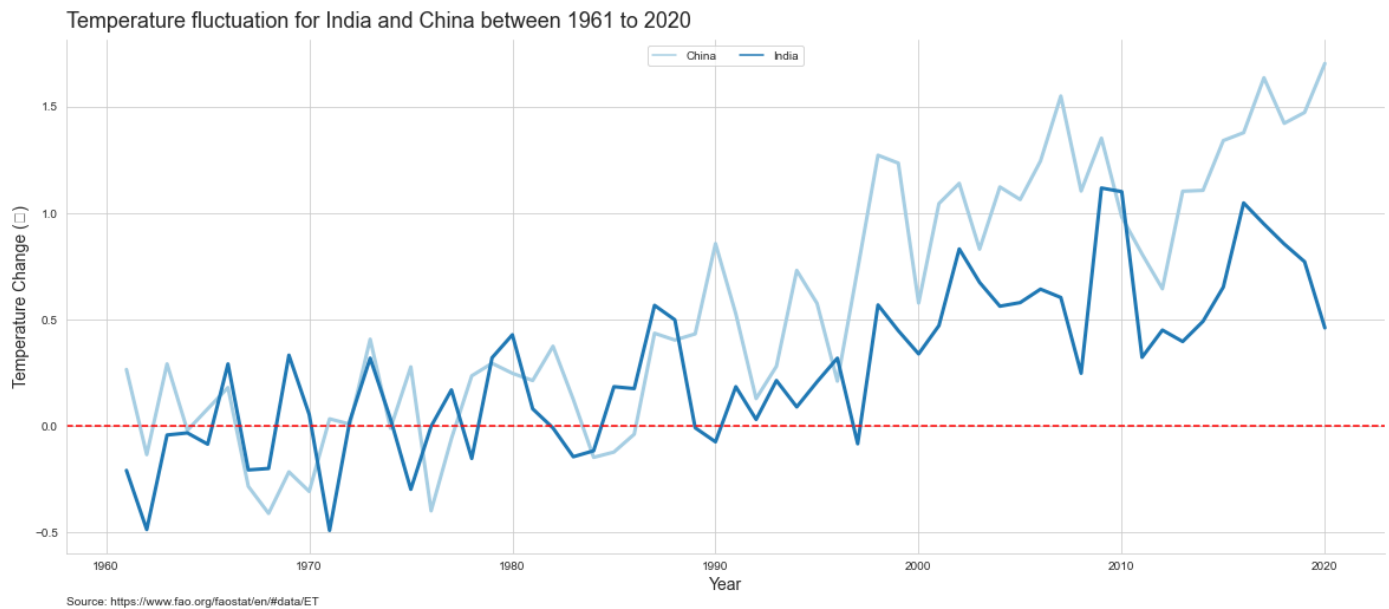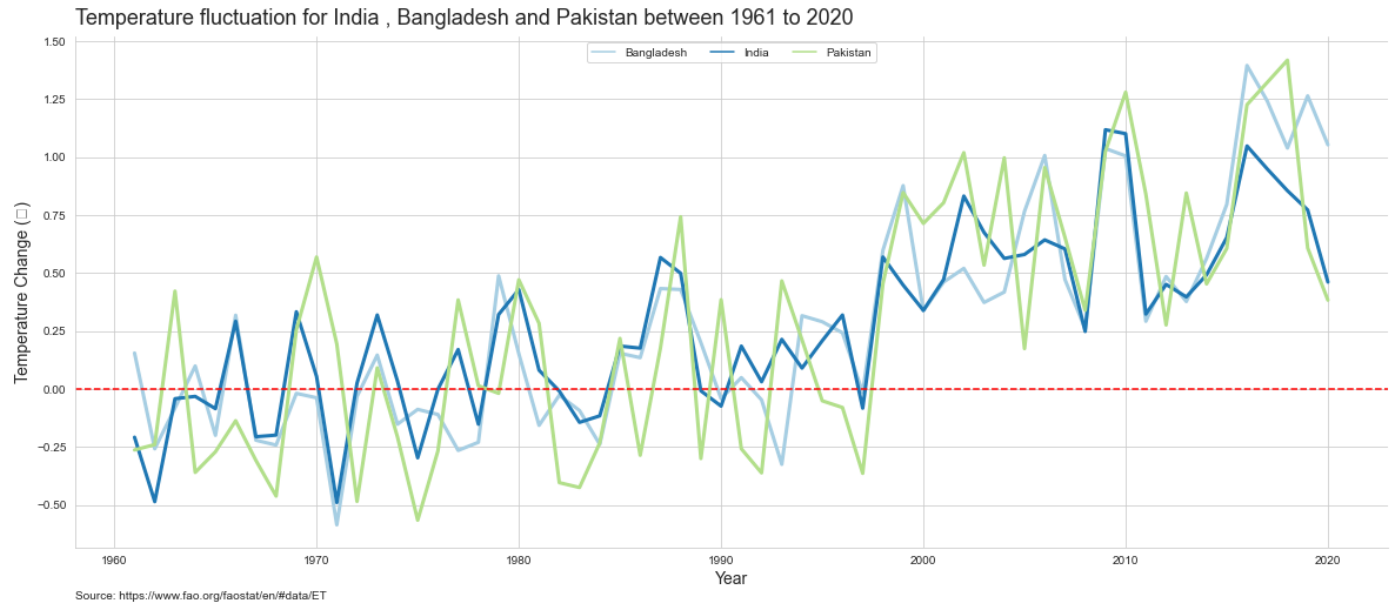
```
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Temperature fluctuation for India and China between 1961 to 2020

```
#Restructure data for visualisation
data = df[df["Country"].isin(("India", "Bangladesh", "Pakistan"))]

#Construct visualisation
plt.figure(figsize=(20,8))
sns.lineplot(data = data, x="Year", y = "Value", hue = "Country", lw=3, palette = "Paired")


#Customisation
plt.title("Temperature fluctuation for India , Bangladesh and Pakistan between 1961 to 2020", fontsize = 18, loc='left', y =
1.01)
plt.axhline(0, ls = "--", color = "red")
plt.legend(title = "Country", bbox_to_anchor=(1.01, 1), loc='upper left', borderaxespad=0)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
plt.legend(loc="upper center", ncol = len(data["Country"]) )

sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Temperature fluctuation for India , Bangladesh and Pakistan between 1961 to 2020
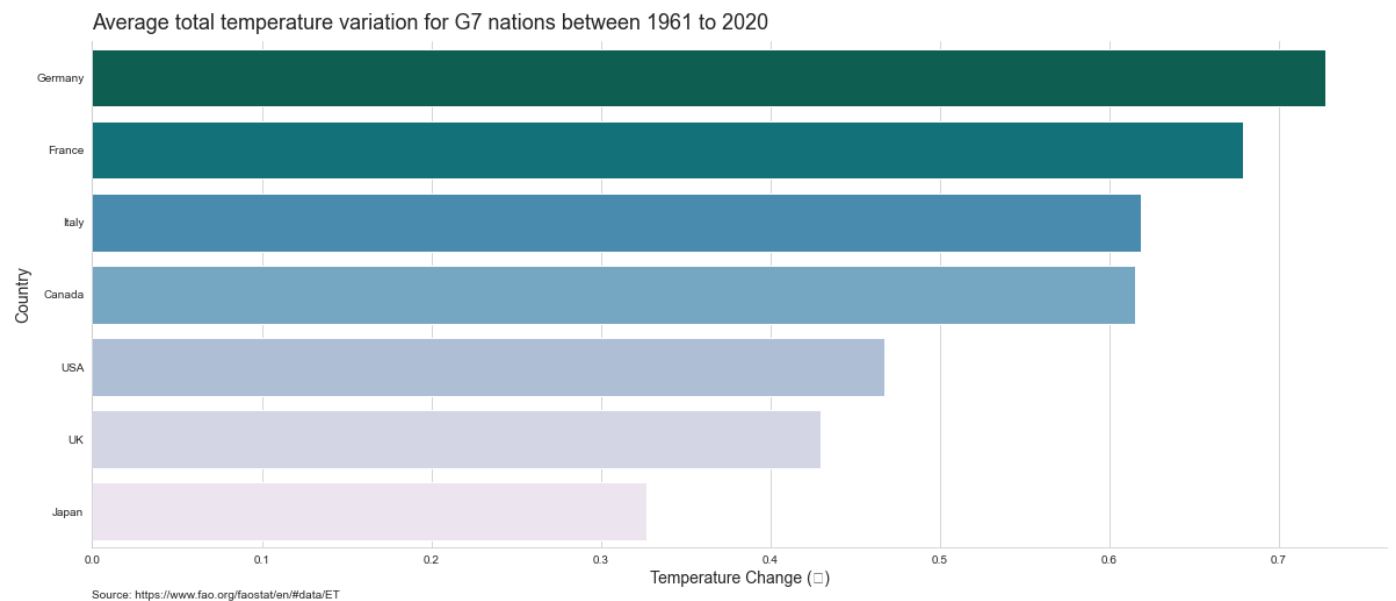

Source: https://www.fao.org/faostat/en/#data/ET

```
#Restructure data for visualisation
g7_pivot = pd.pivot_table(g7, index = ["Country"], columns=["Year"], values = ["Value"])
g7_pivot["Total variation"] = g7_pivot.mean(axis=1)
g7_pivot.reset_index(inplace = True)

#Construct visualisation
plt.figure(figsize= (20,8))
sns.barplot(y = "Country", x = "Total variation", data =g7_pivot, palette = "PuBuGn_r", order = g7_pivot.sort_values("Total
variation", ascending = False)["Country"])

#Customisation
plt.title("Average total temperature variation for G7 nations between 1961 to 2020", fontsize = 18, loc='left', y = 1.01)


plt.ylabel("Country", fontsize=14)
plt.xlabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Average total temperature variation for G7 nations between 1961 to 2020
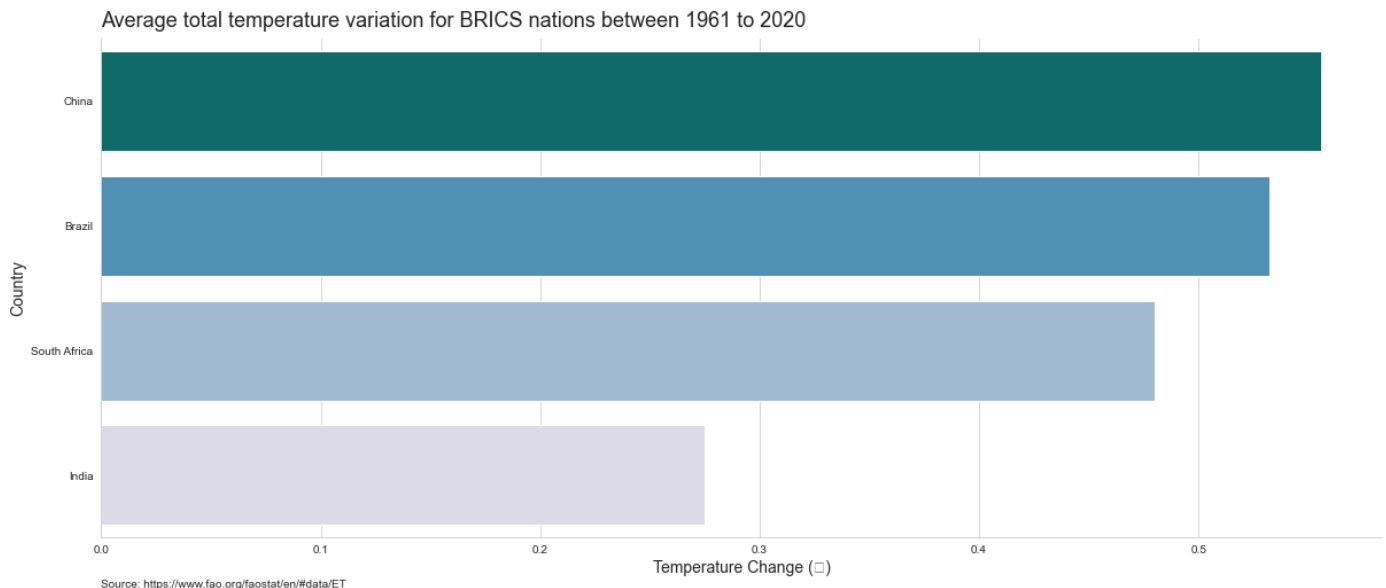

Source: https://www.fao.org/faostat/en/#data/ET

```
#Restructure data for visualisation
BRICS_pivot = pd.pivot_table(BRICS, index = ["Country"], columns=["Year"], values = ["Value"])
BRICS_pivot["Total variation"] = BRICS_pivot.mean(axis=1)
BRICS_pivot.reset_index(inplace = True)

#Construct visualisation
plt.figure(figsize= (20,8))
sns.barplot(y = "Country", x = "Total variation", data =BRICS_pivot, palette = "PuBuGn_r", order =
BRICS_pivot.sort_values("Total variation", ascending = False)["Country"])

#Customisation
plt.title("Average total temperature variation for BRICS nations between 1961 to 2020", fontsize = 18, loc='left', y = 1.01)


plt.ylabel("Country", fontsize=14)
plt.xlabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```



```
#Restructure data for visualisation
IPB = df[df["Country"].isin(("India", "Bangladesh", "Pakistan"))]
```
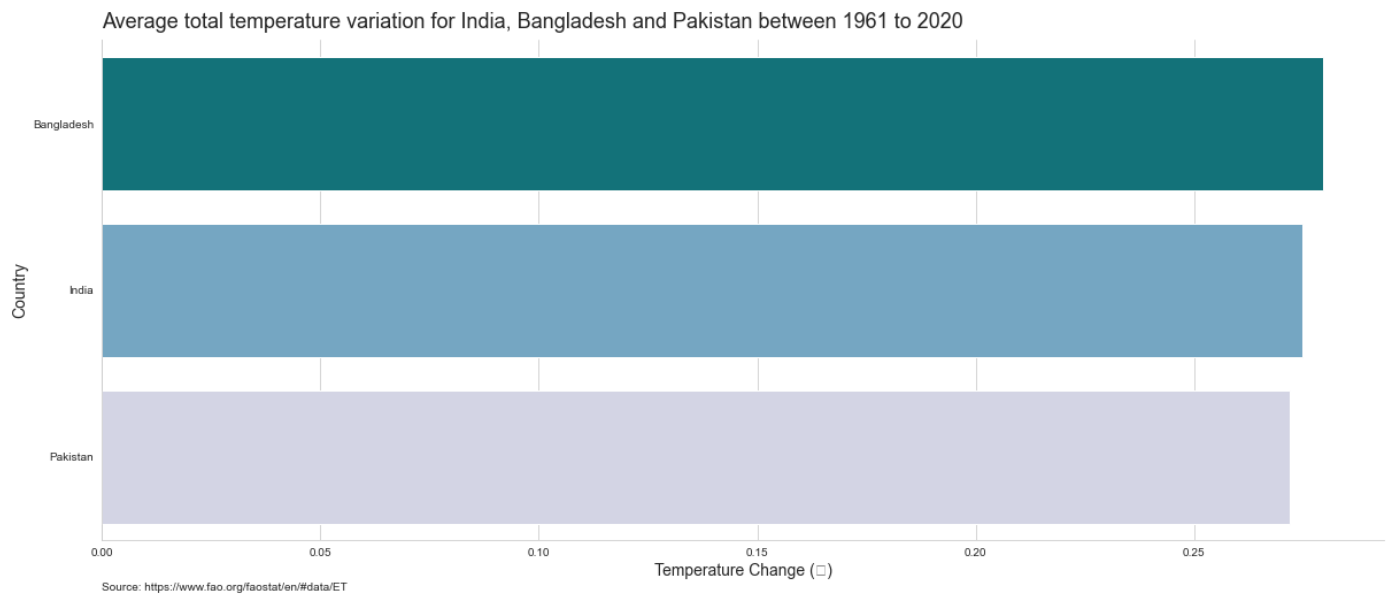
```
#Restructure data for visualisation
IPB_pivot = pd.pivot_table(IPB, index = ["Country"], columns=["Year"], values = ["Value"])
IPB_pivot["Total variation"] = IPB_pivot.mean(axis=1)
IPB_pivot.reset_index(inplace = True)

#Construct visualisation
plt.figure(figsize= (20,8))
sns.barplot(y = "Country", x = "Total variation", data =IPB_pivot, palette = "PuBuGn_r", order = IPB_pivot.sort_values("Total
variation", ascending = False)["Country"])

#Customisation
plt.title("Average total temperature variation for India, Bangladesh and Pakistan between 1961 to 2020", fontsize = 18,
loc='left', y = 1.01)


plt.ylabel("Country", fontsize=14)
plt.xlabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Average total temperature variation for India, Bangladesh and Pakistan between 1961 to 2020


```
South_Asia = ["Afghanistan", "Bangladesh", "Bhutan", "India", "Maldives", "Nepal", "Pakistan", "Sri Lanka"]
```
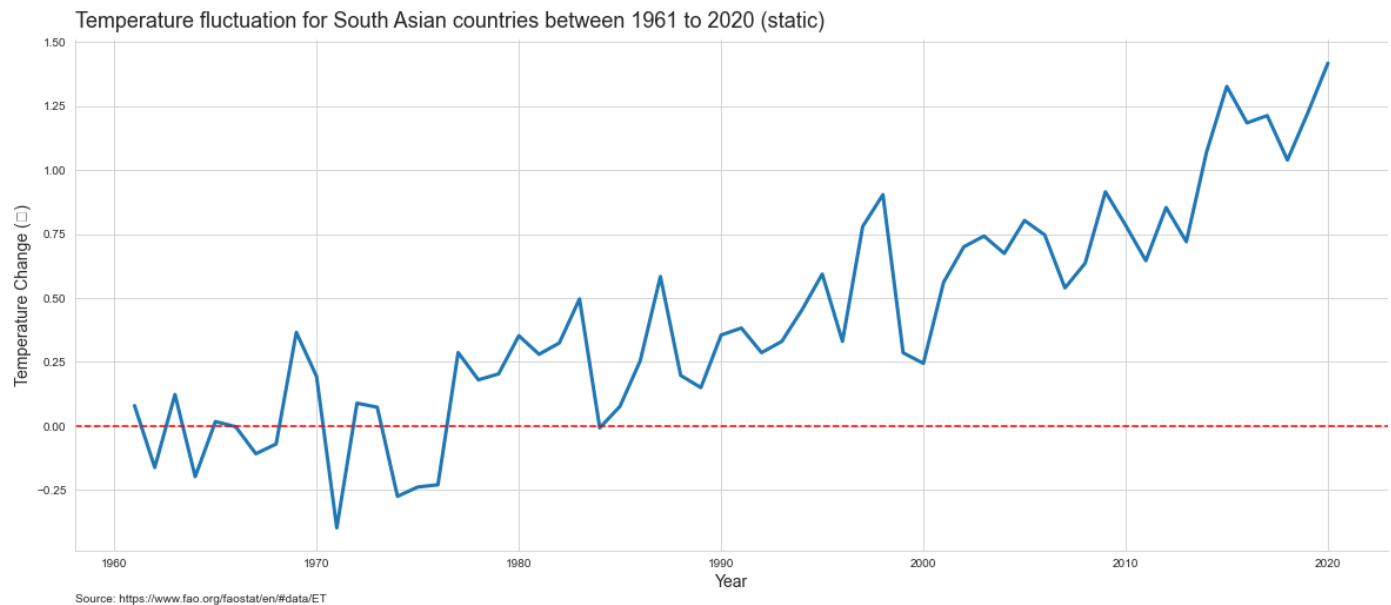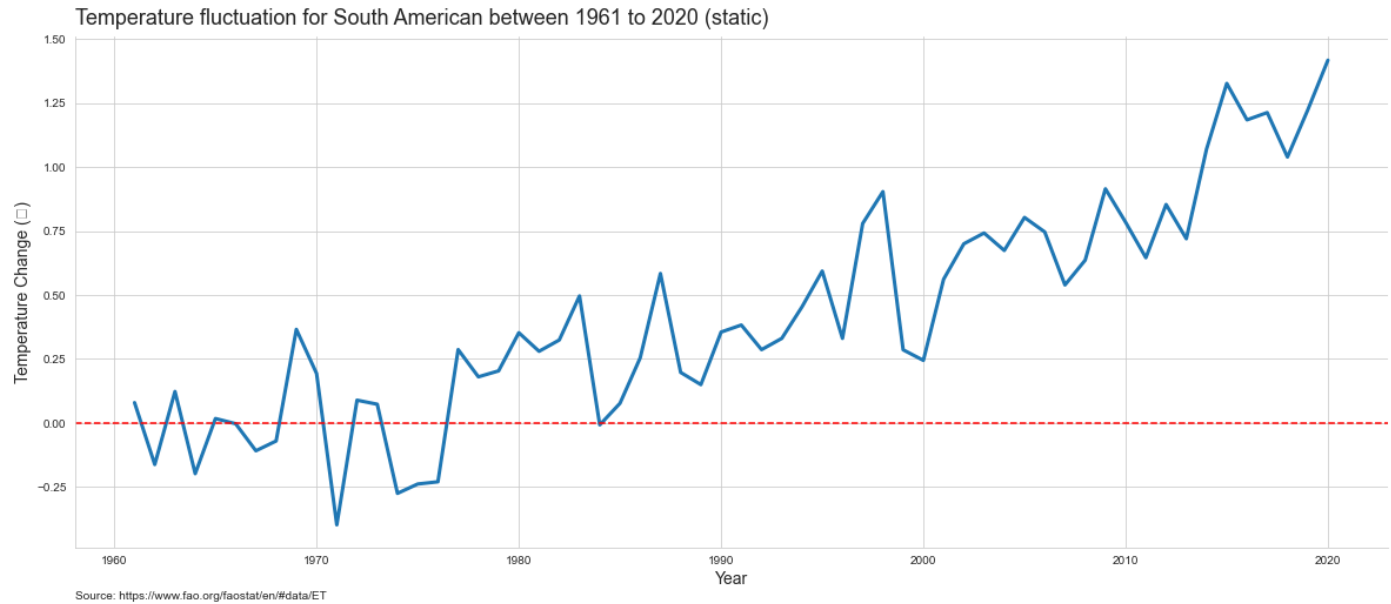
```
#Construct visualisation
plt.figure(figsize = (20,8))
sns.lineplot(x = "Year", y = "Value", data = SA, markers = "o", lw = 3)

#Customisation
plt.axhline(0, ls = "--", color = "red")

plt.title("Temperature fluctuation for South Asian countries between 1961 to 2020 (static)", fontsize = 18, loc='left', y =
1.01)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Temperature fluctuation for South Asian countries between 1961 to 2020 (static)

Source: https://www.fao.org/faostat/en/#data/ET

```
South_America = ["Argentina","Bolivia","Brazil","Chile","Colombia","Ecuador","French Guyana",
                 "Guyana","Paraguay","Peru","Suriname","Uruguay","Venezuela"]
# https://www.britannica.com/topic/list-of-countries-in-Latin-America-2061416
```

```
#Construct visualisation
plt.figure(figsize = (20,8))
sns.lineplot(x = "Year", y = "Value", data = SA, markers = "o", lw = 3)

#Customisation
plt.axhline(0, ls = "--", color = "red")

plt.title("Temperature fluctuation for South American between 1961 to 2020 (static)", fontsize = 18, loc='left', y = 1.01)

plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Temperature fluctuation for South American between 1961 to 2020 (static)

Source: https://www.fao.org/faostat/en/#data/ET

```
#Restructure data for visualisation
South_America_pivot = pd.pivot_table(South_America, index = ["Country"], columns=["Year"], values = ["Value"])
South_America_pivot["Total variation"] = South_America_pivot.mean(axis=1)
South_America_pivot.reset_index(inplace = True)

#Construct visualisation
plt.figure(figsize= (20,8))
sns.barplot(y = "Country", x = "Total variation", data =South_America_pivot,
            palette = "PuBuGn_r", order = South_America_pivot.sort_values("Total variation", ascending = False)["Country"])

#Customisation
plt.ylabel("Country", fontsize=14)
plt.xlabel("Temperature Change (℃)", fontsize=14)

plt.title("Average total temperature fluctuation for South American countries between 1961 to 2020",
          fontsize = 18, loc='left', y = 1.01)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```

Average total temperature fluctuation for South American countries between 1961 to 2020

Source: https://www.fao.org/faostat/en/#data/ET
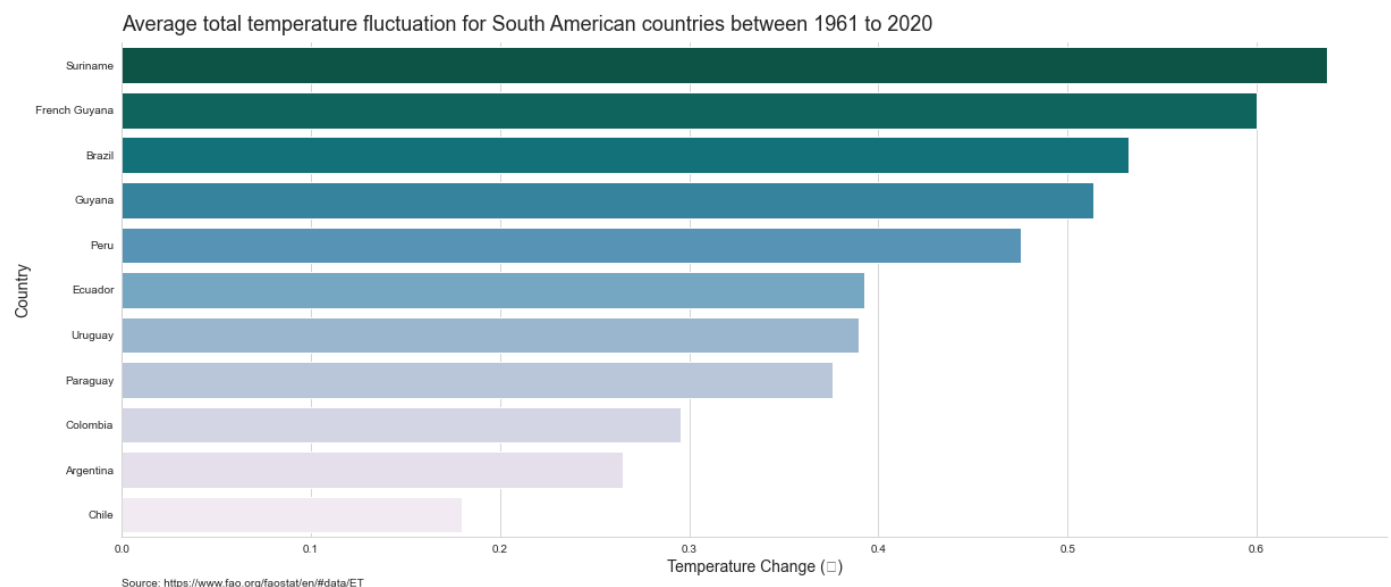
```
#Construct visualisation
plt.figure(figsize= (20,6))
sns.boxplot(x = "Country", y = "Value", data = South_America, palette = "PuBuGn_r",
            order = South_America_pivot.sort_values("Total variation", ascending = True)["Country"])

#Customisation
plt.axhline(0, ls = "--", color = "red")
plt.xlabel("Country", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)

plt.title("Box plot distribution of the temperature fluctuations for South American nations", fontsize = 18, loc='left', y =
1.01)
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )

sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Box plot distribution of the temperature fluctuations for South American nations
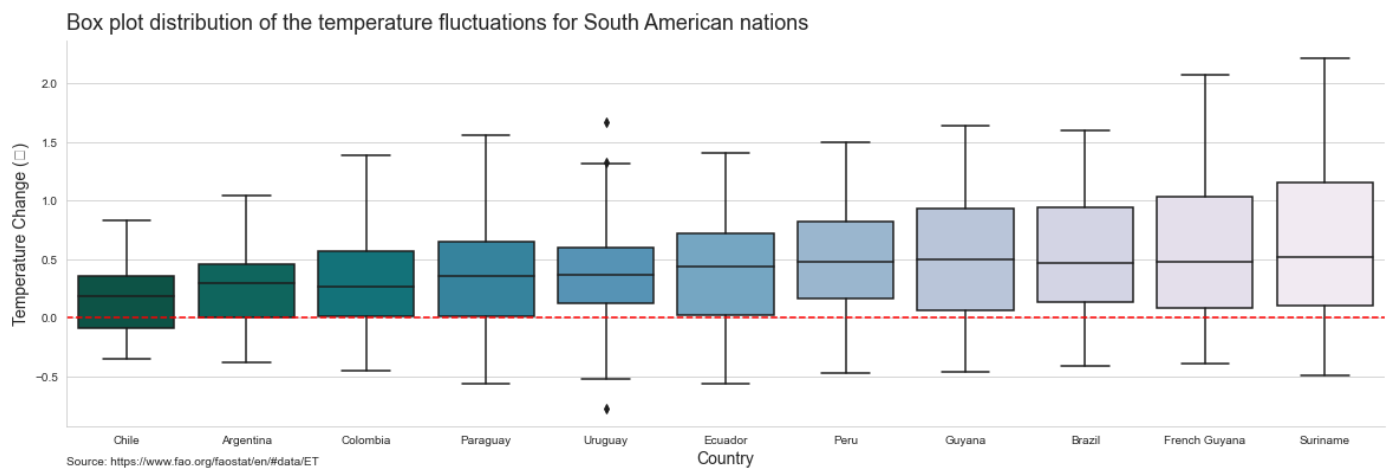
```
df_pivot = pd.pivot_table(df_group, index = ["Country"], columns=["Year"], values = ["Value"])
df_pivot["Total variation"] = df_pivot.mean(axis=1)
df_pivot.reset_index(inplace = True)


data = dict(
        type = 'choropleth',
        colorscale = 'temps',
        reversescale = False,
        locations = df_pivot["Country"],
        locationmode = "country names",
        z = df_pivot['Total variation'],
        text = df_pivot["Country"],
        colorbar = {'title' : 'Total variation'},
     )

layout = dict(title = 'Choromap of average temperature for countries between 1961 to 2020', geo = dict(showframe = False,
projection = {'type':'mercator'})
            )
```

Understanding the dataset

```
data = pd.read_csv("C:\\Users\\bhavya\\Documents\\codanics\\challenge-1\\temperature_change_data.csv")
data.columns
```

```
Index(['Domain Code', 'Domain', 'Area Code (ISO3)', 'Area', 'Element Code',
       'Element', 'Months Code', 'Months', 'Year Code', 'Year', 'Unit',
       'Value', 'Flag', 'Flag Description'],
      dtype='object')
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 67625 entries, 0 to 67624
Data columns (total 14 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   Domain Code       67625 non-null  object
 1   Domain            67625 non-null  object
 2   Area Code (ISO3)  67625 non-null  object
 3   Area              67625 non-null  object
 4   Element Code      67625 non-null  int64
 5   Element           67625 non-null  object
 6   Months Code       67625 non-null  int64
 7   Months            67625 non-null  object
 8   Year Code         67625 non-null  int64
 9   Year              67625 non-null  int64
 10  Unit              67625 non-null  object
 11  Value             65331 non-null  float64
 12  Flag              67625 non-null  object
 13  Flag Description  67625 non-null  object
dtypes: float64(1), int64(4), object(9)
memory usage: 7.2+ MB
```

```
data[data["Value"].isnull()].head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

	Domain Code	Domain	Area Code (ISO3)	Area	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Description
937	ET	Temperature change	ASM	American Samoa	7271	Temperature change	7016	Dec–Jan–Feb	1998	1998	°C	NaN	NV	Data not available
949	ET	Temperature change	ASM	American Samoa	7271	Temperature change	7016	Dec–Jan–Feb	2010	2010	°C	NaN	NV	Data not available
996	ET	Temperature change	ASM	American Samoa	7271	Temperature change	7017	Mar–Apr–May	1997	1997	°C	NaN	NV	Data not available
997	ET	Temperature change	ASM	American Samoa	7271	Temperature change	7017	Mar–Apr–May	1998	1998	°C	NaN	NV	Data not available
1056	ET	Temperature change	ASM	American Samoa	7271	Temperature change	7018	Jun–Jul–Aug	1997	1997	°C	NaN	NV	Data not available

```
x = ((data["Value"].isnull().sum()/len(data))*100).round(1)

print ("Approx", x, "% of data in the Value variable are null values.")
```

```
Approx 3.4 % of data in the Value variable are null values.
```

```python
data.drop(data[data["Value"].isnull()].index, axis = 0, inplace = True)
```

```python
data["Months"].value_counts()
```

```
Dec-Jan-Feb          13080
Mar-Apr-May          13077
Jun-Jul-Aug          13069
Sep-Oct-Nov          13061
Meteorological year  13044
Name: Months, dtype: int64
```

```python
data = data[data["Months"]=="Meteorological year"]
```

```python
df_group = data.groupby(["Area", "Year"])["Value"].mean().reset_index()

print ("Oldest entry - ", df_group["Year"].min())
```

```
Oldest entry -  1961
```

```python
print ("Newest entry - ", df_group["Year"].max())
```

```
Newest entry -  2020
```

```python
x = df_group["Year"].to_numpy()
print ( "The dataset contains records for", np.ptp(x), "years, starting from", df_group["Year"].min(), "to",
df_group["Year"].max())
```

```
The dataset contains records for 59 years, starting from 1961 to 2020
```

```python
x = (df_group["Year"].max() +1) - df_group["Year"].min() == df_group["Year"].nunique()

print( "Are there Values for for every year between 1961 and 2020?", x)
```

```
Are there Values for for every year between 1961 and 2020? True
```

```python
data["Area"].unique()
```

```
array(['Afghanistan', 'Albania', 'Algeria', 'American Samoa', 'Andorra',
       'Angola', 'Anguilla', 'Antarctica', 'Antigua and Barbuda',
       'Argentina', 'Armenia', 'Aruba', 'Australia', 'Austria',
       'Azerbaijan', 'Bahamas', 'Bahrain', 'Bangladesh', 'Barbados',
       'Belarus', 'Belgium', 'Belgium-Luxembourg', 'Belize', 'Benin',
       'Bhutan', 'Bolivia (Plurinational State of)',
       'Bosnia and Herzegovina', 'Botswana', 'Brazil',
       'British Virgin Islands', 'Brunei Darussalam', 'Bulgaria',
```

```
        'Burkina Faso', 'Burundi', 'Cabo Verde', 'Cambodia', 'Cameroon',
        'Canada', 'Cayman Islands', 'Central African Republic', 'Chad',
        'Channel Islands', 'Chile', 'China', 'China, Hong Kong SAR',
        'China, Macao SAR', 'China, mainland', 'China, Taiwan Province of',
        'Christmas Island', 'Cocos (Keeling) Islands', 'Colombia',
        'Comoros', 'Congo', 'Cook Islands', 'Costa Rica', "Côte d'Ivoire",
        'Croatia', 'Cuba', 'Cyprus', 'Czechia', 'Czechoslovakia',
        "Democratic People's Republic of Korea",
        'Democratic Republic of the Congo', 'Denmark', 'Djibouti',
        'Dominica', 'Dominican Republic', 'Ecuador', 'Egypt',
        'El Salvador', 'Equatorial Guinea', 'Eritrea', 'Estonia',
        'Eswatini', 'Ethiopia', 'Ethiopia PDR',
        'Falkland Islands (Malvinas)', 'Faroe Islands', 'Fiji', 'Finland',
        'France', 'French Guyana', 'French Polynesia',
        'French Southern Territories', 'Gabon', 'Gambia', 'Georgia',
        'Germany', 'Ghana', 'Gibraltar', 'Greece', 'Greenland', 'Grenada',
        'Guadeloupe', 'Guatemala', 'Guinea', 'Guinea-Bissau', 'Guyana',
        'Haiti', 'Holy See', 'Honduras', 'Hungary', 'Iceland', 'India',
        'Indonesia', 'Iran (Islamic Republic of)', 'Iraq', 'Ireland',
        'Isle of Man', 'Israel', 'Italy', 'Jamaica', 'Japan', 'Jordan',
        'Kazakhstan', 'Kenya', 'Kiribati', 'Kuwait', 'Kyrgyzstan',
        "Lao People's Democratic Republic", 'Latvia', 'Lebanon', 'Lesotho',
        'Liberia', 'Libya', 'Liechtenstein', 'Lithuania', 'Luxembourg',
        'Madagascar', 'Malawi', 'Malaysia', 'Maldives', 'Mali', 'Malta',
        'Marshall Islands', 'Martinique', 'Mauritania', 'Mauritius',
        'Mayotte', 'Mexico', 'Micronesia (Federated States of)',
        'Midway Island', 'Monaco', 'Mongolia', 'Montenegro', 'Montserrat',
        'Morocco', 'Mozambique', 'Myanmar', 'Namibia', 'Nauru', 'Nepal',
        'Netherlands', 'Netherlands Antilles (former)', 'New Caledonia',
        'New Zealand', 'Nicaragua', 'Niger', 'Nigeria', 'Niue',
        'Norfolk Island', 'North Macedonia', 'Norway', 'Oman',
        'Pacific Islands Trust Territory', 'Pakistan', 'Palau',
        'Palestine', 'Panama', 'Papua New Guinea', 'Paraguay', 'Peru',
        'Philippines', 'Pitcairn', 'Poland', 'Portugal', 'Puerto Rico',
        'Qatar', 'Republic of Korea', 'Republic of Moldova', 'Réunion',
        'Romania', 'Russian Federation', 'Rwanda',
        'Saint Helena, Ascension and Tristan da Cunha',
        'Saint Kitts and Nevis', 'Saint Lucia',
        'Saint Pierre and Miquelon', 'Saint Vincent and the Grenadines',
        'Samoa', 'San Marino', 'Sao Tome and Principe', 'Saudi Arabia',
        'Senegal', 'Serbia', 'Serbia and Montenegro', 'Seychelles',
        'Sierra Leone', 'Singapore', 'Slovakia', 'Slovenia',
        'Solomon Islands', 'Somalia', 'South Africa',
        'South Georgia and the South Sandwich Islands', 'South Sudan',
        'Spain', 'Sri Lanka', 'Sudan', 'Sudan (former)', 'Suriname',
        'Svalbard and Jan Mayen Islands', 'Sweden', 'Switzerland',
        'Syrian Arab Republic', 'Tajikistan', 'Thailand', 'Timor-Leste',
        'Togo', 'Tokelau', 'Tonga', 'Trinidad and Tobago', 'Tunisia',
        'Turkey', 'Turkmenistan', 'Turks and Caicos Islands', 'Tuvalu',
        'Uganda', 'Ukraine', 'United Arab Emirates',
        'United Kingdom of Great Britain and Northern Ireland',
        'United Republic of Tanzania', 'United States of America',
        'United States Virgin Islands', 'Uruguay', 'USSR', 'Uzbekistan',
        'Vanuatu', 'Venezuela (Bolivarian Republic of)', 'Viet Nam',
        'Wake Island', 'Wallis and Futuna Islands', 'Western Sahara',
        'Yemen', 'Yugoslav SFR', 'Zambia', 'Zimbabwe'], dtype=object)
```

```python
data.rename(columns = {"Area": "Country"}, inplace = True)
```

```python
x = data[data["Country"]== "USSR"]["Year"].max()
print ("Most recent record for USSR is", x)
```

```
Most recent record for USSR is 1991
```

```python
data["Country"].value_counts()
```

```
Afghanistan             60
Mali                    60
Martinique              60
Mauritania              60
Mauritius               60
                        ..
Montenegro              15
Serbia                  15
Serbia and Montenegro   14
Sudan                   10
South Sudan             10
Name: Country, Length: 247, dtype: int64
```

```python
#Restructure data for visualisation
limited_values = data["Area Code (ISO3)"].value_counts().tail().rename_axis('Country').reset_index(name='counts')
limited_values = data[data['Area Code (ISO3)'].isin(limited_values["Country"])]

#Construct visualisation
plt.figure(figsize =(20,10))
sns.lineplot(data = limited_values, x="Year", y = "Value", hue = "Country", palette = "crest",style = "Country", lw= 3)

#Customisation
plt.title("Temperature fluctuations for nations with limited data", fontsize = 18, loc='left', y = 1.01)
plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (℃)", fontsize=14)

plt.axhline(0, ls = "--", color = "red")
plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```
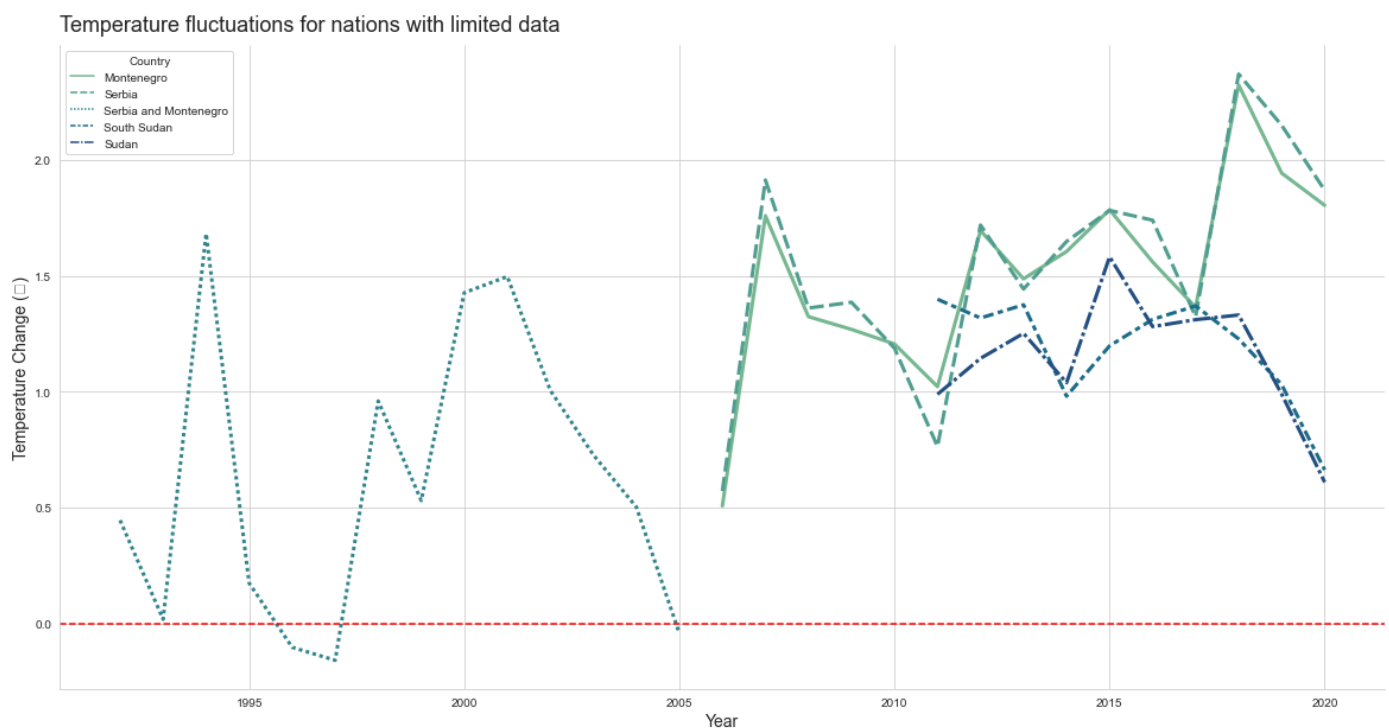
```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Temperature fluctuations for nations with limited data

Source: https://www.fao.org/faostat/en/#data/ET

```python
data["Value"].describe()
```

```
count    13044.000000
mean         0.491651
std          0.649765
min         -3.251000
25%          0.032000
50%          0.415500
75%          0.882000
max          5.328000
Name: Value, dtype: float64
```

```python
#Construct visualisation
plt.figure(figsize = (20,6))
fig = sns.histplot(x = "Value", data = data, kde= True, bins = 50,)

#Customisation
plt.title("Frequency distribution of yearly temperature changes", fontsize = 18, loc='left', y = 1.01)
plt.axvline(0, ls = "--", color = "red", lw= 3)

plt.xlabel("Temperature Change (℃)", fontsize=14)
plt.ylabel("Frequency", fontsize=14)
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Frequency distribution of yearly temperature changes
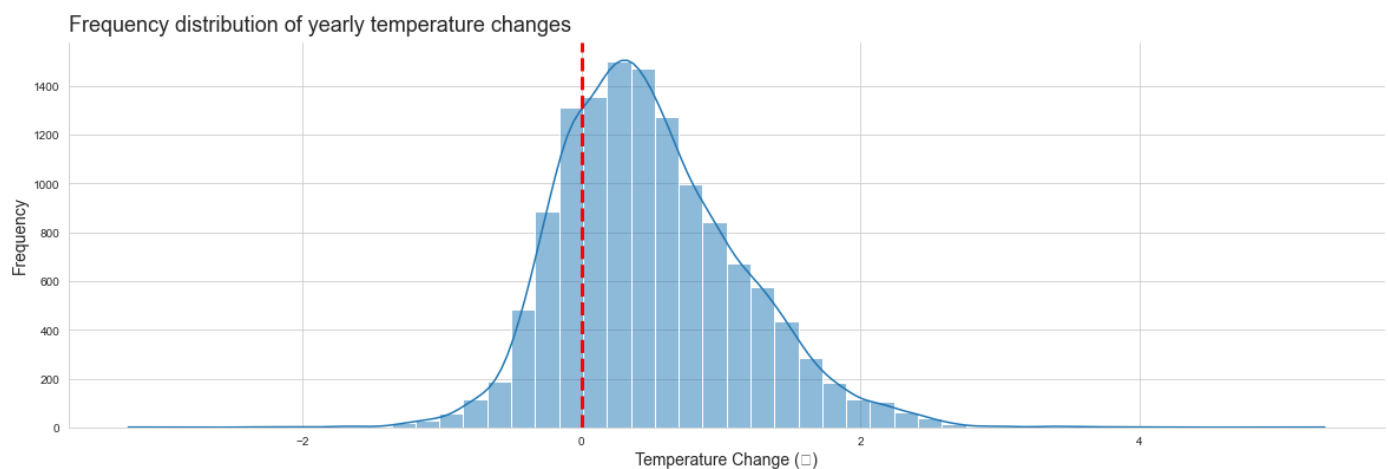
```python
#Construct visualisation
plt.figure(figsize = (20,6))
sns.boxplot(x = "Value", data = data, color = "seagreen")

#Customisation
plt.title("Box plot Distribution of the yearly temperature changes", fontsize = 18, loc='left', y = 1.01)
sns.despine(top = True, right = True, left = True, bottom = False)
```

Box plot Distribution of the yearly temperature changes
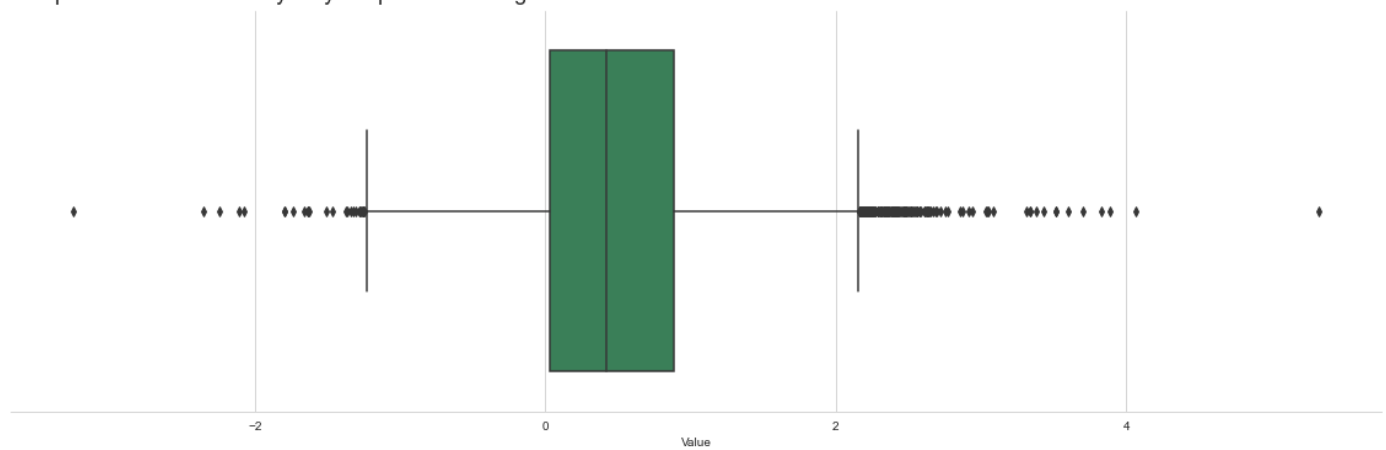

```
#Construct visualisation
plt.figure(figsize=(10,6))
sns.countplot(x = "Flag Description", data= data, palette = "Greens")

#Customisation
plt.title("Distribution data in Flag Description", fontsize = 18, loc='left', y = 1.01)

plt.show()
```


Distribution data in Flag Description

```
data["Unit"].unique()
```

```
array(['°C'], dtype=object)
```

```
#Construct visualisation
plt.figure(figsize = (20,10))
fig = sns.lineplot( x="Year", y = "Value", data = df_group, hue = "Country", palette = "Blues", lw =2)

#Customisation
plt.title("Global temperature fluctuation of countries between 1961 to 2020", fontsize = 18, loc='left', y = 1.01)

plt.axhline(0, ls = "--", color = "red", lw =2)
plt.xlabel("Year", fontsize=14)
plt.ylabel("Temperature Change (°C)", fontsize=14)
fig.get_legend().remove()

plt.annotate('Source: https://www.fao.org/faostat/en/#data/ET', (0,-.1), xycoords ='axes fraction' )
sns.despine(top = True, right = True, left = False, bottom = False)
```

```
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:240: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0.0, flags=flags)
c:\Users\bhavya\anaconda39\lib\site-packages\matplotlib\backends\backend_agg.py:203: RuntimeWarning: Glyph 8451 missing from
current font.
  font.set_text(s, 0, flags=flags)
```


Global temperature fluctuation of countries between 1961 to 2020

Source: https://www.fao.org/faostat/en/#data/ET
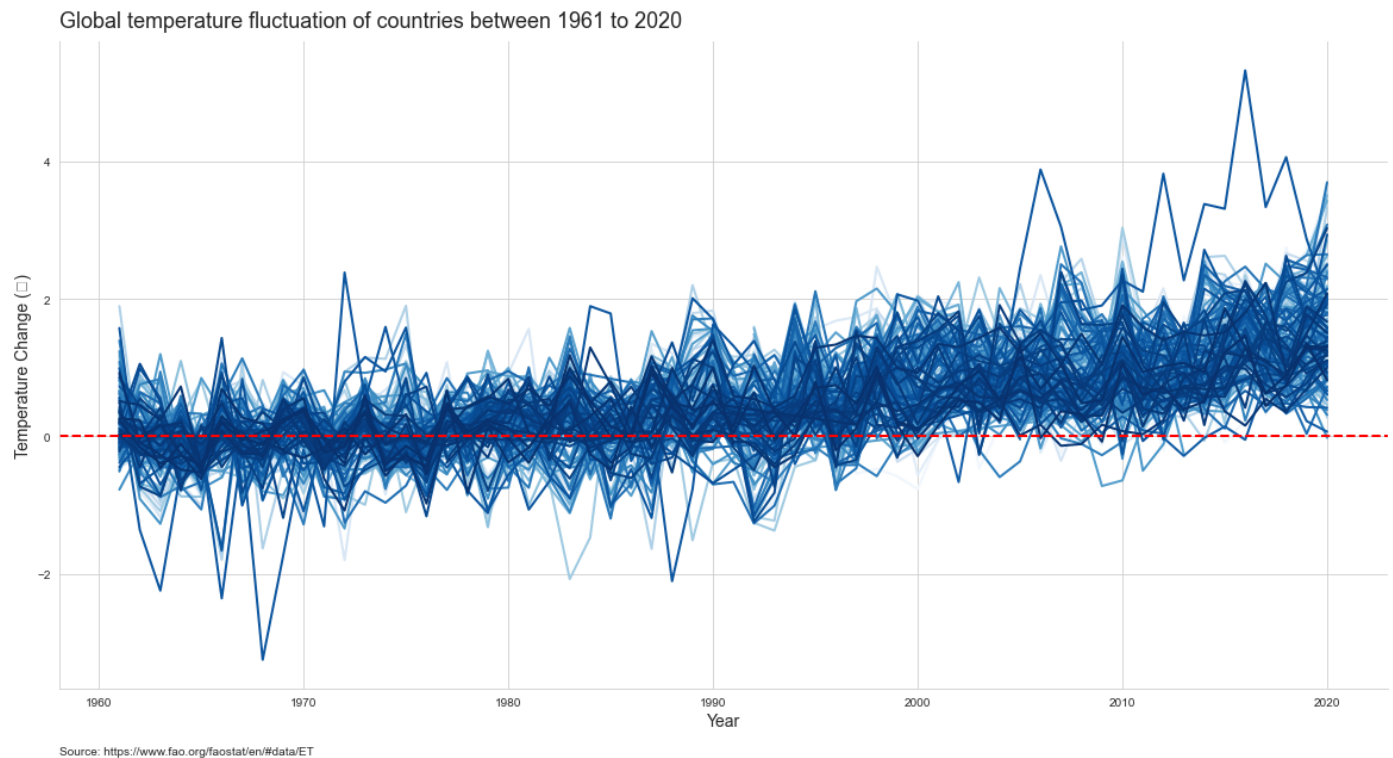
Understanding data from INDIA , Bangladesh and Pakistan.

```
df_sub = df[df["Country"].isin(["India", "Pakistan", 'Bangladesh'])]
df_sub.head()
```

```
.dataframe tbody tr th {
    vertical-align: top;
}

.dataframe thead th {
    text-align: right;
}
```

|	Domain Code	Domain	Area Code (ISO3)	Country	Element Code	Element	Months Code	Months	Year Code	Year	Unit	Value	Flag	Flag Descri
5030	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7020	Meteorological year	1961	1961	°C	0.155	Fc	Calcula data
5031	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7020	Meteorological year	1962	1962	°C	-0.258	Fc	Calcula data
5032	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7020	Meteorological year	1963	1963	°C	-0.082	Fc	Calcula data
5033	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7020	Meteorological year	1964	1964	°C	0.099	Fc	Calcula data
5034	ET	Temperature change	BGD	Bangladesh	7271	Temperature change	7020	Meteorological year	1965	1965	°C	-0.200	Fc	Calcula data

```
df_sub[df_sub["Country"]=="Bangladesh"].groupby("Year")["Value"].mean().plot(kind="bar")
```

```
<AxesSubplot:xlabel='Year'>
```
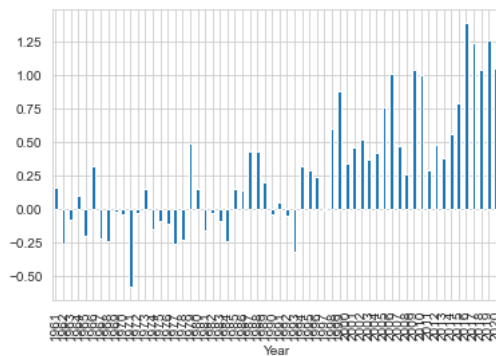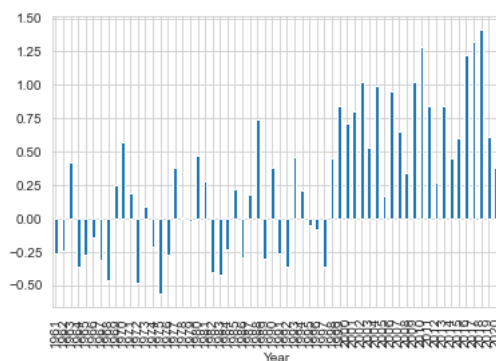


```
df_sub[df_sub["Country"]=="India"].groupby("Year")["Value"].mean().plot(kind="bar")
```

```
<AxesSubplot:xlabel='Year'>
```
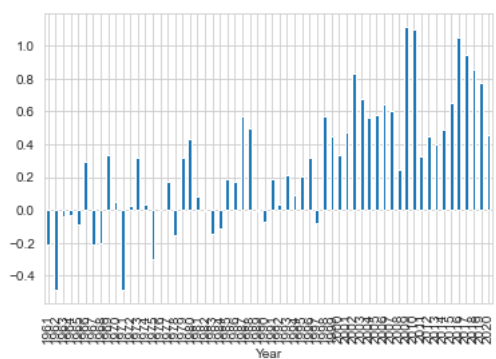


```
df_sub[df_sub["Country"]=="Pakistan"].groupby("Year")["Value"].mean().plot(kind="bar")
```

```
<AxesSubplot:xlabel='Year'>
```



```
df_sub.groupby(['Country','Year'])['Value'].mean(
).unstack().plot(kind='barh', figsize=(15, 10))
```

```
<AxesSubplot:ylabel='Country'>
```