- ***Participant name = Muhammad Arslan Ahmad***
- ***Mobile number 03019249687***

FAO Assignment

> ***Importing libraries***

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

> ***Reading data from csv***

In [ ]:
```
data=pd.read_csv("FAOSTAT_data_Co2_Emission.csv")
data.head()
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	V
0	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1972	1972	kilotonnes	9.3
1	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1973	1973	kilotonnes	7.2
2	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1974	1974	kilotonnes	5.2
3	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1975	1975	kilotonnes	3.1
4	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1976	1976	kilotonnes	3.1

> ***Converting data into numpy***

In [ ]:
```
data.to_numpy()
```

Out[ ]:
```
array([['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1972, 1972, 'kilotonnes', 9.3809, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1973, 1973, 'kilotonnes', 7.2962, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1974, 1974, 'kilotonnes', 5.2116, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1975, 1975, 'kilotonnes', 3.127, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1976, 1976, 'kilotonnes', 3.127, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1977, 1977, 'kilotonnes', 2.5893, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1978, 1978, 'kilotonnes', 2.581, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1979, 1979, 'kilotonnes', 2.6637, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1980, 1980, 'kilotonnes', 2.4817, 'X',
        'International reliable sources'],
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        6804, 'Fuel oil', 1981, 1981, 'kilotonnes', 2.5396, 'X',
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        6804, 'Fuel oil', 1982, 1982, 'kilotonnes', 2.6554, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1983, 1983, 'kilotonnes', 2.6637, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1984, 1984, 'kilotonnes', 2.7878, 'X',
        'International reliable sources'],
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        6804, 'Fuel oil', 1985, 1985, 'kilotonnes', 2.2005, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1986, 1986, 'kilotonnes', 1.8696, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1987, 1987, 'kilotonnes', 0.0745, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1988, 1988, 'kilotonnes', 0.1985, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1989, 1989, 'kilotonnes', 0.1489, 'X',
        'International reliable sources'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1990, 1990, 'kilotonnes', 11.176, 'F',
        'FAO estimate'],
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        6804, 'Fuel oil', 1991, 1991, 'kilotonnes', 9.7945, 'F',
        'FAO estimate'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
        6804, 'Fuel oil', 1992, 1992, 'kilotonnes', 9.6125, 'F',
        'FAO estimate'],
       ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
```

```
 6804, 'Fuel oil', 1993, 1993, 'kilotonnes', 11.8378, 'F',
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 'FAO estimate'],
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 6804, 'Fuel oil', 1995, 1995, 'kilotonnes', 14.5511, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 1996, 1996, 'kilotonnes', 18.6211, 'F',
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 6804, 'Fuel oil', 1997, 1997, 'kilotonnes', 16.4289, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 1998, 1998, 'kilotonnes', 15.792, 'F',
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 6804, 'Fuel oil', 1999, 1999, 'kilotonnes', 16.4207, 'F',
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 6804, 'Fuel oil', 2000, 2000, 'kilotonnes', 16.3462, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2001, 2001, 'kilotonnes', 12.0942, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2002, 2002, 'kilotonnes', 11.0271, 'F',
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 6804, 'Fuel oil', 2003, 2003, 'kilotonnes', 9.4573, 'F',
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 6804, 'Fuel oil', 2004, 2004, 'kilotonnes', 9.5435, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2005, 2005, 'kilotonnes', 7.2202, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2006, 2006, 'kilotonnes', 5.7156, 'F',
 'FAO estimate'],
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 6804, 'Fuel oil', 2007, 2007, 'kilotonnes', 4.5638, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2008, 2008, 'kilotonnes', 4.4304, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2009, 2009, 'kilotonnes', 3.9272, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2010, 2010, 'kilotonnes', 7.2996, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2011, 2011, 'kilotonnes', 7.3028, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2012, 2012, 'kilotonnes', 7.015, 'F',
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['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2013, 2013, 'kilotonnes', 4.4304, 'F',
 'FAO estimate'],
['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
 6804, 'Fuel oil', 2014, 2014, 'kilotonnes', 3.9272, 'F',
```

```
       'FAO estimate'],
      ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
       6804, 'Fuel oil', 2015, 2015, 'kilotonnes', 12.1463, 'F',
       'FAO estimate'],
      ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
       6804, 'Fuel oil', 2016, 2016, 'kilotonnes', 12.8205, 'F',
       'FAO estimate'],
      ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
       6804, 'Fuel oil', 2017, 2017, 'kilotonnes', 9.6952, 'F',
       'FAO estimate'],
      ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
       6804, 'Fuel oil', 2018, 2018, 'kilotonnes', 10.2164, 'F',
       'FAO estimate'],
      ['GN', 'Energy Use', 165, 'Pakistan', 7273, 'Emissions (CO2)',
       6804, 'Fuel oil', 2019, 2019, 'kilotonnes', 11.4742, 'F',
       'FAO estimate']], dtype=object)
```

> ***Description of all data***

In [ ]:
```
data.describe()
```

Out[ ]:

	Area Code	Element Code	Item Code	Year Code	Year	Value
count	48.0	48.0	48.0	48.00	48.00	48.000000
mean	165.0	7273.0	6804.0	1995.50	1995.50	7.525156
std	0.0	0.0	0.0	14.00	14.00	5.021073
min	165.0	7273.0	6804.0	1972.00	1972.00	0.074500
25%	165.0	7273.0	6804.0	1983.75	1983.75	2.756775
50%	165.0	7273.0	6804.0	1995.50	1995.50	7.258200
75%	165.0	7273.0	6804.0	2007.25	2007.25	11.250550
max	165.0	7273.0	6804.0	2019.00	2019.00	18.621100

> ***Transpose of data***

In [ ]:
```
data.T.head()
```

Out[ ]:

	0	1	2	3	4	5	6	7	8	
Domain Code	GN	GN	GN	GN	GN	GN	GN	GN	GN	
Domain	Energy Use	Energy Use	Energy Use	Energy Use	Energy Use	Energy Use	Energy Use	Energy Use	Energy Use	Ene
Area Code	165	165	165	165	165	165	165	165	165	
Area	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakis
Element Code	7273	7273	7273	7273	7273	7273	7273	7273	7273	72

5 rows × 48 columns

Sorting data

In [ ]:

```
sorted_data=data.sort_values(by="Value")
sorted_data
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit
15	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1987	1987	kilotonnes
17	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1989	1989	kilotonnes
16	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1988	1988	kilotonnes
14	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1986	1986	kilotonnes
13	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1985	1985	kilotonnes
8	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1980	1980	kilotonnes
9	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1981	1981	kilotonnes
6	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1978	1978	kilotonnes
5	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1977	1977	kilotonnes
10	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1982	1982	kilotonnes
7	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1979	1979	kilotonnes
11	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1983	1983	kilotonnes
12	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1984	1984	kilotonnes
4	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1976	1976	kilotonnes
3	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1975	1975	kilotonnes
37	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2009	2009	kilotonnes
42	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2014	2014	kilotonnes

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	
41	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2013	2013	kilotonnes	
36	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2008	2008	kilotonnes	
35	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2007	2007	kilotonnes	
2	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1974	1974	kilotonnes	
34	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2006	2006	kilotonnes	
40	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2012	2012	kilotonnes	
33	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2005	2005	kilotonnes	
1	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1973	1973	kilotonnes	
38	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2010	2010	kilotonnes	
39	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2011	2011	kilotonnes	
0	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1972	1972	kilotonnes	
31	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2003	2003	kilotonnes	
32	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2004	2004	kilotonnes	
20	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1992	1992	kilotonnes	
45	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2017	2017	kilotonnes	
19	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1991	1991	kilotonnes	
46	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2018	2018	kilotonnes	1
30	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2002	2002	kilotonnes	1
18	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1990	1990	kilotonnes	1
47	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2019	2019	kilotonnes	1
21	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1993	1993	kilotonnes	1

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	
29	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2001	2001	kilotonnes	1
43	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2015	2015	kilotonnes	1
22	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1994	1994	kilotonnes	1
44	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2016	2016	kilotonnes	1
23	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1995	1995	kilotonnes	1
26	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1998	1998	kilotonnes	1
28	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	2000	2000	kilotonnes	1
27	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1999	1999	kilotonnes	1
25	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1997	1997	kilotonnes	1
24	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1996	1996	kilotonnes	1

Slicing

In [ ]:
```
data[1:10]
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Unit	V
1	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1973	1973	kilotonnes	7.2
2	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1974	1974	kilotonnes	5.2
3	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1975	1975	kilotonnes	3.1
4	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1976	1976	kilotonnes	3.1
5	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1977	1977	kilotonnes	2.5
6	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1978	1978	kilotonnes	2.5
7	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1979	1979	kilotonnes	2.6
8	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1980	1980	kilotonnes	2.4
9	GN	Energy Use	165	Pakistan	7273	Emissions (CO2)	6804	Fuel oil	1981	1981	kilotonnes	2.5

> ***"loc" fuunction for specific indexes and columns***

In [ ]:

```
data.loc[1:10,["Element","Year","Value"]]
```

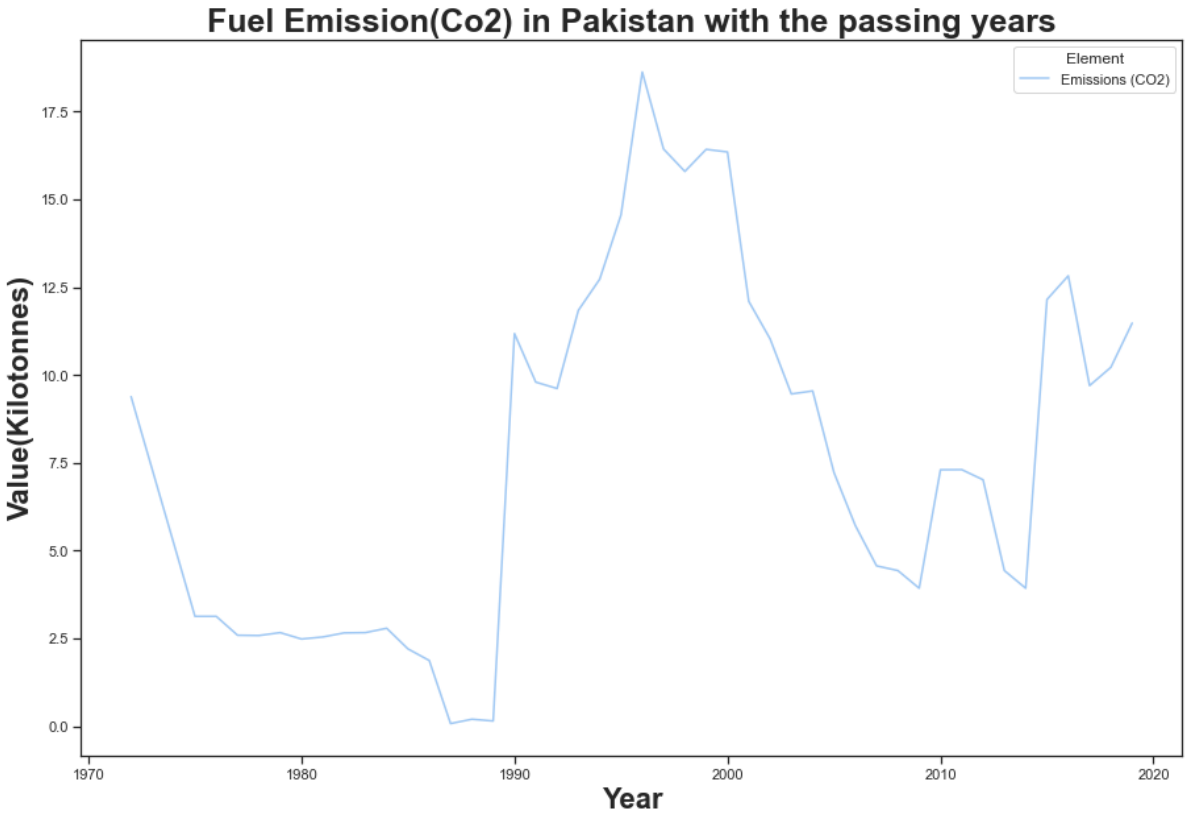
Out[ ]:

	Element	Year	Value
1	Emissions (CO2)	1973	7.2962
2	Emissions (CO2)	1974	5.2116
3	Emissions (CO2)	1975	3.1270
4	Emissions (CO2)	1976	3.1270
5	Emissions (CO2)	1977	2.5893
6	Emissions (CO2)	1978	2.5810
7	Emissions (CO2)	1979	2.6637
8	Emissions (CO2)	1980	2.4817
9	Emissions (CO2)	1981	2.5396
10	Emissions (CO2)	1982	2.6554

Lineplot of sorted value(kilotonnes) of Emission of Co2

In [ ]:

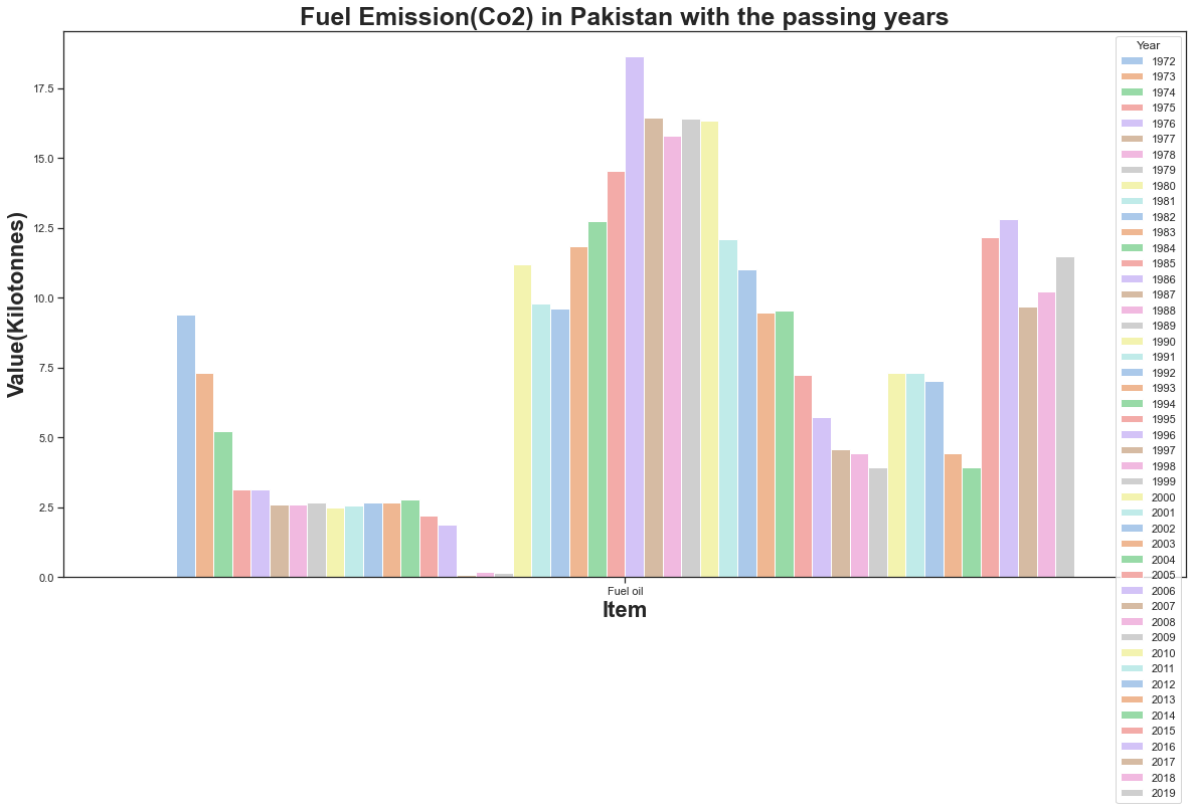
```
plt.figure(figsize=(15,10))
sns.set_theme(style="ticks",color_codes=True)
sns.lineplot(x="Year",y="Value",hue="Element",data=sorted_data,palette="pastel")
plt.xlabel("Year",size=22,weight="bold")
plt.ylabel("Value(Kilotonnes)",size=22,weight="bold")
plt.title("Fuel Emission(Co2) in Pakistan with the passing years",size=25,weight='
plt.show()
```



Barplot of Emission of Co2 and its value(Kilotens)

In [ ]:

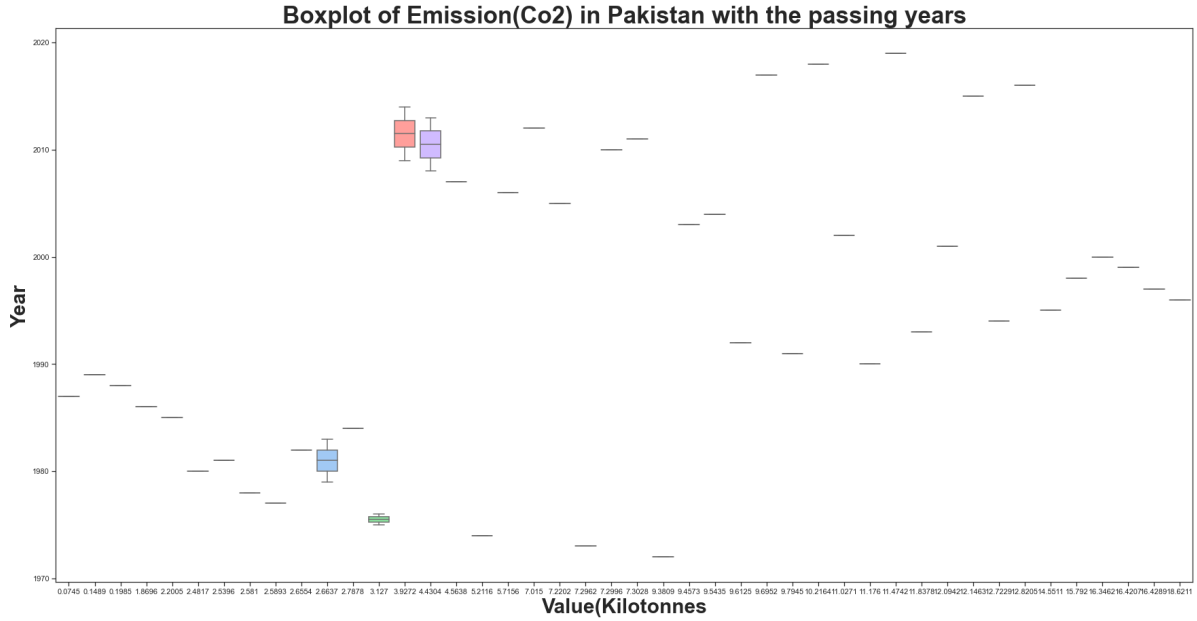
```
plt.figure(figsize=(20,10))
sns.set_theme(style="ticks",color_codes=True)
sns.barplot(x="Item",y="Value",hue="Year",data=data,palette="pastel")
plt.xlabel("Item",size=22,weight="bold")
plt.ylabel("Value(Kilotonnes)",size=22,weight="bold")
plt.title("Fuel Emission(Co2) in Pakistan with the passing years",size=25,weight='
plt.show()
```



Boxplot of value(Kilotonnes) of Emission of Co2

In [ ]:

```
plt.figure(figsize=(30,15))
sns.set_theme(style="ticks",color_codes=True)
sns.boxplot(x="Value",y="Year",data=data,palette="pastel",dodge=True,saturation=1)
plt.xlabel("Value(Kilotonnes",size=30,weight="bold")
plt.ylabel("Year",size=30,weight="bold")
plt.title("Boxplot of Emission(Co2) in Pakistan with the passing years",size=35,we
plt.show()
```


Boxplot of Emission(Co2) in Pakistan with the passing years
Year
2020
2010
2000
1990
1980
1970
0.0745 0.1489 0.1985 1.8696 2.2005 2.4817 2.5396 2.581 2.5893 2.6554 2.6637 2.7878 3.127 3.9272 4.4304 4.5638 5.2116 5.7156 7.015 7.2202 7.2962 7.2996 7.3028 9.3809 9.4573 9.5435 9.6125 9.6952 9.7945 10.216411.0271 11.176 11.4742 11.837812.094212.146312.722912.820514.5511 15.792 16.346216.420716.428918.6211
Value(Kilotonnes

In [ ]:

FAO Nutrients data consumption in Pakistan

> ***Importing libraries and reading data through csv***

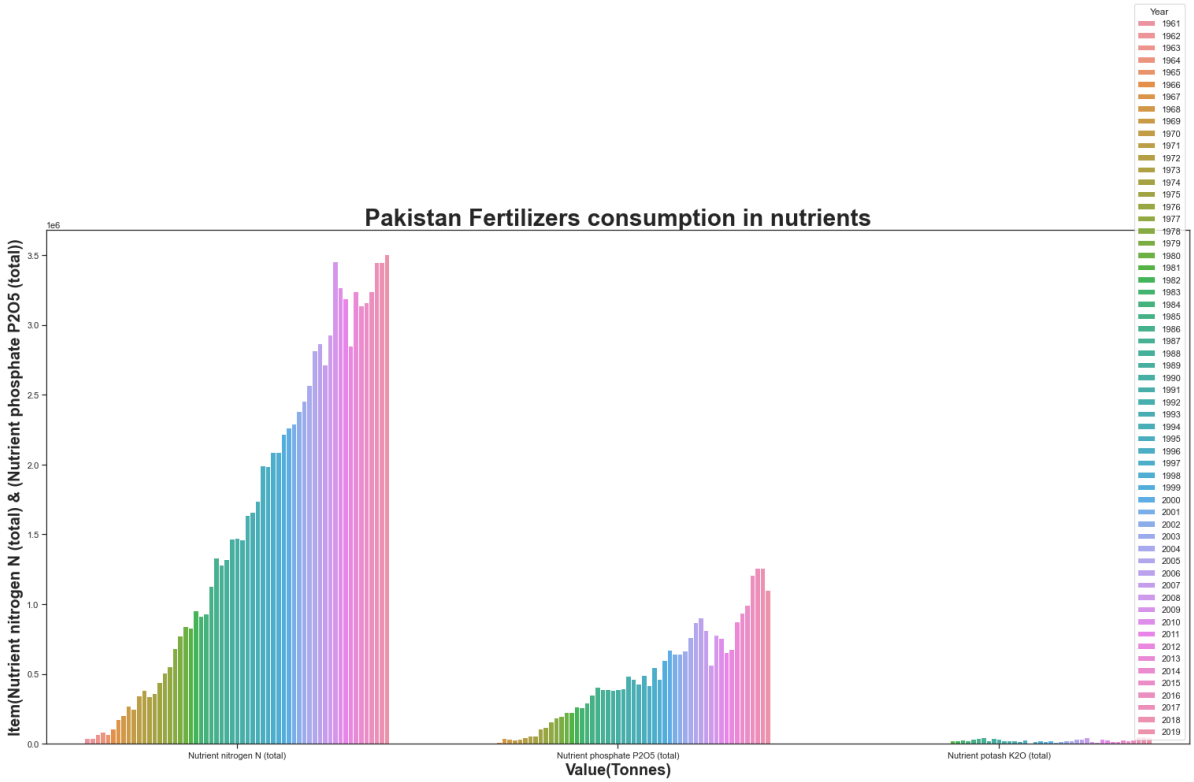
In [ ]:
```
import pandas as pd
fao=pd.read_csv("FAOSTAT_data_of_Pak_Fertilizers_consumption_in_nutrients.csv")
fao
fao.head()
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Uni
0	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1961	1961	tonne
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	tonne
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	tonne
3	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1962	1962	tonne
4	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1963	1963	tonne

Barplot of nutrients

In [ ]:
```
import matplotlib.pyplot as plt
import seaborn as sns
plt.figure(figsize=(26,12))
sns.set_theme(style="ticks",color_codes=True)
sns.barplot(x="Item", y="Value",data=fao,hue="Year" ,saturation=0.8,order=("Nutrie
plt.xlabel("Value(Tonnes)",size=20,weight="bold")
plt.ylabel("Item(Nutrient nitrogen N (total) & (Nutrient phosphate P2O5 (total))",
plt.title("Pakistan Fertilizers consumption in nutrients",size=30,weight="bold")
plt.show()
```



In [ ]:

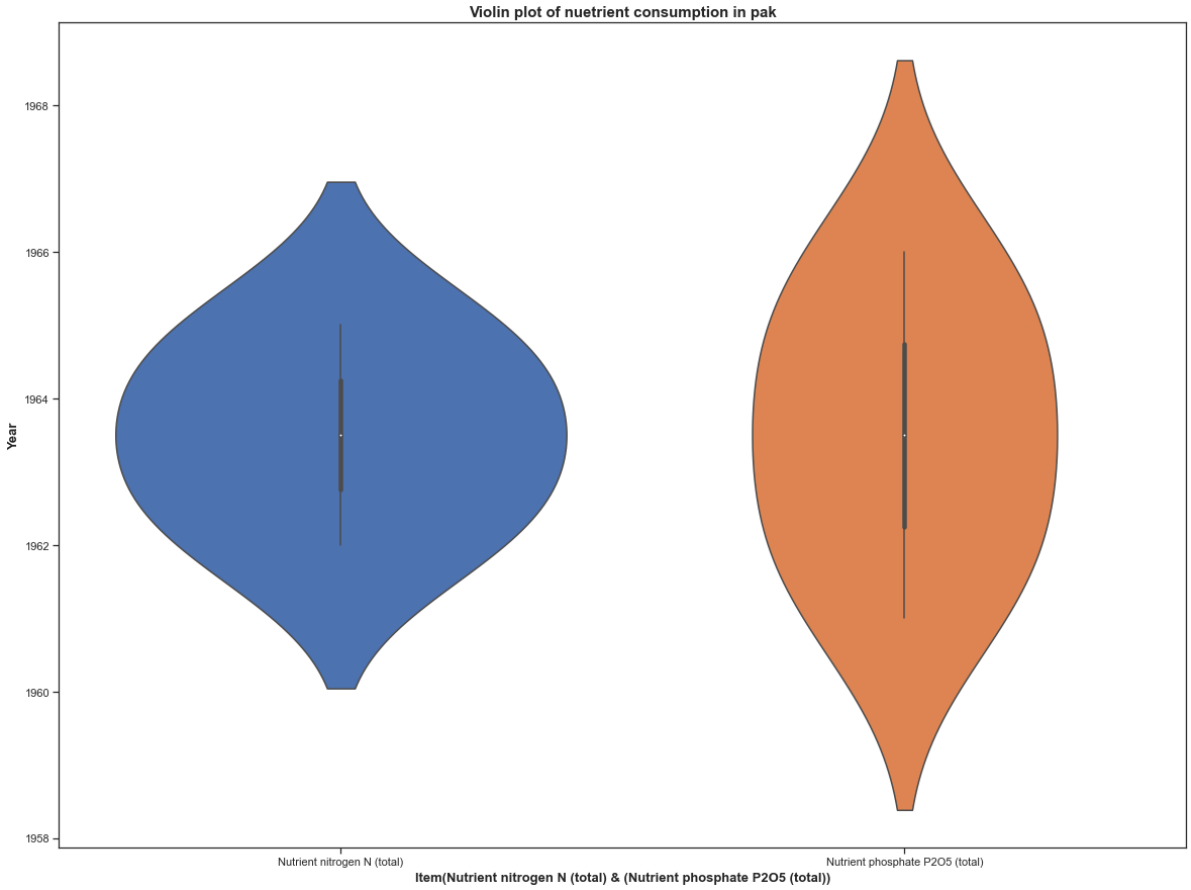
```
df3=fao.loc[1:10,["Year","Item"]]
df3
```

Out[ ]:

	Year	Item
1	1961	Nutrient phosphate P2O5 (total)
2	1962	Nutrient phosphate P2O5 (total)
3	1962	Nutrient nitrogen N (total)
4	1963	Nutrient nitrogen N (total)
5	1963	Nutrient phosphate P2O5 (total)
6	1964	Nutrient phosphate P2O5 (total)
7	1964	Nutrient nitrogen N (total)
8	1965	Nutrient nitrogen N (total)
9	1965	Nutrient phosphate P2O5 (total)
10	1966	Nutrient phosphate P2O5 (total)

In [ ]:

```
plt.figure(figsize=(20,15))
sns.violinplot(x="Item",y="Year",data=df3,saturation=1,order=("Nutrient nitrogen N
plt.xlabel("Item(Nutrient nitrogen N (total) & (Nutrient phosphate P2O5 (total))",
plt.ylabel("Year",size=13,weight="bold")
plt.title("Violin plot of nuetrient consumption in pak",size=15,weight="bold")
plt.show()
```


Violin plot of nuetrient consumption in pak
1968
1966
1964
1962
1960
1958
Year
Nutrient nitrogen N (total)
Nutrient phosphate P2O5 (total)
Item(Nutrient nitrogen N (total) & (Nutrient phosphate P2O5 (total))

In [ ]:

Just Practicing on how to clean data

Note: This data is already cleaned

> ***Importing libraries***

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

> ***Reading CSV File***

In [ ]:
```
df2=pd.read_csv("FAOSTAT_data_of_Pak_Fertilizers_consumption_in_nutrients.csv")
df2
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	U
0	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1961	1961	ton
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	ton
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	ton
3	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1962	1962	ton
4	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1963	1963	ton
...	...	...	...	...	...	...	...	...	...	...	
167	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2018	2018	ton
168	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2018	2018	ton
169	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2019	2019	ton
170	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2019	2019	ton
171	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	2019	2019	ton

172 rows × 14 columns

Head

In [ ]:

```
df2.head(3)
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Uni
0	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1961	1961	tonne
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	tonne
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	tonne

Tail

In [ ]:
```
df2.tail(3)
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	U
169	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2019	2019	ton
170	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2019	2019	ton
171	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	2019	2019	ton

Index

In [ ]:
```
df2.index
```

Out[ ]:
```
RangeIndex(start=0, stop=172, step=1)
```

Convert data into numpy

In [ ]:
```
df2.to_numpy()
```

Out[ ]:
```
array([['RFN', 'Fertilizers by Nutrient', 165, ..., 41659, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)'],
       ['RFN', 'Fertilizers by Nutrient', 165, ..., 500, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)'],
       ['RFN', 'Fertilizers by Nutrient', 165, ..., 210, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)'],
       ...,
       ['RFN', 'Fertilizers by Nutrient', 165, ..., 47260, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)'],
       ['RFN', 'Fertilizers by Nutrient', 165, ..., 3505356, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)'],
       ['RFN', 'Fertilizers by Nutrient', 165, ..., 1099707, 'Qm',
        'Official data from questionnaires and/or national sources and/or COMTRADE
(reporters)']],
      dtype=object)
```

> ***Description of all data***

In [ ]:
```
df2.describe()
```

Out[ ]:

	Area Code	Element Code	Item Code	Year Code	Year	Value
count	172.0	172.0	172.000000	172.000000	172.000000	1.720000e+02
mean	165.0	5157.0	3102.970930	1990.784884	1990.784884	7.064396e+05
std	0.0	0.0	0.812385	16.678775	16.678775	9.709749e+05
min	165.0	5157.0	3102.000000	1961.000000	1961.000000	1.440000e+02
25%	165.0	5157.0	3102.000000	1976.750000	1976.750000	2.615950e+04
50%	165.0	5157.0	3103.000000	1991.000000	1991.000000	2.689255e+05
75%	165.0	5157.0	3104.000000	2005.000000	2005.000000	9.193622e+05
max	165.0	5157.0	3104.000000	2019.000000	2019.000000	3.505356e+06

In [ ]:
```
df2.loc[ 1:10 , ["Area","Item"]]
df2
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	U
0	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1961	1961	ton
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	ton
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	ton
3	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1962	1962	ton
4	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1963	1963	ton
...	...	...	...	...	...	...	...	...	...	...	
167	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2018	2018	ton
168	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2018	2018	ton
169	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2019	2019	ton
170	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2019	2019	ton
171	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	2019	2019	ton

172 rows × 14 columns

Transpose

In [ ]:

```
df2.T
```

Out[ ]:

	0	1	2	3	4	
Domain Code	RFN	RFN	RFN	RFN	RFN	R
Domain	Fertilizers by Nutrient	Fertilizers by Nutrient	Fertilizers by Nutrient	Fertilizers by Nutrient	Fertilizers by Nutrient	Fertilizers Nutri
Area Code	165	165	165	165	165	1
Area	Pakistan	Pakistan	Pakistan	Pakistan	Pakistan	Pakis
Element Code	5157	5157	5157	5157	5157	51
Element	Agricultural Use	Agricultural Use	Agricultural Use	Agricultural Use	Agricultural Use	Agricultu U
Item Code	3102	3103	3103	3102	3102	31
Item	Nutrient nitrogen N (total)	Nutrient phosphate P2O5 (total)	Nutrient phosphate P2O5 (total)	Nutrient nitrogen N (total)	Nutrient nitrogen N (total)	Nutri phosph P2O5 (to
Year Code	1961	1961	1962	1962	1963	19
Year	1961	1961	1962	1962	1963	19
Unit	tonnes	tonnes	tonnes	tonnes	tonnes	tonı
Value	41659	500	210	41160	67620	6
Flag	Qm	Qm	Qm	Qm	Qm	(
Flag Description	Official data from questionnaires and/or natio...	Official data from questionnaires and/or natio...	Official data from questionnaires and/or natio...	Official data from questionnaires and/or natio...	Official data from questionnaires and/or natio...	Official d fr questionnai and/or nati

14 rows × 172 columns

Sort data

In [ ]:

```
df2.sort_values(by="Year")
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	U
0	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1961	1961	ton
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	ton
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	ton
3	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1962	1962	ton
4	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1963	1963	ton
...	...	...	...	...	...	...	...	...	...	...	
166	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	2018	2018	ton
168	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2018	2018	ton
170	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	2019	2019	ton
169	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3104	Nutrient potash K2O (total)	2019	2019	ton
171	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	2019	2019	ton

172 rows × 14 columns

> ***Slicing: Data of first 10 columns***

In [ ]:

```
df2[1:10]
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Uni
1	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1961	1961	tonne
2	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1962	1962	tonne
3	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1962	1962	tonne
4	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1963	1963	tonne
5	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1963	1963	tonne
6	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1964	1964	tonne
7	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1964	1964	tonne
8	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3102	Nutrient nitrogen N (total)	1965	1965	tonne
9	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1965	1965	tonne

> ***Data of index 5 and 6 and all columns***

In [ ]:

```
df2.loc[[5,6],:]
```

Out[ ]:

	Domain Code	Domain	Area Code	Area	Element Code	Element	Item Code	Item	Year Code	Year	Uni
5	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1963	1963	tonne
6	RFN	Fertilizers by Nutrient	165	Pakistan	5157	Agricultural Use	3103	Nutrient phosphate P2O5 (total)	1964	1964	tonne

> ***Data of all indexes and two specific columns***

In [ ]:

```
df2.loc[:,["Year","Item"]]
```

Out[ ]:

	Year	Item
0	1961	Nutrient nitrogen N (total)
1	1961	Nutrient phosphate P2O5 (total)
2	1962	Nutrient phosphate P2O5 (total)
3	1962	Nutrient nitrogen N (total)
4	1963	Nutrient nitrogen N (total)
...	...	...
167	2018	Nutrient nitrogen N (total)
168	2018	Nutrient potash K2O (total)
169	2019	Nutrient potash K2O (total)
170	2019	Nutrient nitrogen N (total)
171	2019	Nutrient phosphate P2O5 (total)

172 rows × 2 columns

> ***Data of first 30 indexes and two specific columns \ We stored the data in p variable for plotting this data***

In [ ]:

```
p=df2.loc[ 1:30 , ["Value","Item"]]
p
```

Out[ ]:

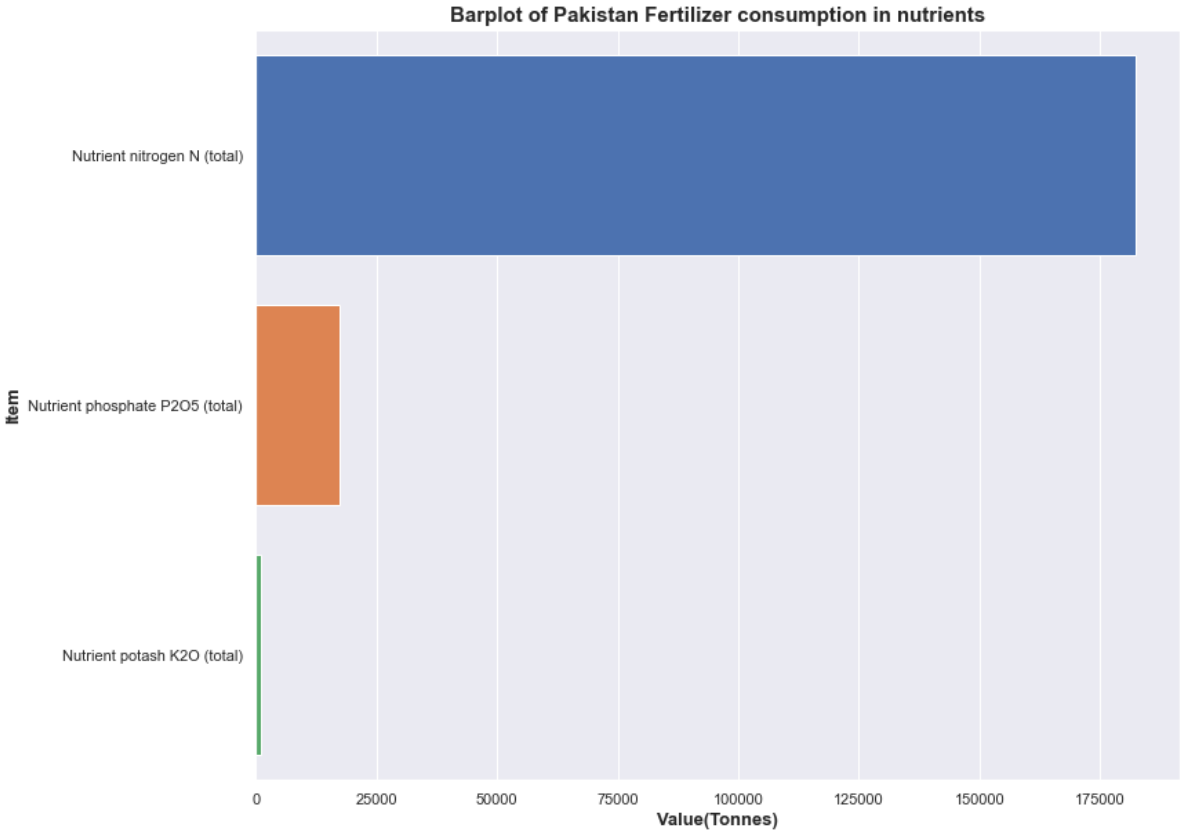
	Value	Item
1	500	Nutrient phosphate P2O5 (total)
2	210	Nutrient phosphate P2O5 (total)
3	41160	Nutrient nitrogen N (total)
4	67620	Nutrient nitrogen N (total)
5	630	Nutrient phosphate P2O5 (total)
6	1029	Nutrient phosphate P2O5 (total)
7	84147	Nutrient nitrogen N (total)
8	69242	Nutrient nitrogen N (total)
9	1245	Nutrient phosphate P2O5 (total)
10	3911	Nutrient phosphate P2O5 (total)
11	107779	Nutrient nitrogen N (total)
12	144	Nutrient potash K2O (total)
13	212	Nutrient potash K2O (total)
14	177441	Nutrient nitrogen N (total)
15	12777	Nutrient phosphate P2O5 (total)
16	38642	Nutrient phosphate P2O5 (total)
17	203521	Nutrient nitrogen N (total)
18	2486	Nutrient potash K2O (total)
19	1344	Nutrient potash K2O (total)
20	272566	Nutrient nitrogen N (total)
21	33801	Nutrient phosphate P2O5 (total)
22	30462	Nutrient phosphate P2O5 (total)
23	251519	Nutrient nitrogen N (total)
24	1225	Nutrient potash K2O (total)
25	744	Nutrient potash K2O (total)
26	343973	Nutrient nitrogen N (total)
27	37231	Nutrient phosphate P2O5 (total)
28	48730	Nutrient phosphate P2O5 (total)
29	386230	Nutrient nitrogen N (total)
30	1400	Nutrient potash K2O (total)

> ***Barplot of variable p data***

In [ ]:

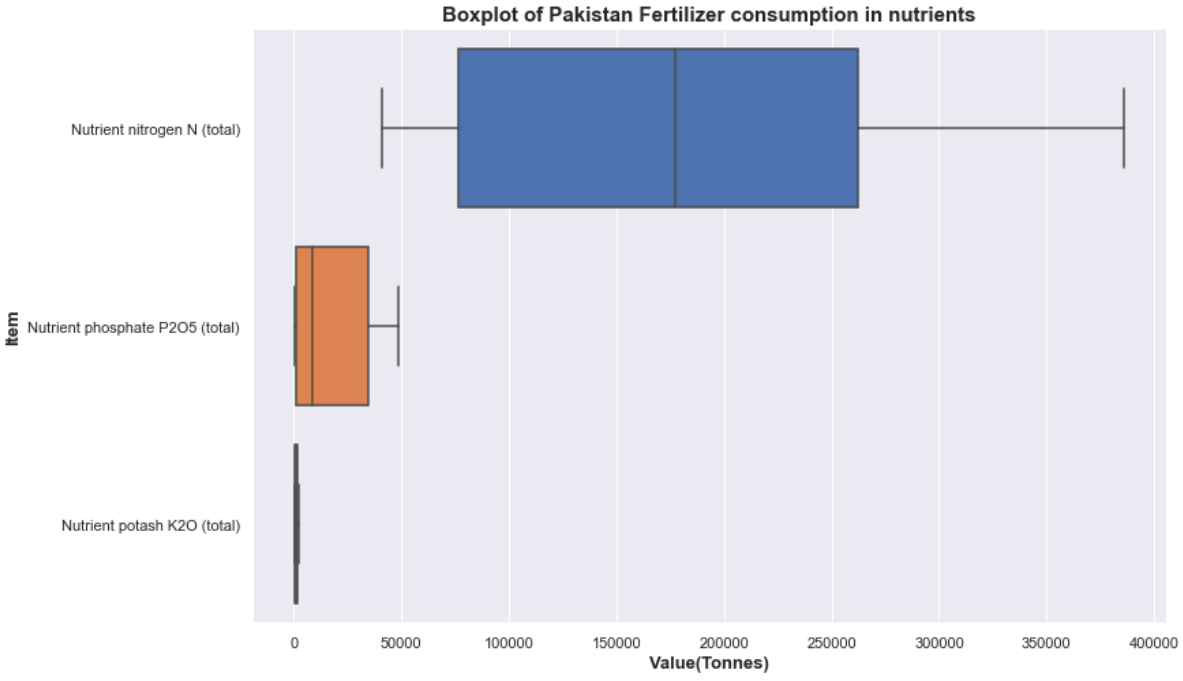
```
plt.figure(figsize=(12,10))
sns.set_theme(style="darkgrid",palette="deep")
sns.barplot(x="Value",y="Item",data=p,ci=None,saturation=1,order=("Nutrient nitrog
plt.xlabel("Value(Tonnes)",size=13,weight="bold")
plt.ylabel("Item",size=13,weight="bold")
```

```
plt.title("Barplot of Pakistan Fertilizer consumption in nutrients",size=15,weight
plt.show()
```



In [ ]:

```
plt.figure(figsize=(12,8))
sns.boxplot(x="Value",y="Item",data=p,dodge=False,saturation=1,order=("Nutrient ni
plt.xlabel("Value(Tonnes)",size=13,weight="bold")
plt.ylabel("Item",size=13,weight="bold")
plt.title("Boxplot of Pakistan Fertilizer consumption in nutrients",size=15,weight
plt.show()
```



In [ ]: