Team Entrepreneur

Exploratory Data Analysis on Fire Dataset

About the Dataset

- Dataset was given by taken from Fao website. All countries available were selected covering 30 years from 1990 to 2019, for Forests and Savanna fire data.

Steps performed

- EDA was perfomed in two steps
    1. EDA on whole dataset
    2. EDA on subcontinent countries

1. Import Libraries

- Import necessary libraries

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

2. Import dataset

- Import dataset and check dataset

```
df= pd.read_csv('fires_data_11-29-2021.csv')
df.head()
```

3. Shape of dataset

- Check Shape of data

```
row, cols= df.shape
print("Number of rows:", row)
print("Number of columns:", cols)
```

Dataset has 47649 rows and 17 columns

4. Check data types

- Check data types of each column

```
df.dtypes
```

5. Check missing values

- Check missing values in each column

```
df.isnull().sum()
```

- Only one column (Note) has missing values

6. Dropping unnecessary columns

- Drop unnecessary columns and making changes in the dataset

```
df.drop(['Note','Domain Code','Element Code','Item Code','Flag
Description','Flag','Source Code'], axis=1, inplace=True)
```

7. Data Structure of dataset

- Check data structure of dataset

```
df.info()
```

- Data has RangeIndex: 47649 entries, starting from 0 to 47648
- Data has total 10 columns
- dtypes of columns are one float64, two int64 and seven object
- Memory usage of the data is 3.6 MB

8. Summery of dataset

- Summery of dataset

```
df.describe()
```

9. Unique values in each column

- Unique values in each column

```
df.nunique()
```

- 238 Countries
- 30 Years
- 7 Items

10. Value counts

- Value counts of Item column

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

Seven different items are available in the dataset and their count are:

> Humid tropical forest 6807
>
> Other forest 6807
>
> Closed shrubland 6807
>
> Grassland 6807
>
> Open shrubland 6807
>
> Savanna 6807
>
> Woody savanna 6807

EDA on whole Dataset

1. Land affected by fires yearly

```
s=df.groupby(["Year"]).sum().sort_values(by="Value", ascending=False).head(30)
s
```

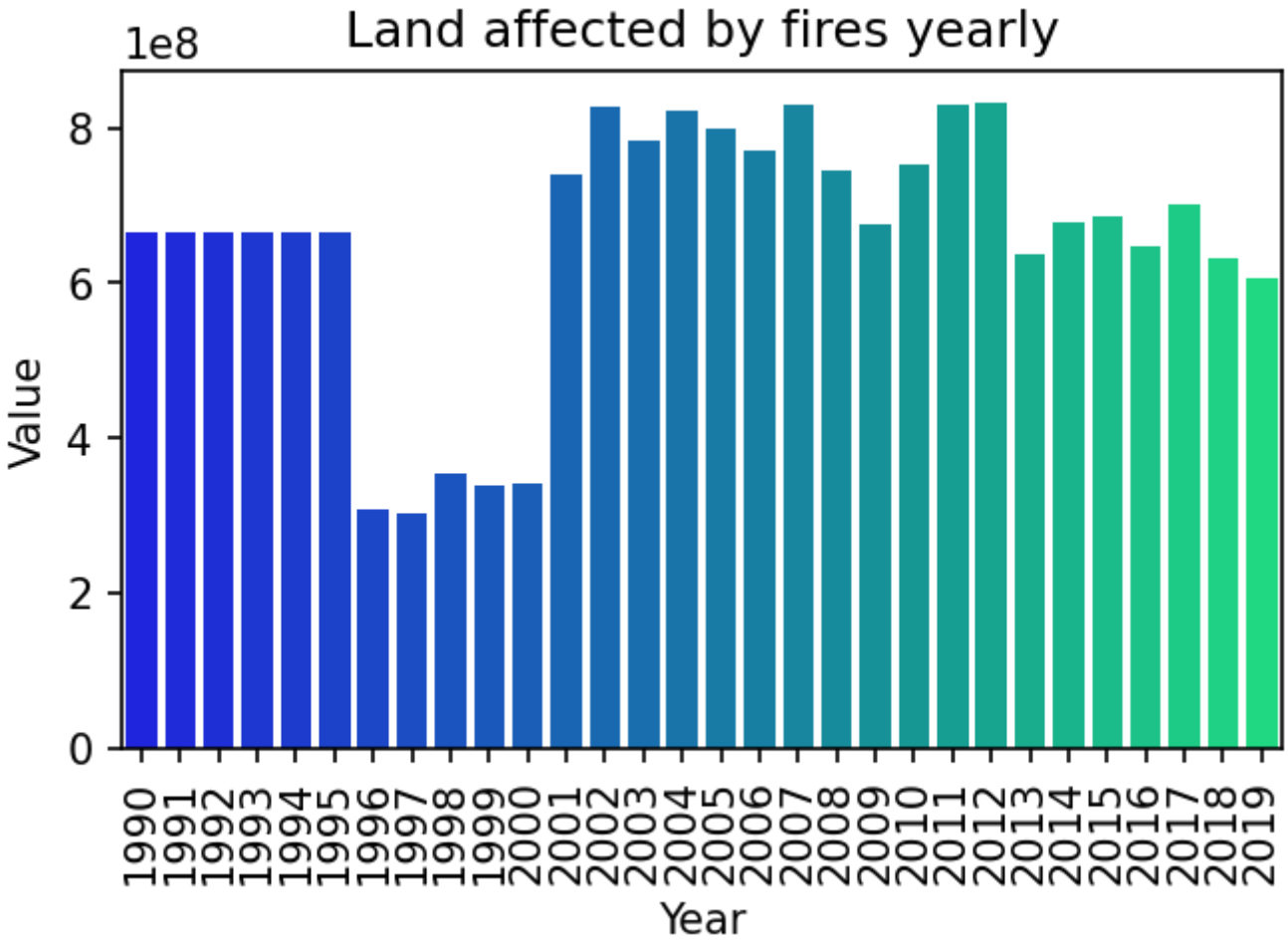
Year	Value
2012	8.320688e+08
2007	8.303040e+08
2011	8.294422e+08
2002	8.285003e+08

Year	Value
2004	8.227932e+08
2005	7.998101e+08
2003	7.846035e+08
2006	7.715579e+08
2010	7.536716e+08
2008	7.461368e+08
2001	7.394390e+08
2017	7.011378e+08
2015	6.869739e+08
2014	6.793501e+08
2009	6.761442e+08
1995	6.640982e+08
1994	6.640982e+08
1993	6.640982e+08
1992	6.640982e+08
1990	6.640982e+08
1991	6.640982e+08
2016	6.469105e+08
2013	6.379084e+08
2018	6.311982e+08
2019	6.064821e+08
1998	3.534771e+08
2000	3.421322e+08
1999	3.396431e+08
1996	3.087709e+08
1997	3.022354e+08

- The highest value is in year **2012** value of **8.320688e+08**
- The lowest value is in year **1997** value of **3.022354e+08**

Graphical Representation land affected by fires yearly

```
plt.figure(figsize=(5,3), dpi=150, linewidth=2)
sns.barplot(x=s.index,y='Value',data=s, palette="winter")
plt.xticks(rotation=90)
plt.title('Land affected by fires yearly')
```



2. Top 10 countries affected by fires

```
```python
a=df.groupby(["Area"]).sum().sort_values(by="Value", ascending=False).head(30)
a
```

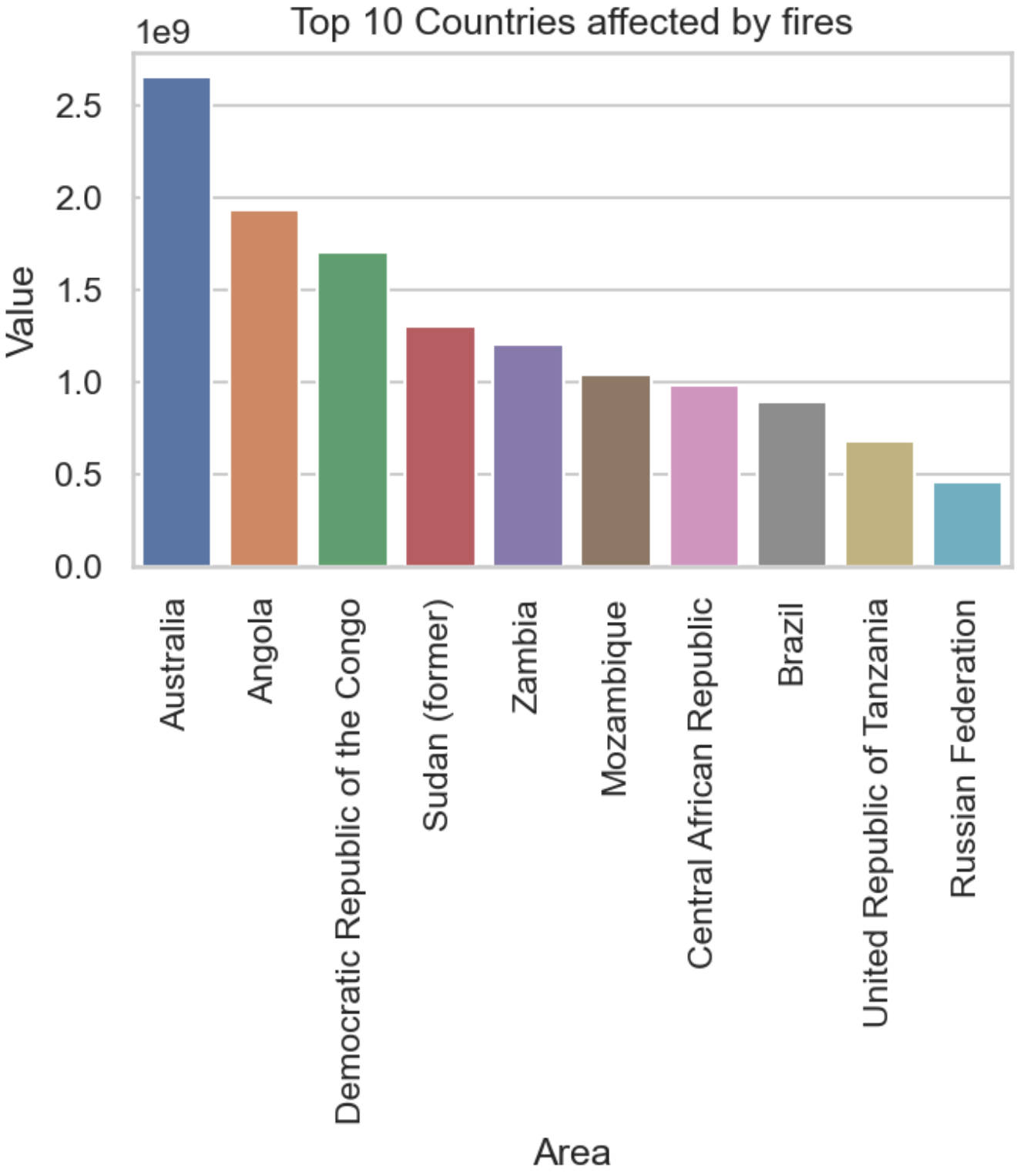
Area	Value
Australia	2.650662e+09
Angola	1.927834e+09
Democratic Republic of the Congo	1.698499e+09
Sudan (former)	1.304401e+09
Zambia	1.204405e+09
```

Area	Value
Mozambique	1.040799e+09
Central African Republic	9.843985e+08
Brazil	8.904736e+08
United Republic of Tanzania	6.783696e+08
Russian Federation	4.573399e+08

- Australia has the highest value of **2.650662e+09**

Graphical Representation of top 10 countries affected by fires

```
plt.figure(figsize=(5,3), dpi=150, linewidth=2)
sns.barplot(x=a.index,y='Value',data=a)
plt.xticks(rotation=90)
plt.title('Top 10 Countries affected by fires')
```



3.Item type burned by fire over years

- Item type burned by fire over years

```
b=df.groupby(["Item"]).sum().sort_values(by="Value", ascending=False)
b
```

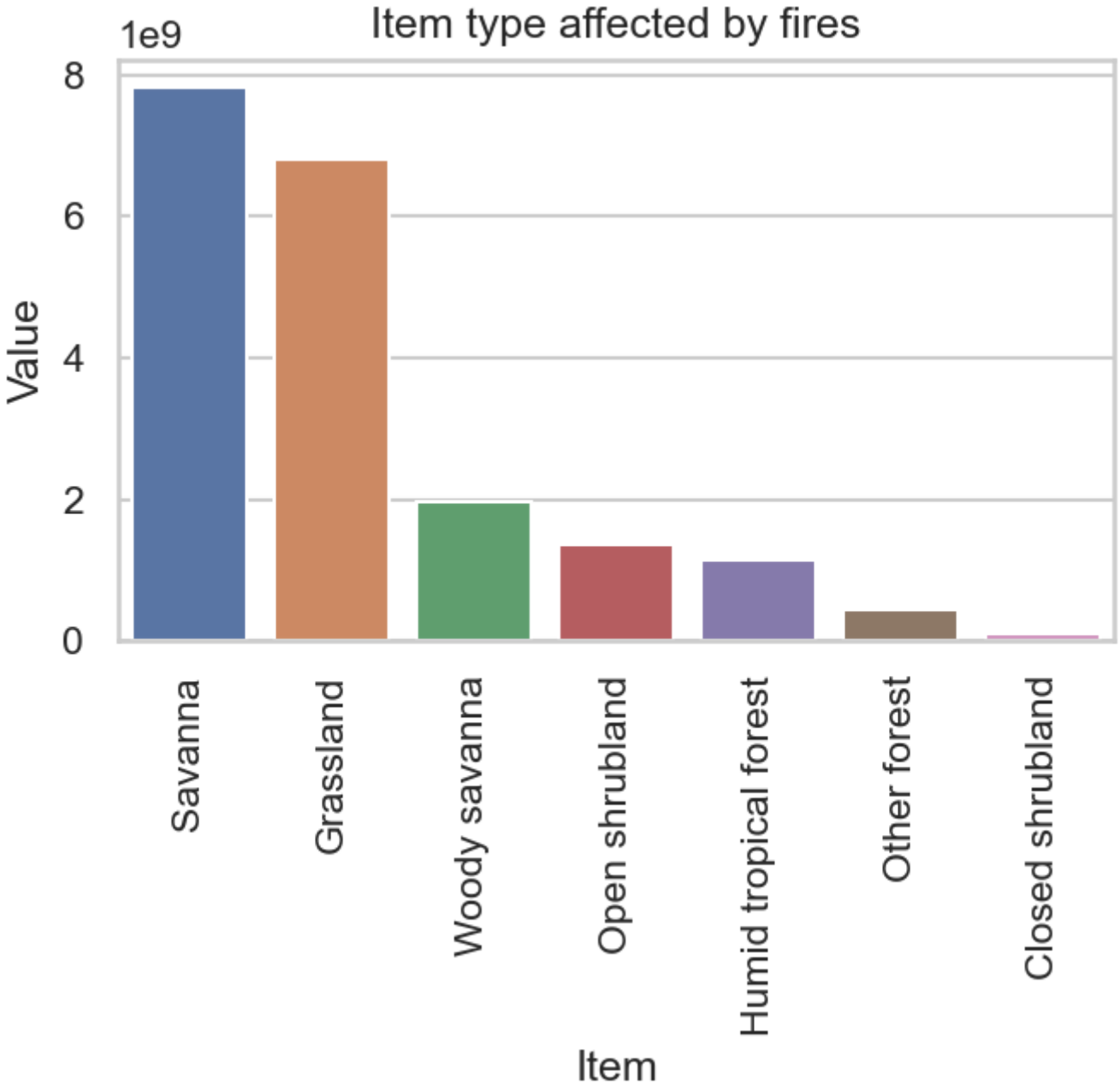
Item	Value

Item	Value
Savanna	7.831523e+09
Grassland	6.801505e+09
Woody savanna	1.957280e+09
Open shrubland	1.365417e+09
Humid tropical forest	1.132681e+09
Other forest	4.478974e+08
Closed shrubland	9.897531e+07

- Savanna is most burned item type with value of **1.957280e+09**
- Closed shrubland is least burned item type with value of **9.897531e+07**

Graphical Representation of item type affected by fire

```
plt.figure(figsize=(5,3), dpi=150)
sns.barplot(x=b.index,y='Value',data=b)
plt.xticks(rotation=90)
plt.title("Item type affected by fires")
```



4. Maximum area burned in a year in a country

- Maximum area burned in a year in a country

```
df.groupby(["Year","Area"]).sum().sort_values(by="Value",
ascending=False).head(10)
```

Year	Area	Value
2001	Australia	1.840483e+08
2012	Australia	1.783090e+08
2011	Australia	1.737702e+08
2002	Australia	1.530490e+08

Year	Area	Value
2004	Australia	1.255536e+08
2006	Australia	1.134671e+08
2007	Australia	1.025287e+08
2018	Australia	1.013396e+08
2017	Australia	9.615384e+07
2014	Australia	9.246523e+07

- For most Forest and Savanna burned in a year in a country Australia has 10 top values of the burned area in a country in a year.

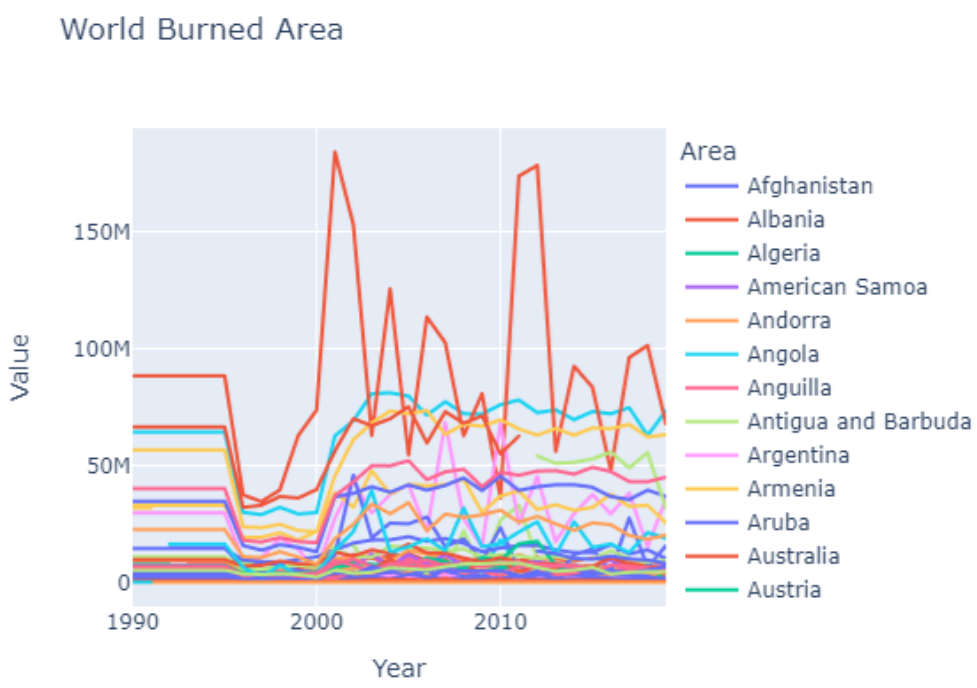
Graphical Representation of maximum area burned in a year in a country

-- Groupby Area, Area code and year and sum the values and rest index will give sum of all the tyoes of forest burned in a year in a country

```
df1 = df.groupby(["Area", "Area Code (ISO3)", "Year"])
["Value"].sum().reset_index()
df1.head()
```

- Ploting the graph

```
plt.figure(figsize=(15,3), dpi=150)
fig = px.line(df1, x="Year", y="Value",color='Area', title='World Burned Area')
fig.show()
```



5. Item type burned most in a year

- Item type burned most in a year

```
df.groupby(["Year","Item"]).sum().sort_values(by="Value",
ascending=False).head(10)
```

Year	Item	Value
2005	Savanna	3.487667e+08
2003	Savanna	3.414789e+08
2007	Savanna	3.294614e+08
2004	Grassland	3.285651e+08
2002	Grassland	3.209670e+08
2007	Grassland	3.209456e+08
2008	Savanna	3.151744e+08
2010	Savanna	3.136204e+08
2004	Savanna	3.135659e+08
2005	Grassland	3.107788e+08

- For most Forest and Savanna burned in a year Savanna has the highest value of **3.487667e+08** in year **2005**

6. Which type of item is burned most in a year and in which country

```
df.groupby(["Year","Area","Item"]).sum().sort_values(by="Value",
ascending=False).head(10)
```

Year	Area	Item	Value
2011	Australia	Open shrubland	1.052085e+08
2012	Australia	Open shrubland	9.431891e+07
2001	Australia	Open shrubland	9.156779e+07
2002	Australia	Open shrubland	8.998342e+07
2001	Australia	Grassland	7.639979e+07
2004	Australia	Grassland	6.797964e+07
2012	Australia	Grassland	6.456851e+07
2011	Australia	Grassland	5.287709e+07
2017	Australia	Open shrubland	5.209256e+07
2006	Australia	Grassland	5.006097e+07

- For most Forest and Savanna burned in a year in a country Open shrubland has the highest value which is **1.052085e+08** in year **2011** in Australia
- Open shrubland and Grassland are most burned item type in a year in a country.
- Both item type are most burned in Australia in a year.

EDA on Subcontinent countries

1.Select countries

- Select sub-continent countries

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

- India, Pakistan and Bangladesh are the selected countries in south Asia

Area	Value
India	6.546250e+07
Bangladesh	2.536032e+06

Area	Value
Pakistan	1.015368e+06

- From the above analysis we can say that **India** is the most affected country in subcontinent with value of **6.546250e+07**
- **Pakistan** is least affected country in subcontinent with value of **1.015368e+06**

2. Item type burned by fire in selected countries

- Item type burned by fire in selected countries

```
df_selected.groupby(["Item"]).sum().sort_values(by="Value",
ascending=False).head(10)
```

Item	Value
Other forest	2.952491e+07
Woody savanna	1.180380e+07
Humid tropical forest	1.146947e+07
Grassland	8.249579e+06
Savanna	7.762407e+06
Open shrubland	1.553655e+05
Closed shrubland	5.010989e+04

- From the subcontinent countries, the most burned item type was **Other forest** with value of **2.952522e+07**
- Least burned item type is **Closed shrubland** with value of **5.624728e+04**

3. Most burned area in selected countries in a year

- Most burned area in selected countries in a year

```
df_selected.groupby("Year").sum().sort_values(by="Value", ascending=False)
```

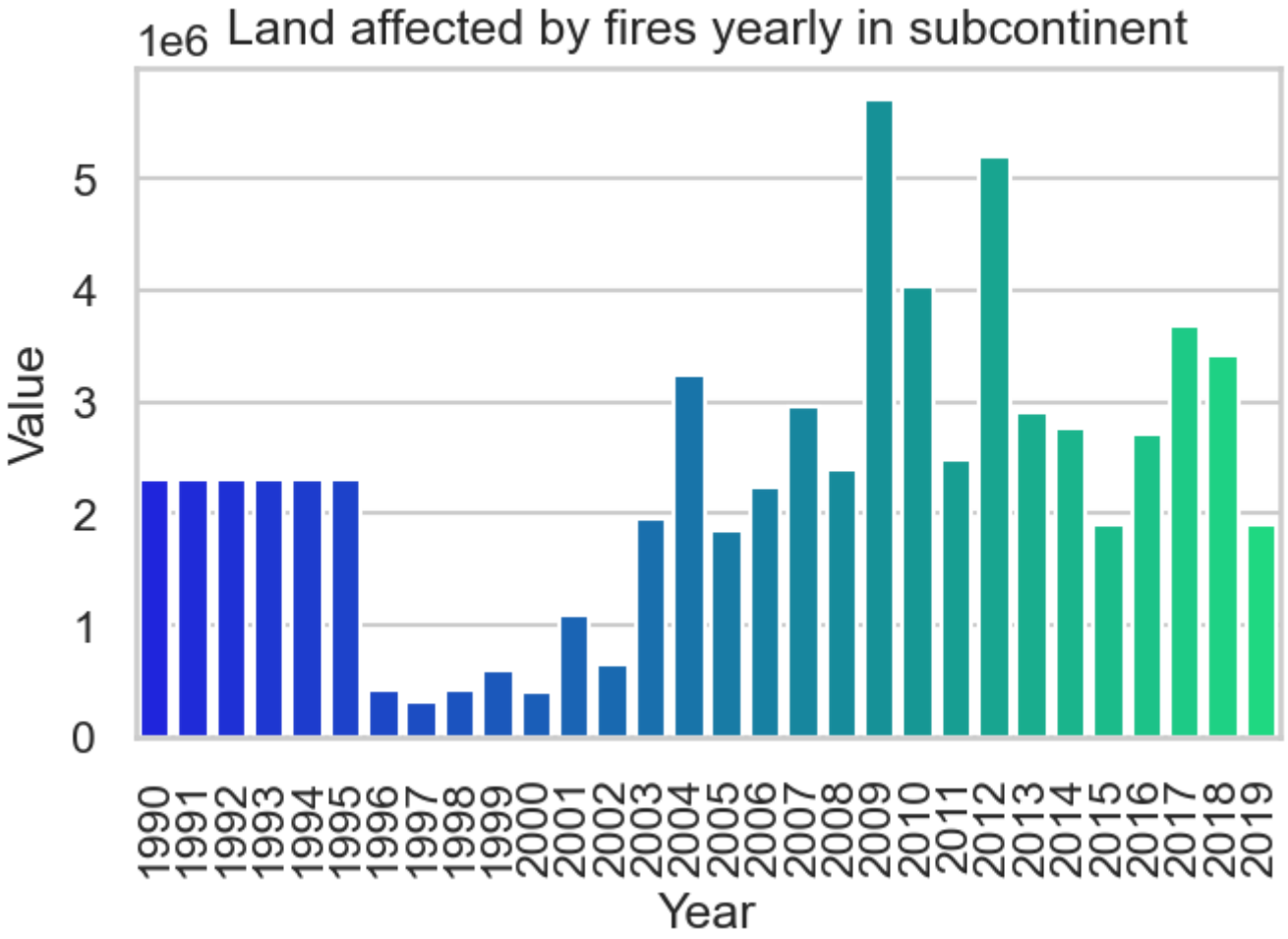
Year	Value
2009	5.705159e+06
2012	5.201674e+06
2010	4.037667e+06

Year	Value
2017	3.677225e+06
2018	3.413118e+06
2004	3.239376e+06
2007	2.952916e+06
2013	2.908165e+06
2014	2.762922e+06
2016	2.710776e+06
2011	2.484390e+06
2008	2.388524e+06
1995	2.302982e+06
1994	2.302982e+06
1993	2.302982e+06
1991	2.302982e+06
1992	2.302982e+06
1990	2.302982e+06
2006	2.230222e+06
2003	1.952966e+06
2019	1.895419e+06
2015	1.893740e+06
2005	1.841006e+06
2001	1.098290e+06
2002	6.435178e+05
1999	5.964729e+05
1998	4.256860e+05
1996	4.232155e+05
2000	3.992597e+05
1997	3.143008e+05

- From the above table it is clear the most area burned in a year is in year **2009** with value of **5.705159e+06**
- Minimum area burned in a year is in year **1997** with value of **3.143008e+05**

Graph of yearly area burned in subcontinent countries

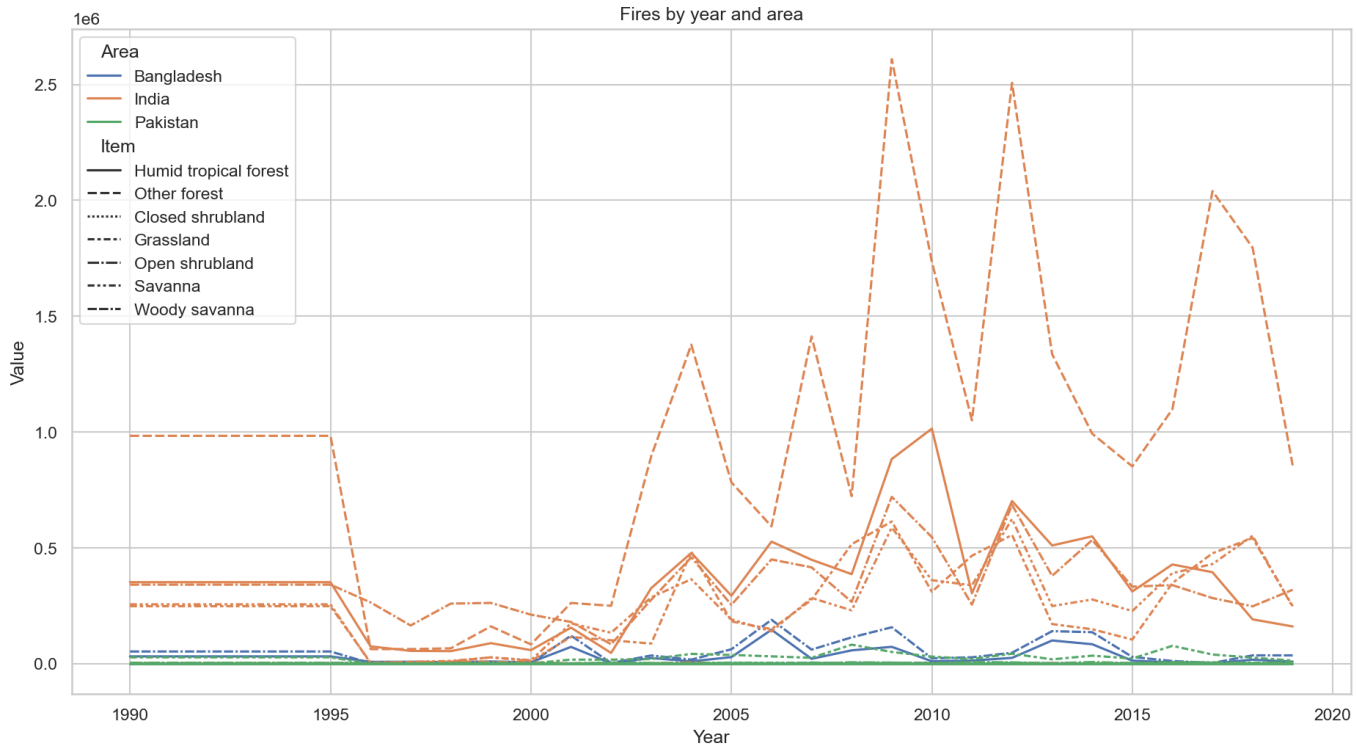
```
plt.figure(figsize=(5,3), dpi=150, linewidth=2)
sns.barplot(x="Year",y='Value',data=sy, palette="winter")
plt.xticks(rotation=90)
plt.title('Land affected by fires yearly in subcontinent')
```



4. Line graph of subcontinent countries

- Graphical analysis of selected countries

```
plt.figure(figsize=(15,8), dpi=150)
sns.set(font_scale=1)
sns.set_style("whitegrid")
sns.lineplot(x="Year",y="Value",hue="Area",style="Item",data=df_selected)
plt.title("Fires by year and area")
```

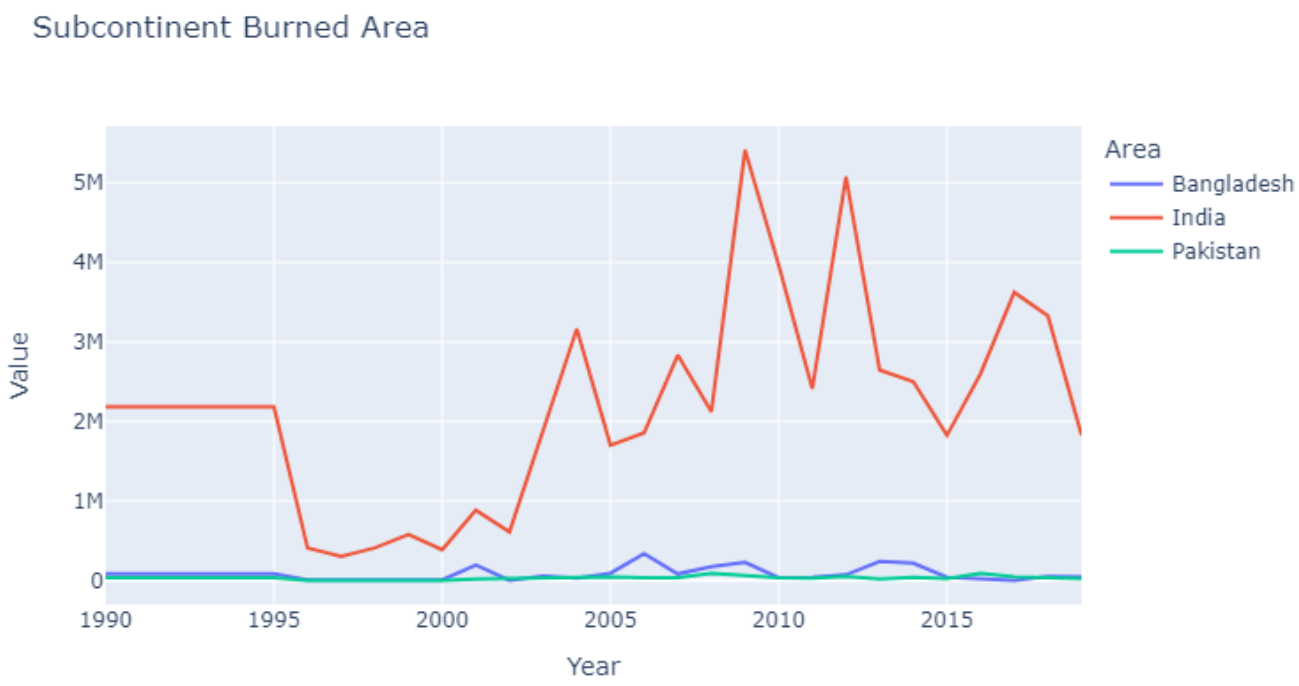


- Above graph is visualized to show the fires by year and area of selected countries with the style of line for the item type.

5.Graph of subcontinent countries showing yearly fire area

- Graph of subcontinent countries showing yearly fire area

```
fig = px.line(df2, x="Year", y="Value",color='Area', title='Subcontinent Burned Area')
fig.show()
```



Conclusion

1. For World

- The highest value of burned area was in year **2012** which **8.320688e+08**
- The lowest value of burned area was in year **1997** which is **3.022354e+08**
- A **sudden increase** in burned area value was observed after year **2000**
- From the available data **year 2002 to year 2012** has observes an increase burned area value, and a decrease after year 2012
- **Australia** is most affected country with area affected was **2.650662e+09**
- **Savanna** is most burned item type with value of **1.957280e+09**
- **Closed shrubland** is least burned item type with value of **9.897531e+07**
- For most Forest and Savanna burned in a year in a country **Australia** has 10 top values of the burned area in a country in a year.
- For most Forest and Savanna burned in a year **Savanna** has the highest value which is **3.487667e+08** in year **2005**
- For most Forest and Savanna burned in a year in a country **Open shrubland** has the highest value which is **1.052085e+08** in year **2011** in **Australia**
- **Open shrubland** and **Savanna** are in top 10 item type most burned in **Australia** in a year.

2. Subcontinent countries Analysis

- **India** is the most affected country from Subcontinent with value of **6.546250e+07**
- **Pakistan** is least affected country from Sub continent with value of **1.015368e+06**
- From the subcontinent countries, the most burned item type was **Other forest** with value of **2.952522e+07**
- Least burned item type is **Closed shrubland** with value of **5.624728e+04**
- Most area burned in a year in subcontinent was in year **2009** having value **5.705159e+06**
- Minimum area burned in a year in subcontinent was in year **1997** having value **3.143008e+05**