You need to submit 3 tree maps, 3 area charts and 3 stacked area charts using Tableau or PowerBI, Python and R using the data below (or your own datasets). You can also submit using D3. You can choose which library to use in Python or R, documentation is provided to help you decide and as you start to play around in the libraries, you will decide which you prefer.

Python

Data Import step

In [1]:
```
# Import libraries
import csv
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib as mpl
import squarify
import numpy as np
from datetime import datetime as dt
```

In [2]:
```
# Read world population data
dirData = 'ex3-3'
file_expenditures = 'expenditures.txt'
file_unemployement = 'unemployement-rate-1948-2010.csv'

dir_expenditures = dirData+'/'+file_expenditures
dir_unemployment = dirData+'/'+file_unemployement

raw_expenditures = pd.read_csv(dir_expenditures, sep = '\t', header=0)
raw_unemployment = pd.read_csv(dir_unemployment)

# Calculate total expenditure for categories
expenditures_cat = raw_expenditures.groupby(['category'])['expenditure'].sum().reset_index

# Calculate total expenditure by year
expenditures_year = raw_expenditures.groupby(['year'])['expenditure'].sum().reset_index()

print(raw_expenditures.head())
print(expenditures_cat.head())
print(expenditures_year.head())
print(raw_unemployment.head())
```

```
   year             category  expenditure  sex
0  2008                 Food         6443    1
1  2008  Alcoholic Beverages          444    1
2  2008              Housing        17109    1
3  2008              Apparel         1801    1
4  2008       Transportation         8604    1
             category  expenditure
0  Alcoholic Beverages         8424
1              Apparel        41833
2   Cash Contributions        27987
3            Education        14498
4        Entertainment        44273
   year  expenditure
0  1984        21972
1  1985        23489
2  1986        23865
3  1987        24415
4  1988        25893
     Series id  Year Period  Value
0  LNS14000000  1948    M01    3.4
```

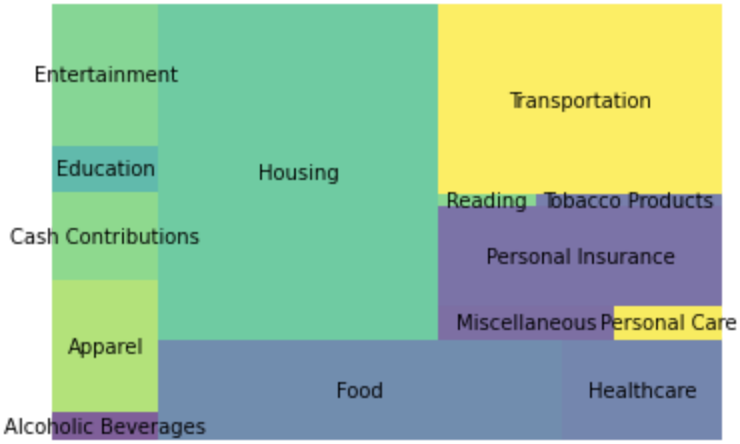
```
1  LNS14000000  1948    M02    3.8
2  LNS14000000  1948    M03    4.0
3  LNS14000000  1948    M04    3.9
4  LNS14000000  1948    M05    3.5
```

Treemap

Expenditure data

For this treemap, I would like to see how much each category has costed in total.

In [3]:
```
# Create tree map
squarify.plot(sizes=expenditures_cat['expenditure'], label=expenditures_cat['category'], a
plt.axis('off')
plt.show()
```



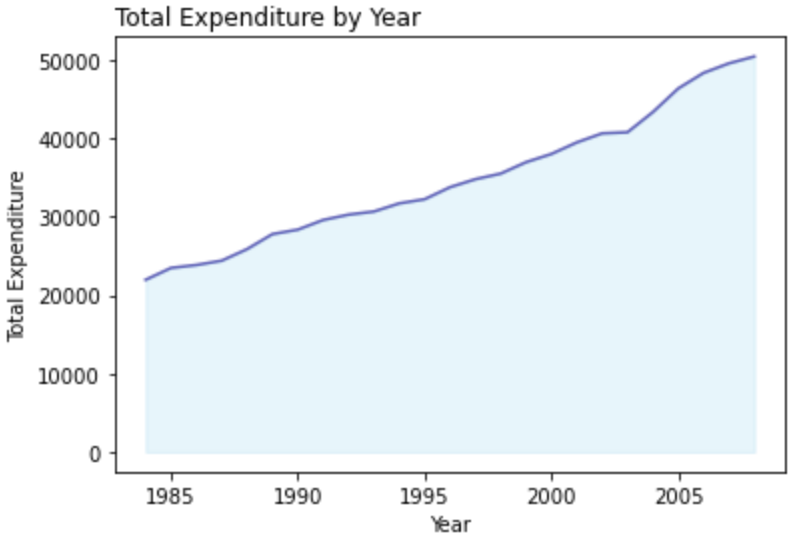
Area Chart

Expenditure data

For this area chart, I would like to see how much was the total expenditure every year

In [4]:
```
# Create x and y values to plot
x = expenditures_year['year']
y = expenditures_year['expenditure']

# Add a stronger line on top (edge)
plt.fill_between( x, y, color='skyblue', alpha=0.2)
plt.title('Total Expenditure by Year', loc='left')
plt.xlabel('Year')
plt.ylabel('Total Expenditure')
plt.plot(x, y, color='darkblue', alpha=0.6)
```

Out[4]:
```
[<matplotlib.lines.Line2D at 0x7fa791ceeaf0>]
```



Stacked Area Chart

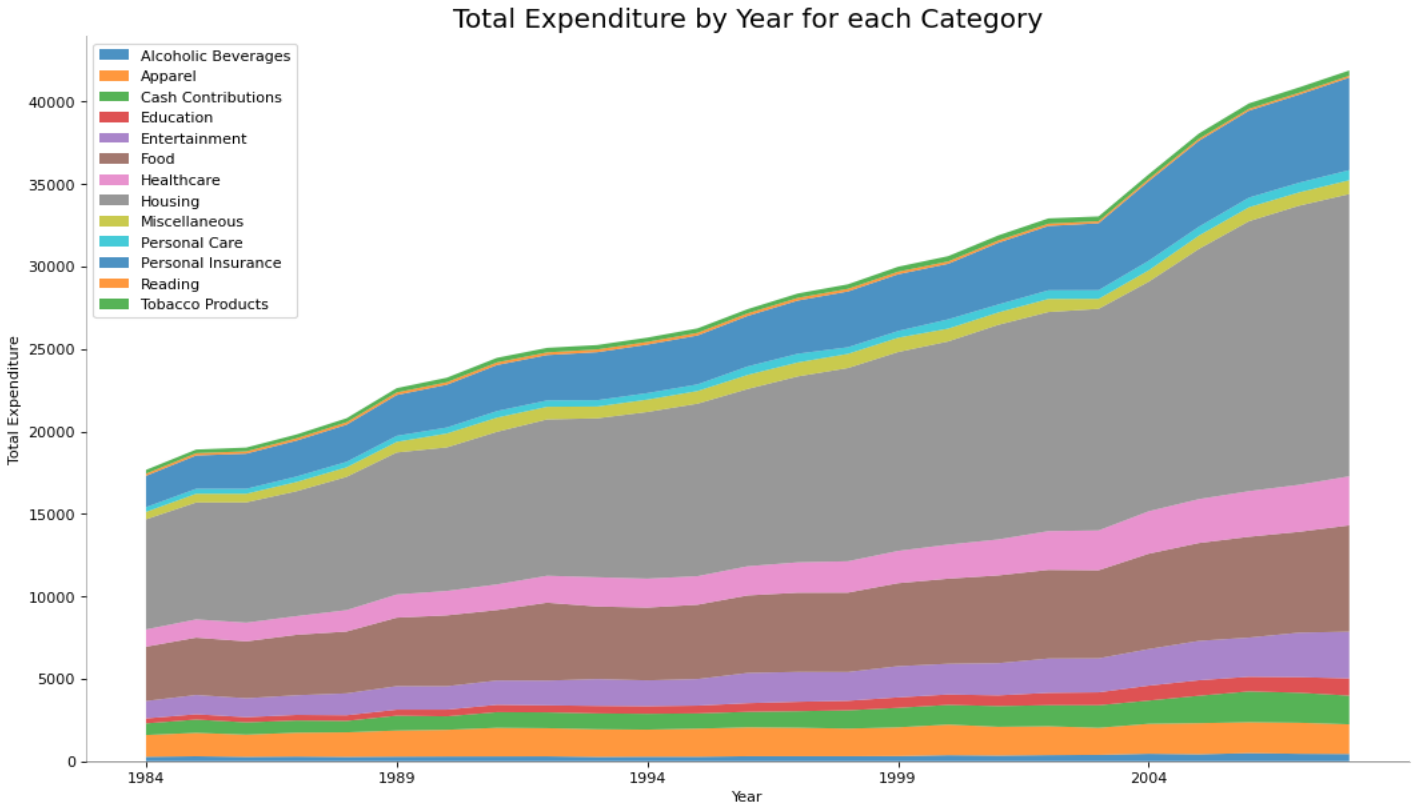
Expenditure data

For stacked area chart, I would like to see how much was the total expenditure every year for each category

In [5]:

```
# Reshape data to be used for stacked area chart
plt_expenditures = raw_expenditures.loc[:, raw_expenditures.columns != 'sex'].pivot(index=
plt_expenditures.reset_index(level=0, inplace=True)

# Draw Plot and Annotate
fig, ax = plt.subplots(1,1,figsize=(16, 9), dpi= 80)
columns = plt_expenditures.columns[1:]
labs = plt_expenditures.values.tolist()

# Prepare data
x  = plt_expenditures['year'].values.tolist()
y0 = plt_expenditures[columns[0]].values.tolist()
y1 = plt_expenditures[columns[1]].values.tolist()
y2 = plt_expenditures[columns[2]].values.tolist()
y3 = plt_expenditures[columns[3]].values.tolist()
y4 = plt_expenditures[columns[4]].values.tolist()
y5 = plt_expenditures[columns[5]].values.tolist()
y6 = plt_expenditures[columns[6]].values.tolist()
y7 = plt_expenditures[columns[7]].values.tolist()
y8 = plt_expenditures[columns[8]].values.tolist()
y9 = plt_expenditures[columns[9]].values.tolist()
y10 = plt_expenditures[columns[10]].values.tolist()
y11 = plt_expenditures[columns[11]].values.tolist()
y12 = plt_expenditures[columns[12]].values.tolist()
y = np.vstack([y0, y1, y2, y3, y4, y5, y6, y7, y8, y9, y10, y11, y12])

# Plot for each column
labs = columns.values.tolist()
ax = plt.gca()
ax.stackplot(x, y, labels=labs, alpha=0.8)

# Create title
ax.set_title('Total Expenditure by Year for each Category', fontsize=18)
plt.xlabel('Year')
plt.ylabel('Total Expenditure')

# Show legend
ax.legend(fontsize=10, ncol=1, loc = 'upper left')
plt.xticks(x[::5], fontsize=10, horizontalalignment='center')
```

```
# Lighten borders
plt.gca().spines["top"].set_alpha(0)
plt.gca().spines["bottom"].set_alpha(.3)
plt.gca().spines["right"].set_alpha(0)
plt.gca().spines["left"].set_alpha(.3)

# Output graph
plt.show()
```



End of Code