ENSF 592 Spring 2023
Project Report

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This program aims to determine the countries most affected by climate change and the rate at which they are being affected. Datasets of three key indicators of climate change were used to build the data frame of this program, which include:

- Annual Surface Temperature Change [1]
- Land Cover and Land Cover Altering Indicator (Carbon Sequestration) [1]
- Climate-related Disaster Frequency [1]

To ensure data consistency, only the common years for which the data was present were merged into the data frame. The index used to identify countries is the ISO 3 code which is what the user is required to enter. The full names of the countries can be long, and tedious to type, which is why ISO 3 is used. For instance, the country Madagascar, Rep. of can be entered as MDG.

The program starts by asking for two inputs:

1. The ISO 3 code of the first country.
2. The ISO 3 code of the second country to compare with.

If an invalid input is entered, the user is prompted to re-enter a valid input. After the selection, the means for each parameter are printed for the 29 year period for both countries. Please refer to Figure 1 in Appendix A to view the screenshot when Canada and USA were selected as an example.

Next, the user is asked to select a parameter from the menu for which a pivot table is printed, and a plot generated. Temperature change is selected for USA and Canada as a continuance of the previous example, the results can be seen in Appendix B.

The final two prompts allow the user to enter Y for the aggregate statistics for the entire climate dataset, and how many countries experienced more than 20 climate-related disasters in a year. If the user pleases to skip any of these prompts, any key can be entered. The results of entering Y are shown in Appendix C. After these two prompts, an Excel file named ClimateDataExport.xlsx is exported.

References

[1] "Climate change data," Climate Change Indicators Dashboard,
    https://climatedata.imf.org/pages/climatechange-data (accessed Jun. 12, 2023).

Appendix A – Initial Prompts

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ENSF592 Climate Data Statistics
Influence of climate change on various indicators for countries across several years

Please enter the ISO3 code of the country (example: CAN, USA) or enter 'exit' to exit the program: CAN
Now pick a second country to compare with the first country.
Please enter the ISO3 code of the country (example: CAN, USA) or enter 'exit' to exit the program: usa

You chose the countries Canada and United States

The mean aggregate statistics for the 2 countries over a period of 29 years is shown below:
For Canada:
Temperature Change              1.158759
Land Cover Index               99.571262
Extreme Temperature                  NaN
Wildfires                            NaN
Storms                          1.400000
Landslides                           NaN
Droughts                             NaN
Floods                          1.500000
Total Disasters                 2.827586
Fractional Total Disaster       0.979499
Fractional Land Cover Index     0.513028

For United States:
Temperature Change              0.863345
Land Cover Index               99.168032
Extreme Temperature                  NaN
Wildfires                            NaN
Storms                         14.827586
Landslides                      1.000000
Droughts                        1.181818
Floods                          4.571429
Total Disasters                23.172414
Fractional Total Disaster       8.066846
Fractional Land Cover Index     0.510900
```

Figure 1: Selecting Canada and USA using ISO 3

Appendix B: Pivot Table and Figure

```
Please select the parameter or climate change indicator you want to compare from the list.
Please enter the code for the parameter you want to choose from the list below or enter 'exit' to exit the program
0: Temperature Change
1: Land Cover Index
2: Total Disasters
0
You picked the Temperature Change parameter to compare the two countries.

A pivot table showing the Temperature Change statistics for the 2 countries for the period from 1992 to 2020 is displayed below and a corresponding bar gr
aph is generated as well showing the trend:
Country  Canada  United States
Year
F1992     0.100         0.395
F1993     0.342         0.004
F1994     0.467         0.466
F1995     0.938         0.630
F1996    -0.125        -0.011
F1997     0.426         0.384
F1998     2.470         1.272
F1999     1.694         0.758
F2000     1.291         1.000
F2001     1.421         0.786
F2002     0.540         0.951
F2003     1.240         0.990
F2004     0.485         0.863
F2005     1.282         1.153
F2006     2.343         1.026
F2007     1.333         1.143
F2008     0.851         0.212
F2009     0.539         0.398
F2010     2.915         0.695
F2011     1.438         0.537
F2012     2.144         1.448
F2013     1.182         0.614
F2014     0.288         0.501
F2015     1.231         1.531
F2016     2.373         2.224
F2017     1.480         1.433
F2018     0.477         1.276
F2019     1.311         1.034
F2020     1.128         1.324
Plotting the data.
```

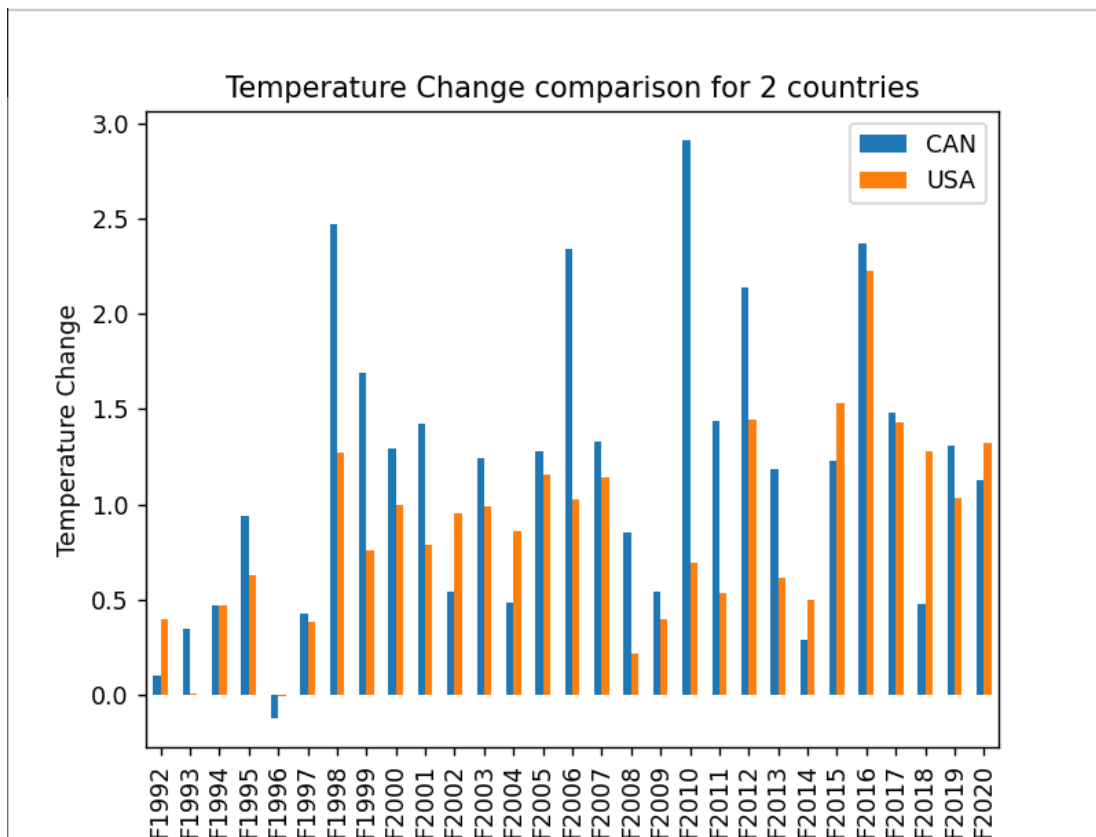Figure 2: Pivot table showing yearly temperature change for Canada and USA

Figure 3: Plot generated using Matplotlib

Appendix C


```
Plotting the data.
Would you be interested in knowing the aggregate statistics for the entire climate data dataset?
Enter 'Y' for yes or enter any other key to skip this step and continue: Y

The aggregate stats for the entire Climate Data dataset is:
       Temperature Change  Land Cover Index  Extreme Temperature  ...  Total Disasters  Fractional Total Disaster  Fractional Land Cover Index
count                 0.0               0.0                  0.0  ...              0.0                        0.0                          0.0
mean                  NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
std                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
min                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
25%                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
50%                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
75%                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN
max                   NaN               NaN                  NaN  ...              NaN                        NaN                          NaN

[8 rows x 11 columns]
```

Figure 4: Statistics of the entire climate data


```
Would you be interested in knowing how many countries experienced more than 20 climate-related disasters in a year?
Enter 'Y' for yes or enter any other key to skip this step and continue: Y

The countries (along with their ISO3 codes and year) that experienced more than 20 climate-related disasters a year are:
('CHN', 'China, P.R.: Mainland', 'F2000')
('CHN', 'China, P.R.: Mainland', 'F2001')
('CHN', 'China, P.R.: Mainland', 'F2002')
('CHN', 'China, P.R.: Mainland', 'F2005')
('CHN', 'China, P.R.: Mainland', 'F2006')
('CHN', 'China, P.R.: Mainland', 'F2008')
('CHN', 'China, P.R.: Mainland', 'F2009')
('CHN', 'China, P.R.: Mainland', 'F2010')
('CHN', 'China, P.R.: Mainland', 'F2012')
('CHN', 'China, P.R.: Mainland', 'F2013')
('CHN', 'China, P.R.: Mainland', 'F2014')
('CHN', 'China, P.R.: Mainland', 'F2015')
('CHN', 'China, P.R.: Mainland', 'F2016')
('CHN', 'China, P.R.: Mainland', 'F2017')
('IDN', 'Indonesia', 'F2020')
('IND', 'India', 'F2005')
('IND', 'India', 'F2018')
('PHL', 'Philippines', 'F2009')
('PHL', 'Philippines', 'F2011')
('USA', 'United States', 'F1992')
('USA', 'United States', 'F1993')
('USA', 'United States', 'F1997')
('USA', 'United States', 'F1998')
('USA', 'United States', 'F1999')
('USA', 'United States', 'F2000')
('USA', 'United States', 'F2001')
('USA', 'United States', 'F2002')
('USA', 'United States', 'F2003')
('USA', 'United States', 'F2006')
('USA', 'United States', 'F2007')
('USA', 'United States', 'F2008')
('USA', 'United States', 'F2011')
('USA', 'United States', 'F2012')
('USA', 'United States', 'F2013')
('USA', 'United States', 'F2015')
('USA', 'United States', 'F2016')
('USA', 'United States', 'F2017')
('USA', 'United States', 'F2020')
Please wait. The program is exporting the dataframe to an excel file.
Exporting completed. Thank you for your patience.
```

Figure 5: More than 20 climate-related disasters in a year