Analyses of Global Temperature Rise

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DATA 230: Data Visualization

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Abstract

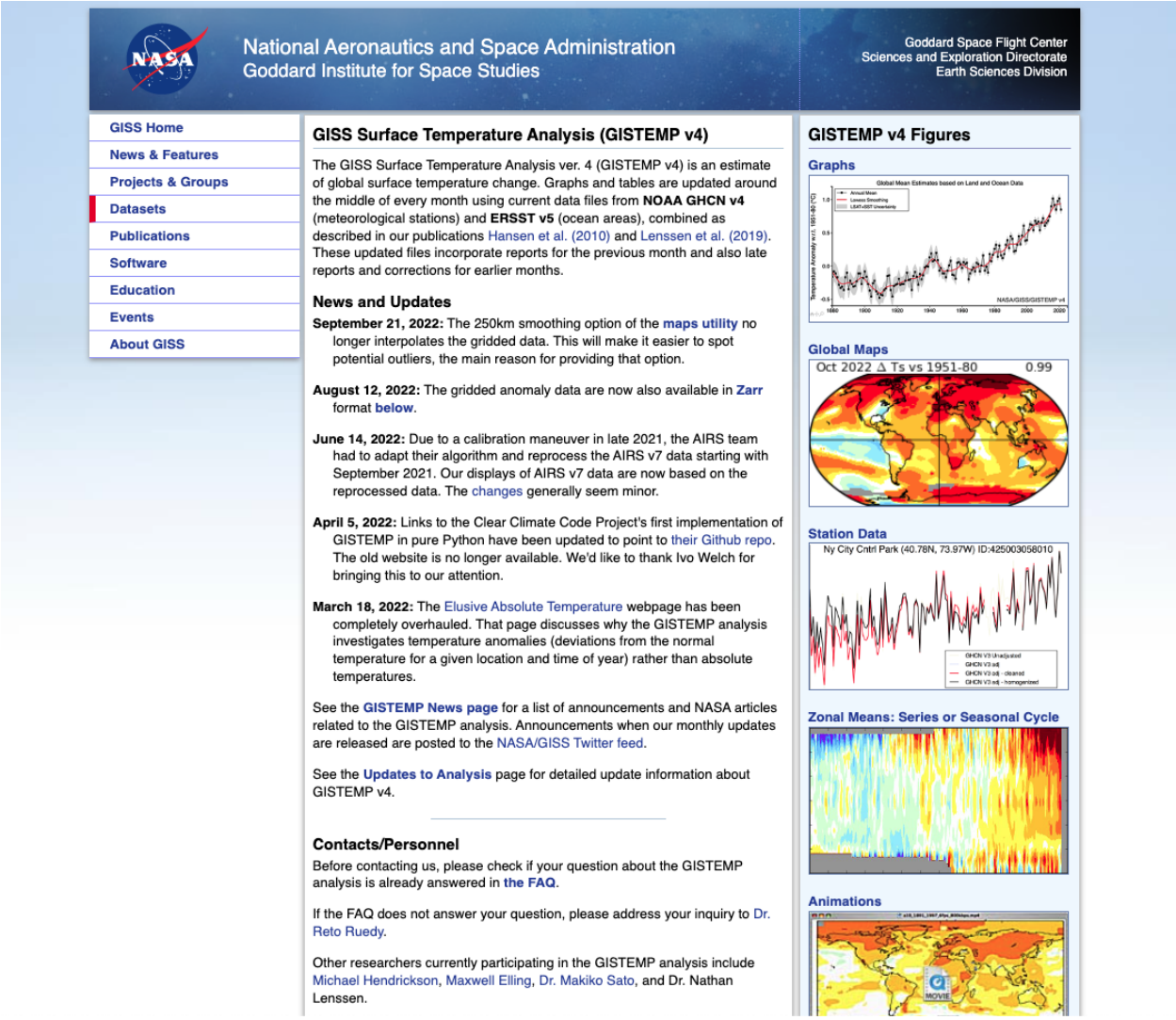
The effects of global warming are severe and widespread, with the average global temperature increasing by more than 1.5 degrees Fahrenheit since 1880. Human activities, particularly the emission of greenhouse gases, are the primary cause of global warming. This project aims to analyse global temperature data and the effects of global warming on Earth. Using data collected from weather stations around the world, the analysis will provide insights on the average temperature, temperature variations, and the causes of global warming. The results of this analysis can help identify cities where the temperature is increasing at a faster rate, providing valuable information for policymakers and stakeholders in addressing the impacts of global warming.

My analysis will be based on the data collected from the weather stations around the world. The data collected from the weather stations is cleaned and analyses will be done to find the global average temperature. The analysis of the data will provide us the insights about the average temperature, the variation in the temperature and the reasons behind global warming and also provides insights about the cities where the temperature is increasing at a faster rate.

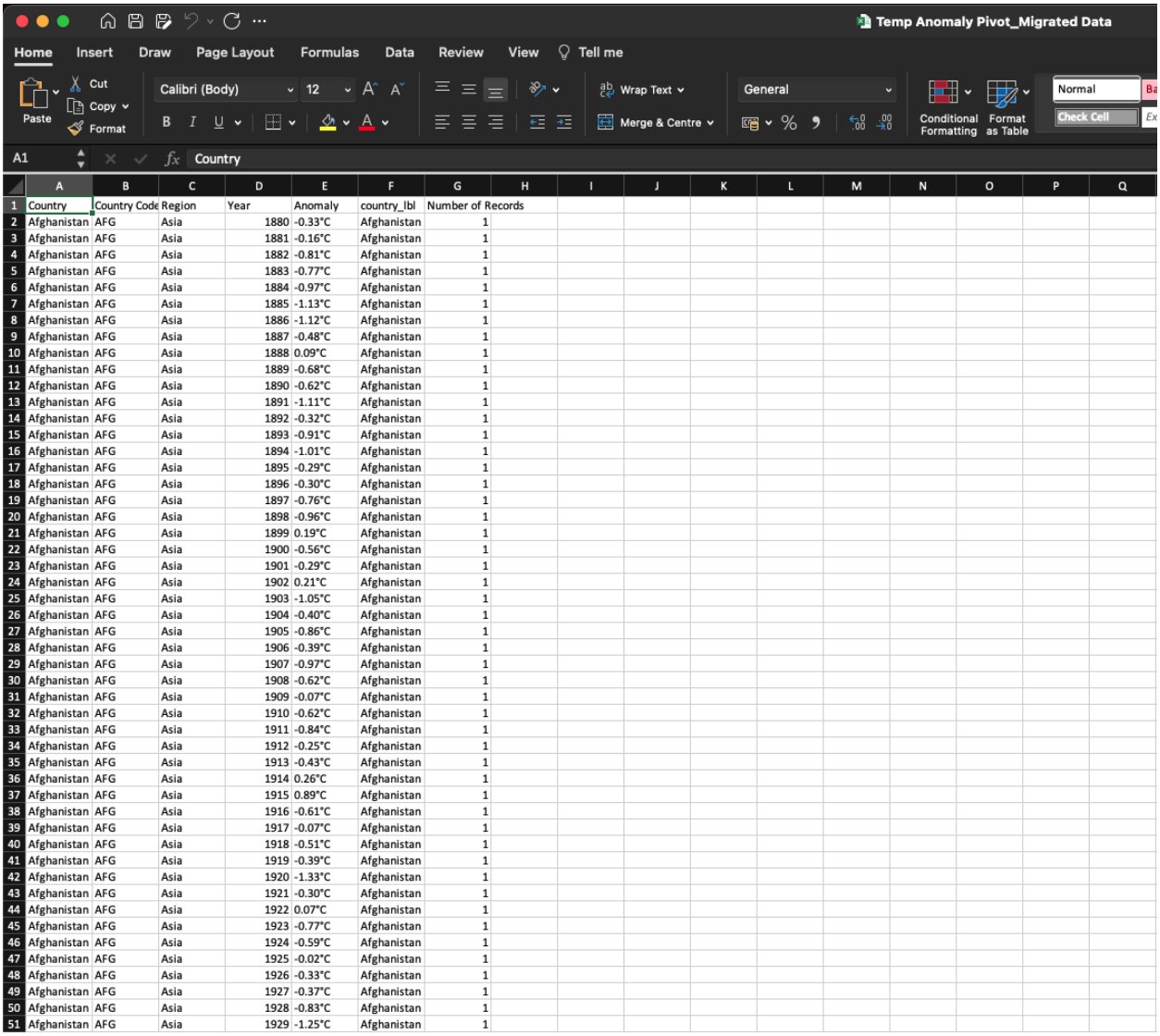
Data Sources

Temperature Data had been collected from “NASA – GISS Surface Temperature Analysis Data”, CO2 Emission Data from “Climate Watch – Co2 Emission Sector Level Data” and Human Development Index Data from “UNDP– Human Development Index Data”.

- **NASA – GISS Data**



- Website



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Country	Country Code	Region	Year	Anomaly	country_lbl	Number of Records										
2	Afghanistan	AFG	Asia	1880	-0.33°C	Afghanistan	1										
3	Afghanistan	AFG	Asia	1881	-0.16°C	Afghanistan	1										
4	Afghanistan	AFG	Asia	1882	-0.81°C	Afghanistan	1										
5	Afghanistan	AFG	Asia	1883	-0.77°C	Afghanistan	1										
6	Afghanistan	AFG	Asia	1884	-0.97°C	Afghanistan	1										
7	Afghanistan	AFG	Asia	1885	-1.13°C	Afghanistan	1										
8	Afghanistan	AFG	Asia	1886	-1.12°C	Afghanistan	1										
9	Afghanistan	AFG	Asia	1887	-0.48°C	Afghanistan	1										
10	Afghanistan	AFG	Asia	1888	0.09°C	Afghanistan	1										
11	Afghanistan	AFG	Asia	1889	-0.68°C	Afghanistan	1										
12	Afghanistan	AFG	Asia	1890	-0.62°C	Afghanistan	1										
13	Afghanistan	AFG	Asia	1891	-1.11°C	Afghanistan	1										
14	Afghanistan	AFG	Asia	1892	-0.32°C	Afghanistan	1										
15	Afghanistan	AFG	Asia	1893	-0.91°C	Afghanistan	1										
16	Afghanistan	AFG	Asia	1894	-1.01°C	Afghanistan	1										
17	Afghanistan	AFG	Asia	1895	-0.29°C	Afghanistan	1										
18	Afghanistan	AFG	Asia	1896	-0.30°C	Afghanistan	1										
19	Afghanistan	AFG	Asia	1897	-0.76°C	Afghanistan	1										
20	Afghanistan	AFG	Asia	1898	-0.96°C	Afghanistan	1										
21	Afghanistan	AFG	Asia	1899	0.19°C	Afghanistan	1										
22	Afghanistan	AFG	Asia	1900	-0.56°C	Afghanistan	1										
23	Afghanistan	AFG	Asia	1901	-0.29°C	Afghanistan	1										
24	Afghanistan	AFG	Asia	1902	0.21°C	Afghanistan	1										
25	Afghanistan	AFG	Asia	1903	-1.05°C	Afghanistan	1										
26	Afghanistan	AFG	Asia	1904	-0.40°C	Afghanistan	1										
27	Afghanistan	AFG	Asia	1905	-0.86°C	Afghanistan	1										
28	Afghanistan	AFG	Asia	1906	-0.39°C	Afghanistan	1										
29	Afghanistan	AFG	Asia	1907	-0.97°C	Afghanistan	1										
30	Afghanistan	AFG	Asia	1908	-0.62°C	Afghanistan	1										
31	Afghanistan	AFG	Asia	1909	-0.07°C	Afghanistan	1										
32	Afghanistan	AFG	Asia	1910	-0.62°C	Afghanistan	1										
33	Afghanistan	AFG	Asia	1911	-0.84°C	Afghanistan	1										
34	Afghanistan	AFG	Asia	1912	-0.25°C	Afghanistan	1										
35	Afghanistan	AFG	Asia	1913	-0.43°C	Afghanistan	1										
36	Afghanistan	AFG	Asia	1914	0.26°C	Afghanistan	1										
37	Afghanistan	AFG	Asia	1915	0.89°C	Afghanistan	1										
38	Afghanistan	AFG	Asia	1916	-0.61°C	Afghanistan	1										
39	Afghanistan	AFG	Asia	1917	-0.07°C	Afghanistan	1										
40	Afghanistan	AFG	Asia	1918	-0.51°C	Afghanistan	1										
41	Afghanistan	AFG	Asia	1919	-0.39°C	Afghanistan	1										
42	Afghanistan	AFG	Asia	1920	-1.33°C	Afghanistan	1										
43	Afghanistan	AFG	Asia	1921	-0.30°C	Afghanistan	1										
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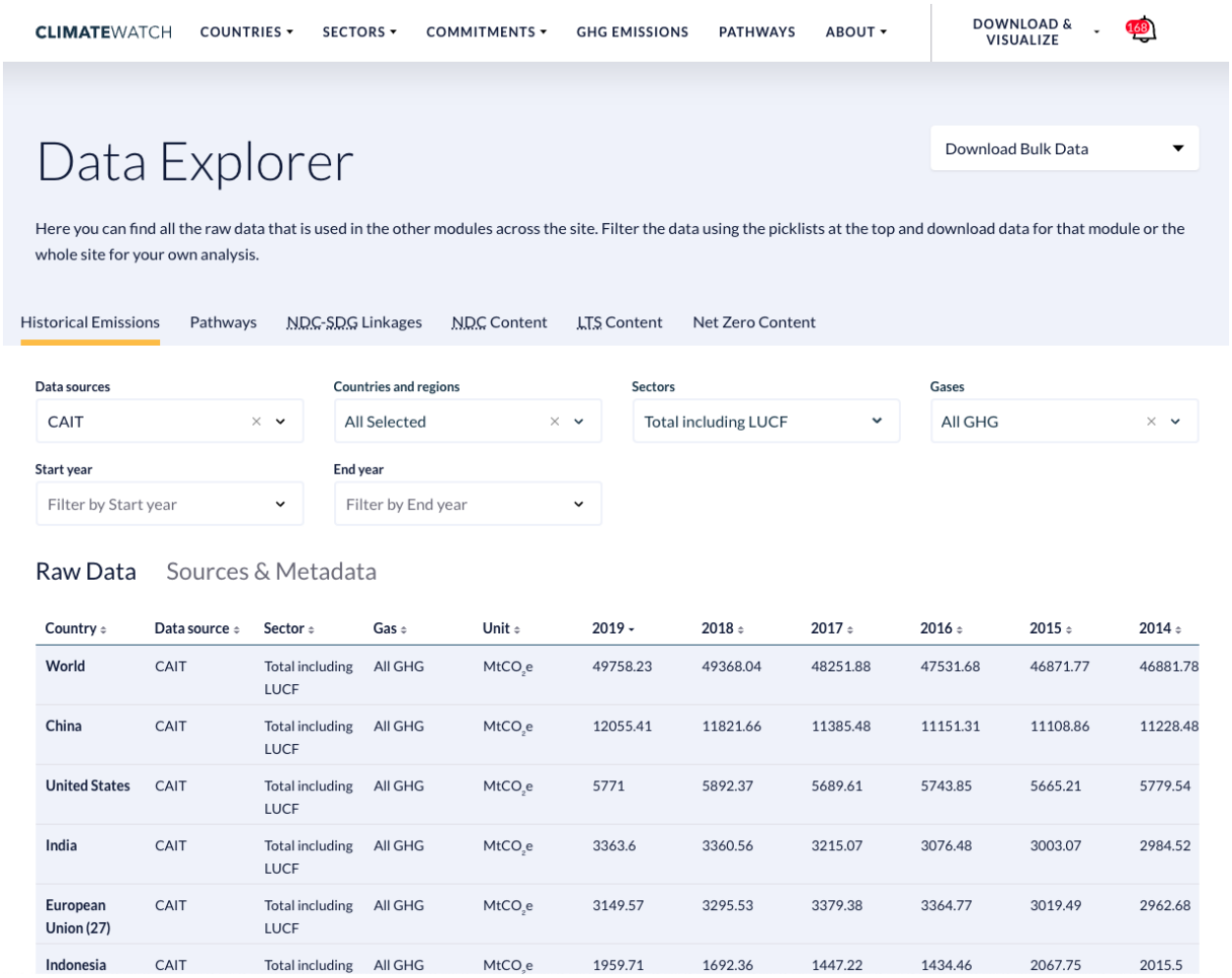
47	Afghanistan	AFG	Asia	1925	-0.02°C	Afghanistan	1										
48	Afghanistan	AFG	Asia	1926	-0.33°C	Afghanistan	1										
49	Afghanistan	AFG	Asia	1927	-0.37°C	Afghanistan	1										
50	Afghanistan	AFG	Asia	1928	-0.83°C	Afghanistan	1										
51	Afghanistan	AFG	Asia	1929	-1.25°C	Afghanistan	1										

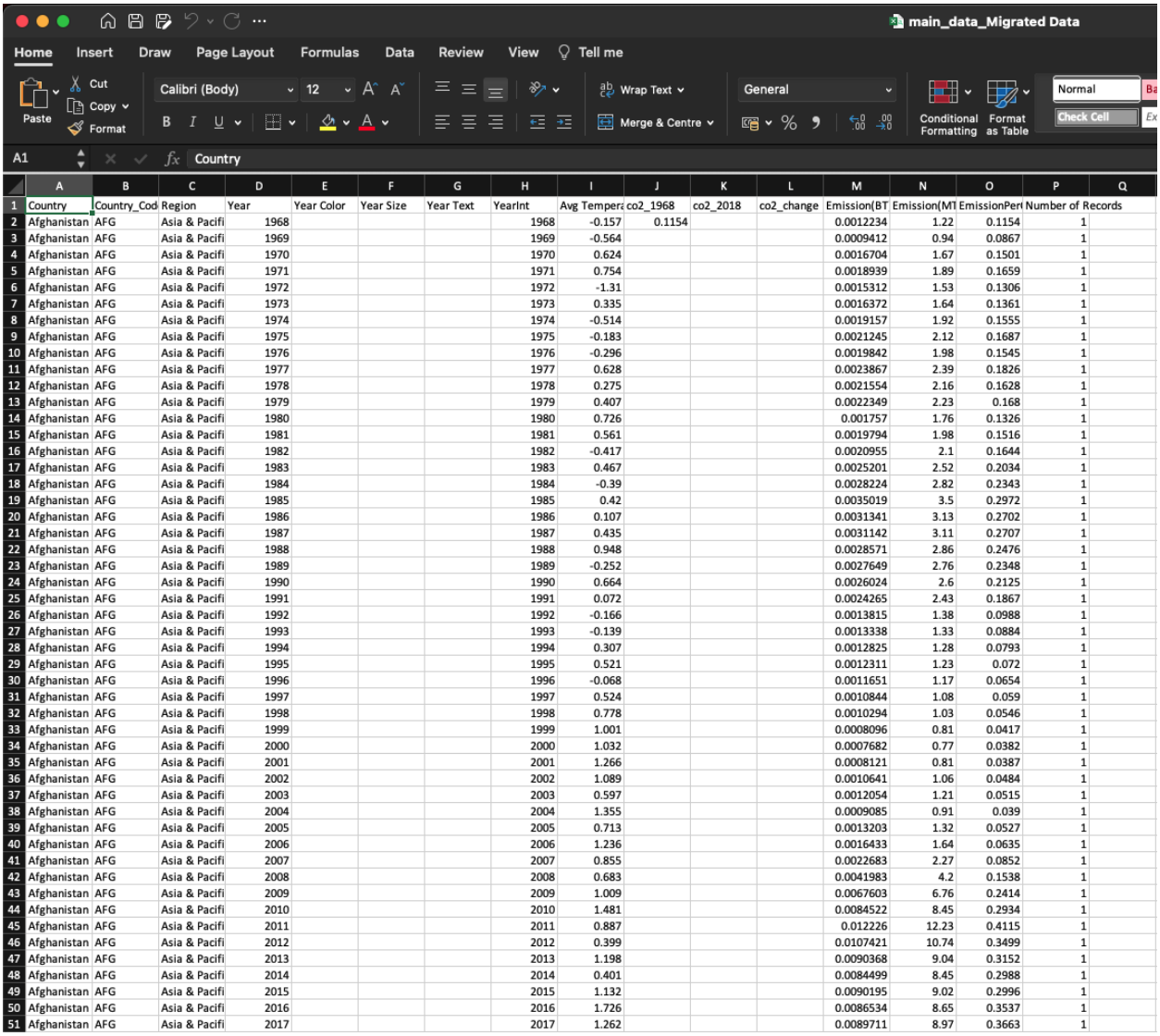
- CSV Data

- Climate Watch CO2 Data



Country	Data source	Sector	Gas	Unit	2019	2018	2017	2016	2015	2014
World	CAIT	Total including LUCF	All GHG	$MtCO_2e$	49758.23	49368.04	48251.88	47531.68	46871.77	46881.78
China	CAIT	Total including LUCF	All GHG	$MtCO_2e$	12055.41	11821.66	11385.48	11151.31	11108.86	11228.48
United States	CAIT	Total including LUCF	All GHG	$MtCO_2e$	5771	5892.37	5689.61	5743.85	5665.21	5779.54
India	CAIT	Total including LUCF	All GHG	$MtCO_2e$	3363.6	3360.56	3215.07	3076.48	3003.07	2984.52
European Union (27)	CAIT	Total including LUCF	All GHG	$MtCO_2e$	3149.57	3295.53	3379.38	3364.77	3019.49	2962.68
Indonesia	CAIT	Total including	All GHG	$MtCO_2e$	1959.71	1692.36	1447.22	1434.46	2067.75	2015.5

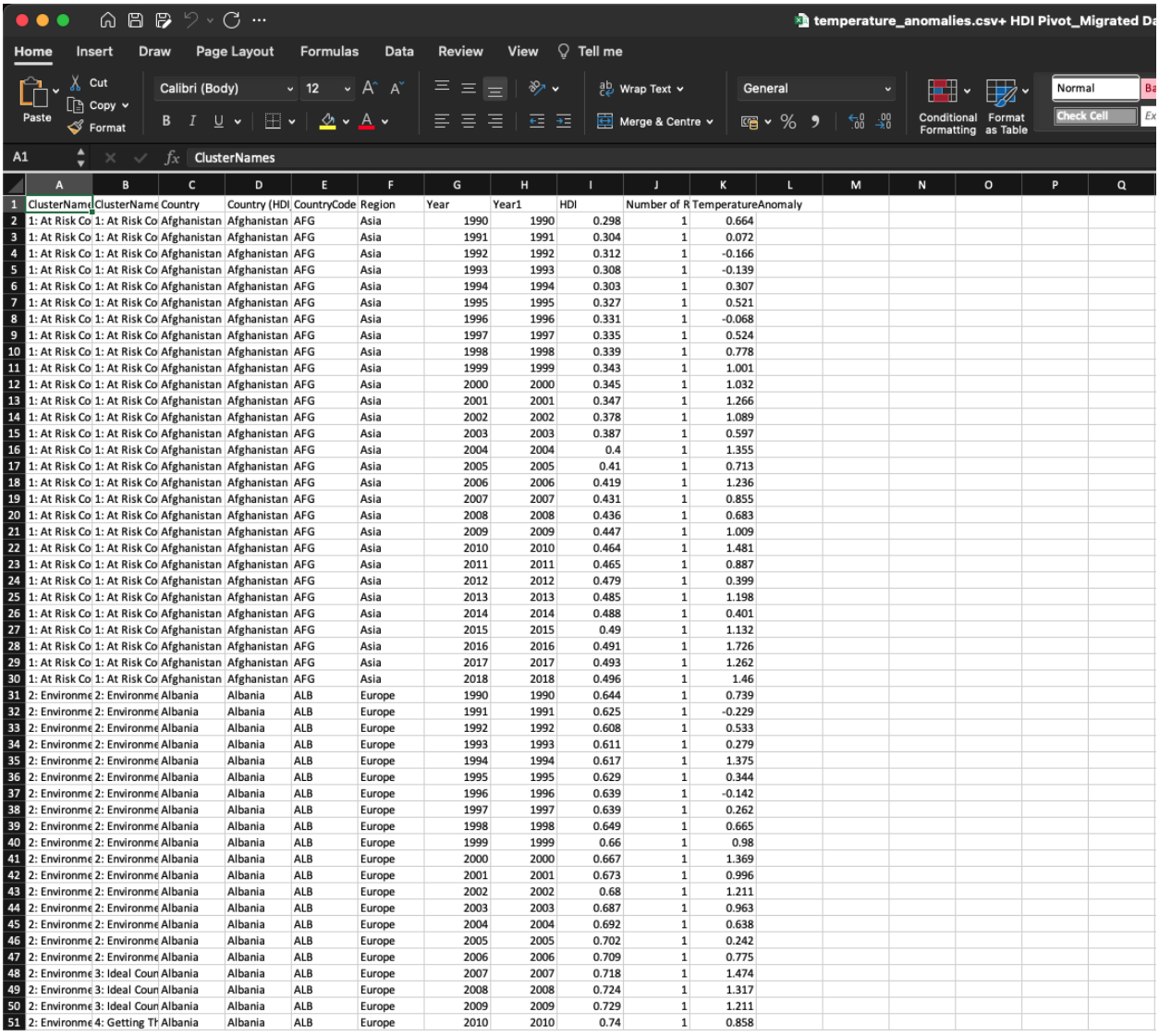
- Website



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Country	Country_Cod	Region	Year	Year Color	Year Size	Year Text	YearInt	Avg Tempera	co2_1968	co2_2018	co2_change	Emission(BT	Emission(MT	EmissionPer	Number of Records	
2	Afghanistan	AFG	Asia & Pacifi	1968				1968	-0.157	0.1154			0.0012234	1.22	0.1154	1	
3	Afghanistan	AFG	Asia & Pacifi	1969				1969	-0.564				0.0009412	0.94	0.0867	1	
4	Afghanistan	AFG	Asia & Pacifi	1970				1970	0.624				0.0016704	1.67	0.1501	1	
5	Afghanistan	AFG	Asia & Pacifi	1971				1971	0.754				0.0018939	1.89	0.1659	1	
6	Afghanistan	AFG	Asia & Pacifi	1972				1972	-1.31				0.0015312	1.53	0.1306	1	
7	Afghanistan	AFG	Asia & Pacifi	1973				1973	0.335				0.0016372	1.64	0.1361	1	
8	Afghanistan	AFG	Asia & Pacifi	1974				1974	-0.514				0.0019157	1.92	0.1555	1	
9	Afghanistan	AFG	Asia & Pacifi	1975				1975	-0.183				0.0021245	2.12	0.1687	1	
10	Afghanistan	AFG	Asia & Pacifi	1976				1976	-0.296				0.0019842	1.98	0.1545	1	
11	Afghanistan	AFG	Asia & Pacifi	1977				1977	0.628				0.0023867	2.39	0.1826	1	
12	Afghanistan	AFG	Asia & Pacifi	1978				1978	0.275				0.0021554	2.16	0.1628	1	
13	Afghanistan	AFG	Asia & Pacifi	1979				1979	0.407				0.0022349	2.23	0.168	1	
14	Afghanistan	AFG	Asia & Pacifi	1980				1980	0.726				0.001757	1.76	0.1326	1	
15	Afghanistan	AFG	Asia & Pacifi	1981				1981	0.561				0.0019794	1.98	0.1516	1	
16	Afghanistan	AFG	Asia & Pacifi	1982				1982	-0.417				0.0020955	2.1	0.1644	1	
17	Afghanistan	AFG	Asia & Pacifi	1983				1983	0.467				0.0025201	2.52	0.2034	1	
18	Afghanistan	AFG	Asia & Pacifi	1984				1984	-0.39				0.0028224	2.82	0.2343	1	
19	Afghanistan	AFG	Asia & Pacifi	1985				1985	0.42				0.0035019	3.5	0.2972	1	
20	Afghanistan	AFG	Asia & Pacifi	1986				1986	0.107				0.0031341	3.13	0.2702	1	
21	Afghanistan	AFG	Asia & Pacifi	1987				1987	0.435				0.0031142	3.11	0.2707	1	
22	Afghanistan	AFG	Asia & Pacifi	1988				1988	0.948				0.0028571	2.86	0.2476	1	
23	Afghanistan	AFG	Asia & Pacifi	1989				1989	-0.252				0.0027649	2.76	0.2348	1	
24	Afghanistan	AFG	Asia & Pacifi	1990				1990	0.664				0.0026024	2.6	0.2125	1	
25	Afghanistan	AFG	Asia & Pacifi	1991				1991	0.072				0.0024265	2.43	0.1867	1	
26	Afghanistan	AFG	Asia & Pacifi	1992				1992	-0.166				0.0013815	1.38	0.0988	1	
27	Afghanistan	AFG	Asia & Pacifi	1993				1993	-0.139				0.0013338	1.33	0.0884	1	
28	Afghanistan	AFG	Asia & Pacifi	1994				1994	0.307				0.0012825	1.28	0.0793	1	
29	Afghanistan	AFG	Asia & Pacifi	1995				1995	0.521				0.0012311	1.23	0.072	1	
30	Afghanistan	AFG	Asia & Pacifi	1996				1996	-0.068				0.0011651	1.17	0.0654	1	
31	Afghanistan	AFG	Asia & Pacifi	1997				1997	0.524				0.0010844	1.08	0.059	1	
32	Afghanistan	AFG	Asia & Pacifi	1998				1998	0.778				0.0010294	1.03	0.0546	1	
33	Afghanistan	AFG	Asia & Pacifi	1999				1999	1.001				0.0008096	0.81	0.0417	1	
34	Afghanistan	AFG	Asia & Pacifi	2000				2000	1.032				0.0007682	0.77	0.0382	1	
35	Afghanistan	AFG	Asia & Pacifi	2001				2001	1.266				0.0008121	0.81	0.0387	1	
36	Afghanistan	AFG	Asia & Pacifi	2002				2002	1.089				0.0010641	1.06	0.0484	1	
37	Afghanistan	AFG	Asia & Pacifi	2003				2003	0.597				0.0012054	1.21	0.0515	1	
38	Afghanistan	AFG	Asia & Pacifi	2004				2004	1.355				0.0009085	0.91	0.039	1	
39	Afghanistan	AFG	Asia & Pacifi	2005				2005	0.713				0.0013203	1.32	0.0527	1	
40	Afghanistan	AFG	Asia & Pacifi	2006				2006	1.236				0.0016433	1.64	0.0635	1	
41	Afghanistan	AFG	Asia & Pacifi	2007				2007	0.855				0.0022683	2.27	0.0852	1	
42	Afghanistan	AFG	Asia & Pacifi	2008				2008	0.683				0.0041983	4.2	0.1538	1	
43	Afghanistan	AFG	Asia & Pacifi	2009				2009	1.009				0.0067603	6.76	0.2414	1	
44	Afghanistan	AFG	Asia & Pacifi	2010				2010	1.481				0.0084522	8.45	0.2934	1	
45	Afghanistan	AFG	Asia & Pacifi	2011				2011	0.887				0.012226	12.23	0.4115	1	
46	Afghanistan	AFG	Asia & Pacifi	2012				2012	0.399				0.0107421	10.74	0.3499	1	
47	Afghanistan	AFG	Asia & Pacifi	2013				2013	1.198				0.0090368	9.04	0.3152	1	
48	Afghanistan	AFG	Asia & Pacifi	2014				2014	0.401				0.0084499	8.45	0.2988	1	
49	Afghanistan	AFG	Asia & Pacifi	2015				2015	1.132				0.0090195	9.02	0.2996	1	
50	Afghanistan	AFG	Asia & Pacifi	2016				2016	1.726				0.0086534	8.65	0.3537	1	
51	Afghanistan	AFG	Asia & Pacifi	2017				2017	1.262				0.0089711	8.97	0.3663	1	

- CSV Data

- UNDP's Human Development Index Data



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	ClusterNam	ClusterName	Country	Country (HDI	CountryCode	Region	Year	Year1	HDI	Number of R	TemperatureAnomaly						
2	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1990	1990	0.298	1	0.664						
3	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1991	1991	0.304	1	0.072						
4	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1992	1992	0.312	1	-0.166						
5	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1993	1993	0.308	1	-0.139						
6	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1994	1994	0.303	1	0.307						
7	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1995	1995	0.327	1	0.521						
8	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1996	1996	0.331	1	-0.068						
9	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1997	1997	0.335	1	0.524						
10	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1998	1998	0.339	1	0.778						
11	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	1999	1999	0.343	1	1.001						
12	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2000	2000	0.345	1	1.032						
13	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2001	2001	0.347	1	1.266						
14	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2002	2002	0.378	1	1.089						
15	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2003	2003	0.387	1	0.597						
16	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2004	2004	0.4	1	1.355						
17	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2005	2005	0.41	1	0.713						
18	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2006	2006	0.419	1	1.236						
19	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2007	2007	0.431	1	0.855						
20	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2008	2008	0.436	1	0.683						
21	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2009	2009	0.447	1	1.009						
22	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2010	2010	0.464	1	1.481						
23	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2011	2011	0.465	1	0.887						
24	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2012	2012	0.479	1	0.399						
25	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2013	2013	0.485	1	1.198						
26	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2014	2014	0.488	1	0.401						
27	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2015	2015	0.49	1	1.132						
28	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2016	2016	0.491	1	1.726						
29	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2017	2017	0.493	1	1.262						
30	1: At Risk Co	1: At Risk Co	Afghanistan	Afghanistan	AFG	Asia	2018	2018	0.496	1	1.46						
31	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1990	1990	0.644	1	0.739						
32	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1991	1991	0.625	1	-0.229						
33	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1992	1992	0.608	1	0.533						
34	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1993	1993	0.611	1	0.279						
35	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1994	1994	0.617	1	1.375						
36	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1995	1995	0.629	1	0.344						
37	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1996	1996	0.639	1	-0.142						
38	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1997	1997	0.639	1	0.262						
39	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1998	1998	0.649	1	0.665						
40	2: Environme	2: Environme	Albania	Albania	ALB	Europe	1999	1999	0.66	1	0.98						
41	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2000	2000	0.667	1	1.369						
42	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2001	2001	0.673	1	0.996						
43	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2002	2002	0.68	1	1.211						
44	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2003	2003	0.687	1	0.963						
45	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2004	2004	0.692	1	0.638						
46	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2005	2005	0.702	1	0.242						
47	2: Environme	2: Environme	Albania	Albania	ALB	Europe	2006	2006	0.709	1	0.775						
48	2: Environme	3: Ideal Coun	Albania	Albania	ALB	Europe	2007	2007	0.718	1	1.474						
49	2: Environme	3: Ideal Coun	Albania	Albania	ALB	Europe	2008	2008	0.724	1	1.317						
50	2: Environme	3: Ideal Coun	Albania	Albania	ALB	Europe	2009	2009	0.729	1	1.211						
51	2: Environme	4: Getting Th	Albania	Albania	ALB	Europe	2010	2010	0.74	1	0.858						

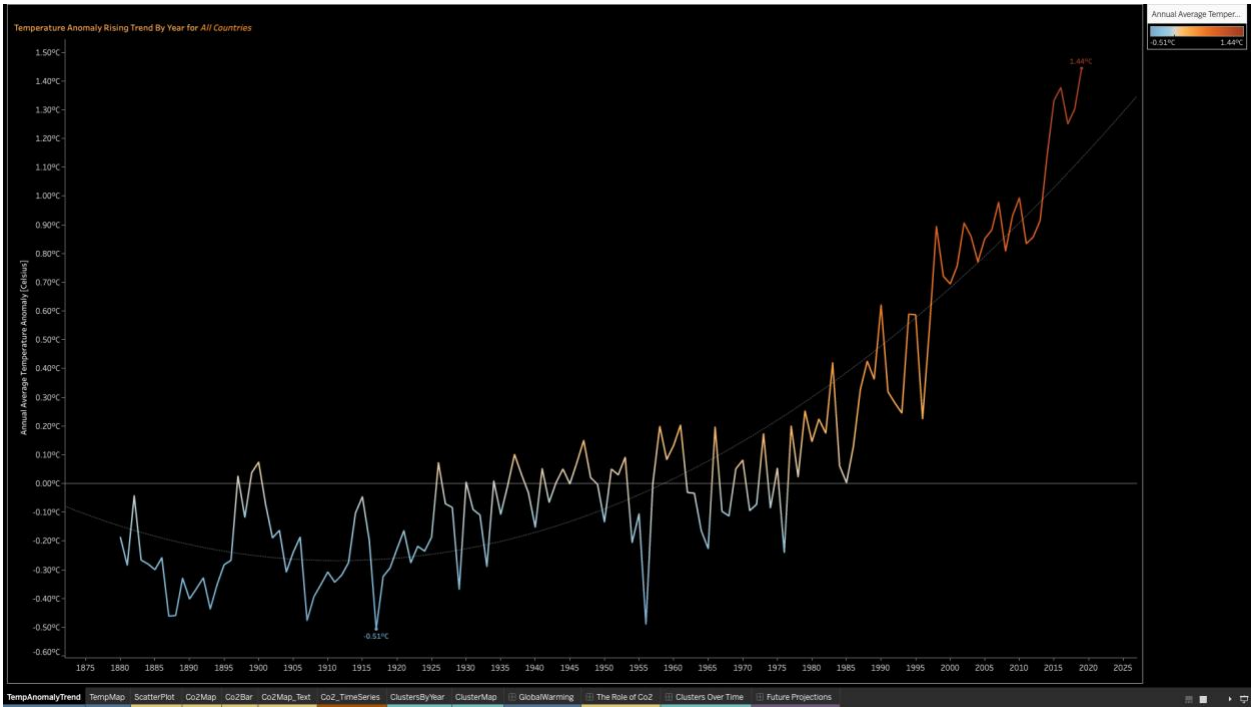
- CSV Data

Patterns

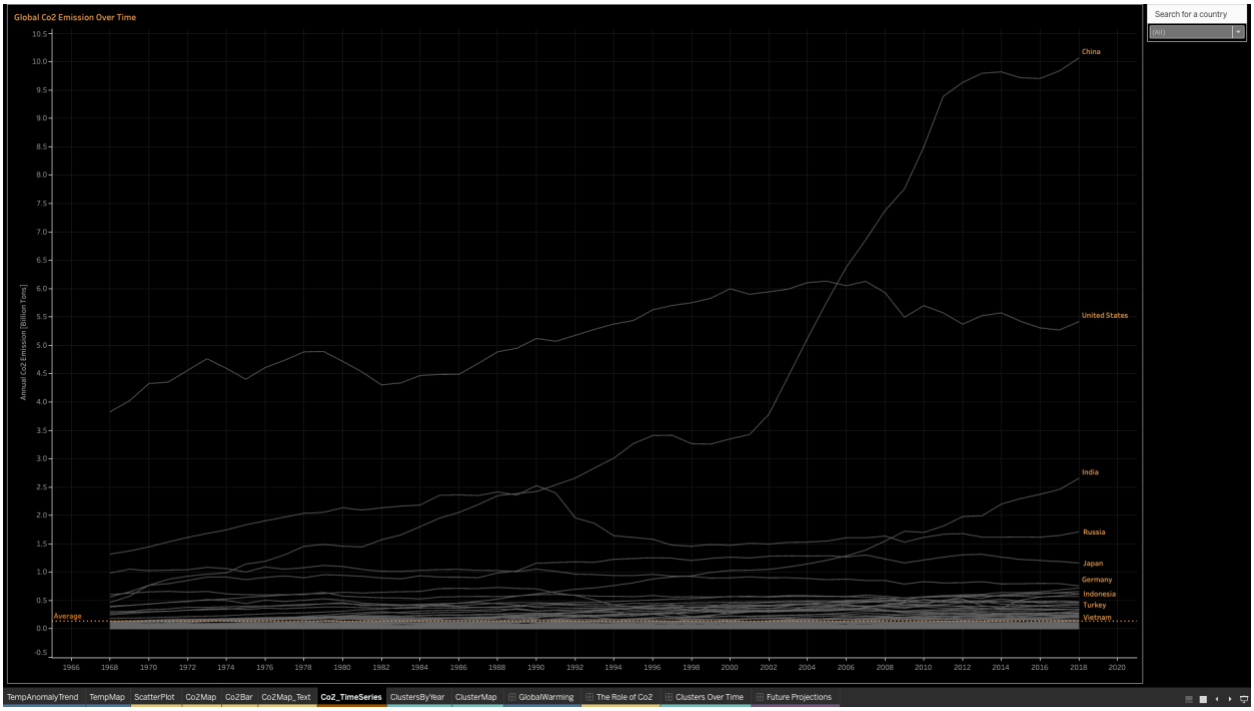
- The global average temperature has increased by more than 1.5 degrees Fahrenheit since 1880.
- Human activities, particularly the emission of greenhouse gases, are the primary cause of global warming.
- The effects of global warming are severe and widespread, impacting various aspects of life on Earth.
- Analysis of global temperature data can provide valuable insights on temperature variations and the causes of global warming.
- Identifying cities where the temperature is increasing at a faster rate can aid in addressing the impacts of global warming.
- The use of renewable energy sources and reduction of greenhouse gas emissions can help mitigate the effects of global warming.

Diagrams

- Temperature Anomalies



- CO2 Emission of Various Countries



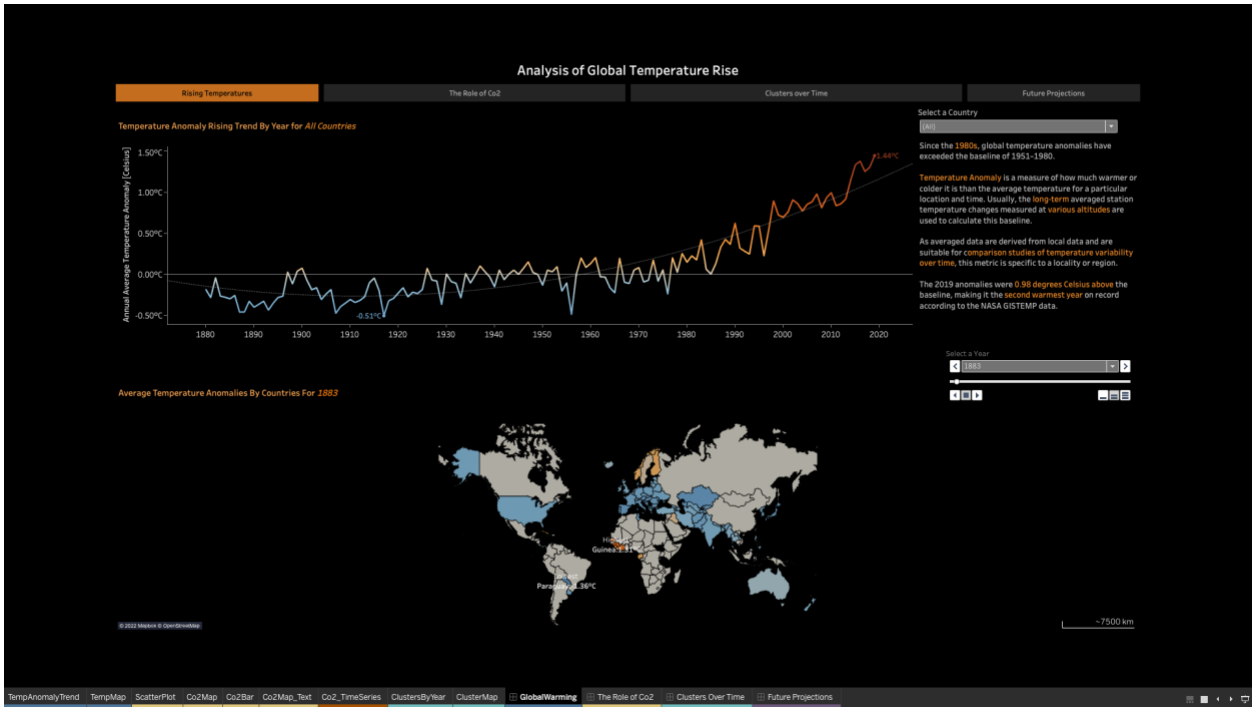
- Average Temperature Anomalies by Clusters of HDI 2012

Usecases

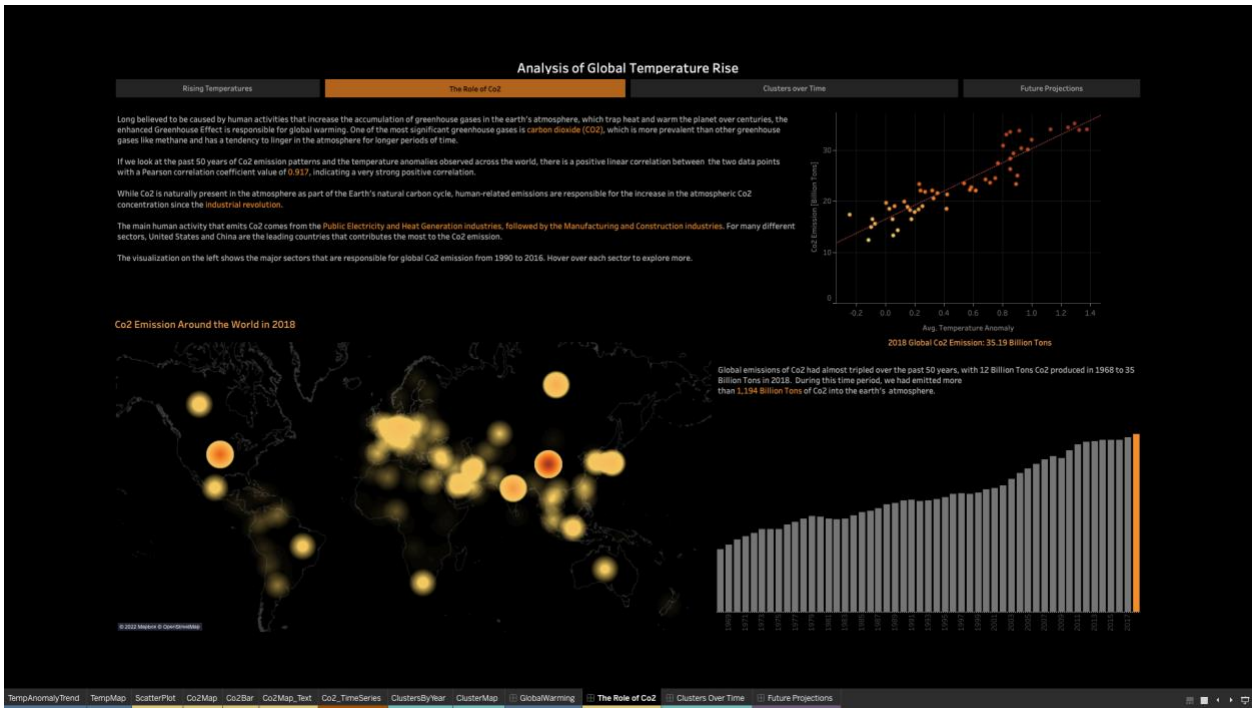
- Policymakers and government officials can use the findings of the analysis to develop strategies and policies to address the impacts of global warming in their respective regions.
- Environmental organizations and advocacy groups can use the data to raise awareness and educate the public on the causes and effects of global warming.
- Businesses and industries can use the insights from the analysis to evaluate their own greenhouse gas emissions and develop strategies for reducing their carbon footprint.
- Researchers and academics can use the data to conduct further studies and investigations on global warming and its effects on different aspects of the environment and human life.
- Individual consumers can use the information from the analysis to make informed decisions about their own behaviour and actions that contribute to global warming.
- The analysis can also provide valuable insights for scientists and meteorologists in predicting future weather patterns and climate trends.
- Governments and international organizations can use the data to monitor and evaluate the progress of global efforts to combat climate change and reduce greenhouse gas emissions.
- The findings of the analysis can be used by educators and educators to teach students about the importance of addressing global warming and its impacts.
- The data can also be used by journalists and media outlets to report on global warming and its effects, raising public awareness and fostering discussions on potential solutions.
- The analysis can provide valuable information for individuals and communities in planning and preparing for the potential impacts of global warming on their local environment and economy.

Screenshots

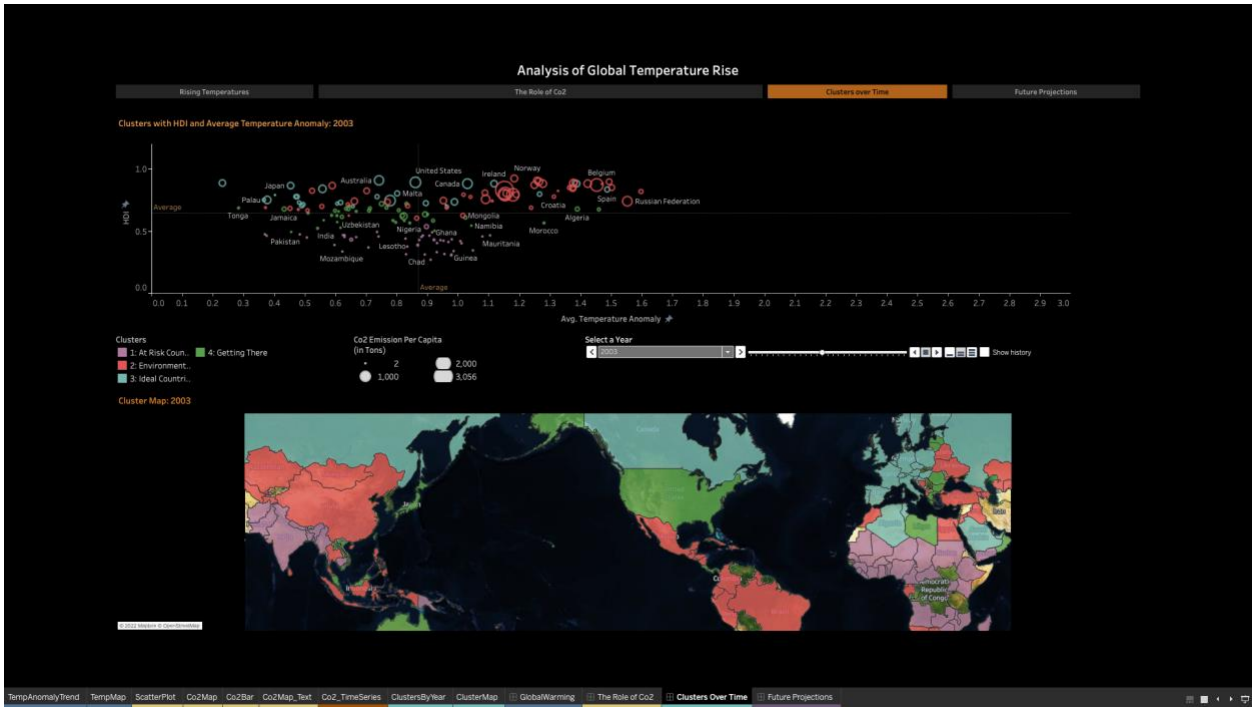
1. Rising Temperature



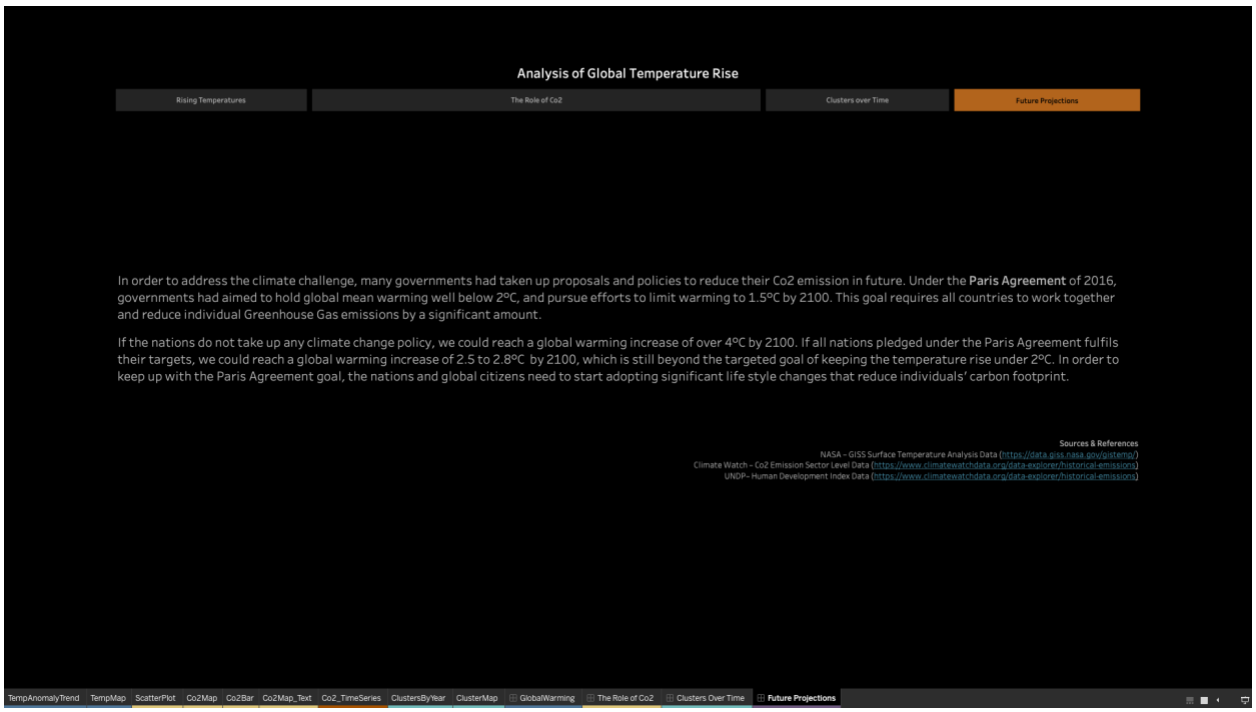
2. Role of CO2



3. Risk Custers



4. Future Projection



Conclusion

In conclusion, the analysis of global temperature data and the effects of global warming has provided valuable insights on the state of the Earth's climate and the impact of human activities on the environment. The findings of this study highlight the urgent need for action to address global warming and its impacts, and provide valuable information for policymakers, stakeholders, and individuals in addressing this global crisis. By reducing greenhouse gas emissions and transitioning to renewable energy sources, we can work towards mitigating the effects of global warming and ensuring a sustainable future for all.