Is the ground Temperature of the World's Cities increasing?

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Increase of Temperature?

- We have heard that gas emissions caused by human actions are the main contributor to our planet's temperature increase. We have heard that an increase of 2 degrees Celsius will be catastrophic.

- We have also heard that climate change is a hoax and is part of our planet's natural cycle.

So:

Is the temperature of the World's cities increasing?

Dataset

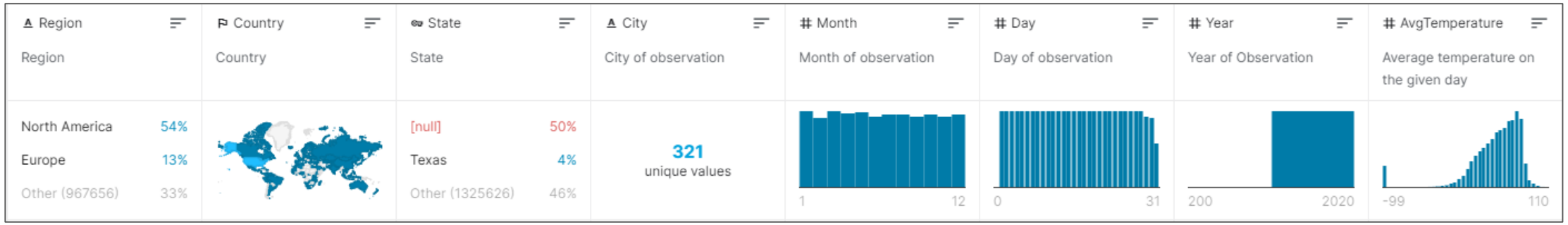
Dataset: Daily Temperature of Major Cities

<citytemperature.csv>

Daily Temperature of Major Cities | Kaggle[1]

Original # of records	2,906,327
Records after wrangling	2,826,655
Original Variables	8
Original Format	csv

This dataset contains the average daily temperatures at 157 US and 167 international cities. The source information is the Global Summary of the Day database archived by the National Climatic Center.
All temperatures are in degrees Fahrenheit and a “-99” is used when no data was available. [1]



Important: The temperatures contained in the dataset are Averages Daily Temperatures, not Maximum Temperatures.

1: See section Credits & References to learn more about the dataset, its source, and its maintainer.

Data Wrangling

The original dataset contains more records than Excel's maximum capacity of 1,048,576 rows.[2]

Steps

1 Use R studio to subset the dataset

```r
```{r}
library("dplyr")
library("plyr")
library("readr")

citytemperature_remergedataset <-
list.files("C:/Users/hhira/OneDrive/Documents/DataAnalytics/CityTemperature/Hugo/data_final_to_merge",pattern="*.csv", full.names = TRUE) %>%

  lapply(read_csv) %>%
  bind_rows

citytemperature_remergedataset

#library(plyr)
#citytemperature_final <- ldply(list.files(),read.csv,header=TRUE)
#View(citytemperature_final)

# write_csv(citytemperature_final,"citytemperature_final_test.csv")
```
```

```r
#Africa
write_csv(Africa_1995_1999,'Africa_1995_1999.csv')
write_csv(Africa_2000_2004,'Africa_2000_2004.csv')
write_csv(Africa_2005_2009,'Africa_2005_2009.csv')
write_csv(Africa_2010_2014,'Africa_2010_2014.csv')
write_csv(Africa_2015_2021,'Africa_2015_2021.csv')
```

2

Clean and wrangle with Excel.

39 subsets

3 Use R studio to merge the subsets into 1 dataset

```r
#Region: Africa
Africa<-subset(temperature,Region=='Africa')
#Year before 2000
Africa_1995_1999<-subset(Africa,Year<2000)
#Year from 2000 to 2004
Africa_2000_2004<-subset(Africa,Year>=2000 & Year<=2004)
#Year from 2005 to 2009
Africa_2005_2009<-subset(Africa,Year>=2005 & Year<=2009)
#Year from 2010 to 2014
Africa_2010_2014<-subset(Africa,Year>=2010 & Year<=2014)
#Year after 2014
Africa_2015_2021<-subset(Africa,Year>=2015)
```

<citytemperature_final.csv>

https://drive.google.com/file/d/1XFgiV0efhrFp8Nig_kOxCQEoHWKjuJ-5/view?usp=sharing

After wrangling our dataset was 79,672 records shorter!

2: Excel specifications and limits: https://support.microsoft.com/en-us/office/excel-specifications-and-limits-1672b34d-7043-467e-8e27-269d656771c3

Tableau Data Analysis

Calculated Fields

Date

```
MAKEDATE([Year],[Month],[Day])
```

Ranking

Results are computed along Year of Date.

```
RANK(AVG([Temperature]))
```

1995 Average Temp

```
IF ([Year]=1995)
THEN ([Temperature])
END
```

count of temperatures

```
COUNT([Temperature])
```

Delta Year Temperature

```
AVG([Temperature])-
AVG([1995 Average Temp])
```

verage Temperature minus 1995

```
if ([Year]>1995)
THEN ([Temperature])
END
```

Highest Temperature

```
MAX([Temperature])
```

Delta Year Temp minus 1995

```
AVG([Average Temperature minus 1995])
-AVG([1995 Average Temp])
```

Median Temperature

```
MEDIAN([Temperature])
```

Tables

- Country, State, City
  - Country
  - City
  - State
- Date
- Day
- Month
- Region
- Temp - dimension
- Temperature (bin)
- Year
- *Measure Names*
- 1995 Average Temp
- 1995 Maximum Day Temp
- Average Temperature minus 1995
- count of temperatures
- Delta Year Temp minus 1995
- Delta Year Temperature
- Highest Temperature
- Index
- Median Temperature
- Ranking
- Temperature
- *citytemperature_final.csv (Count)*
- *Latitude (generated)*
- *Longitude (generated)*
- *Measure Values*

Parameters

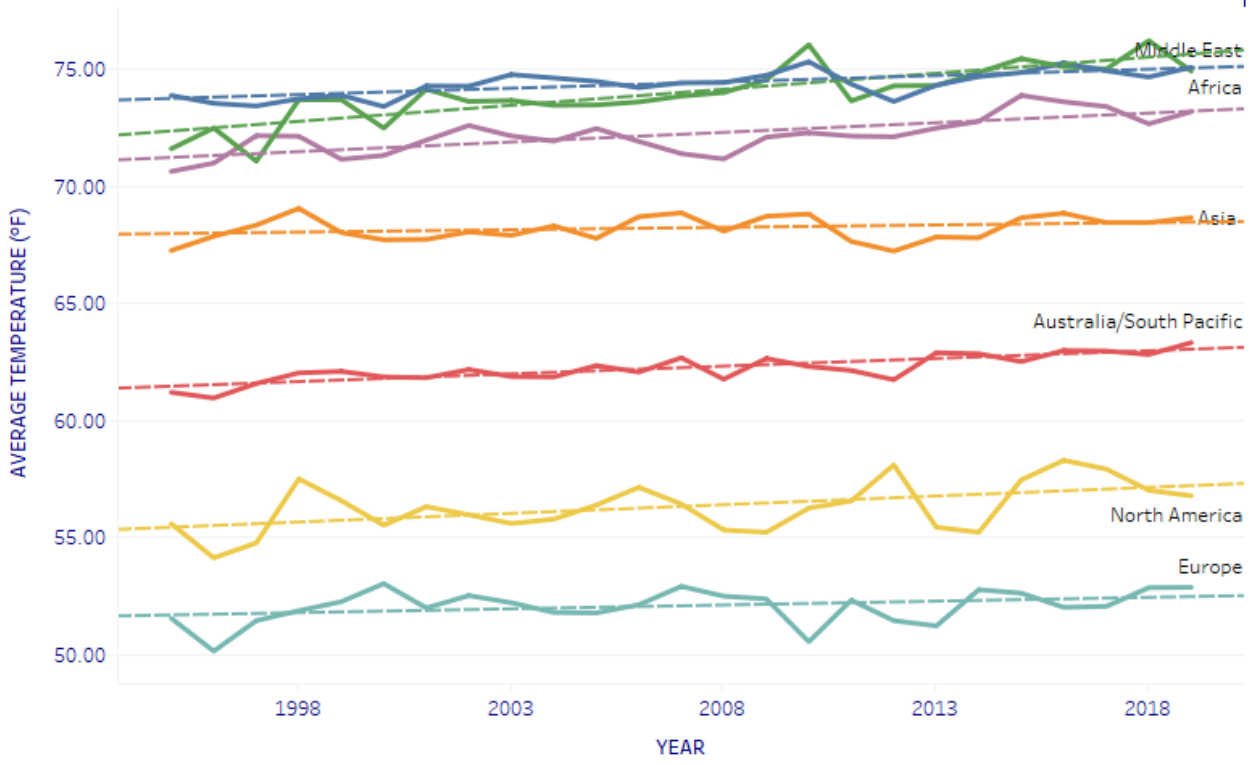
- EndYear
- Southern Hemisphere Summer
- StartYear
- Value (bin) Parameter

World Cities Average Temperatures

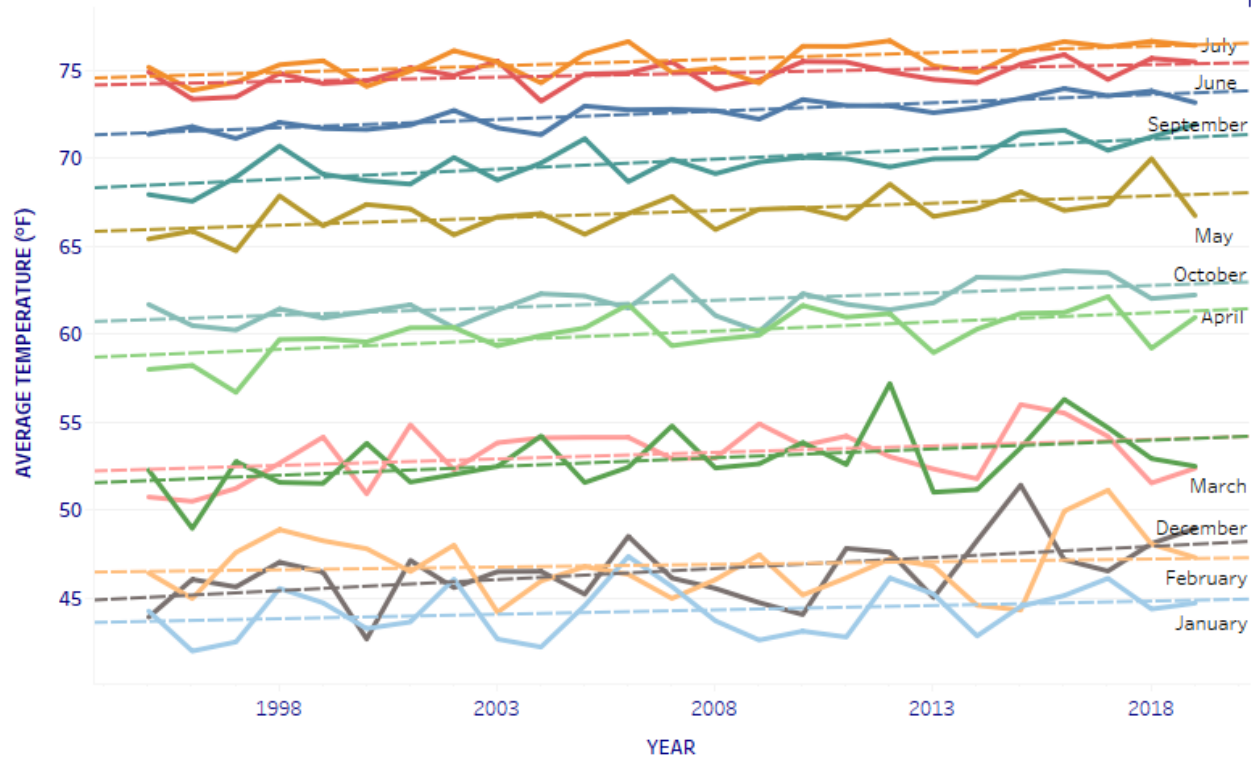
(grouped by Regions)

Region	Region ..	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
World's Average Temperature	65.62	64.53	64.31	64.69	65.72	65.39	65.05	65.47	65.61	65.46	65.40	65.53	65.69	65.80	65.33	65.77	65.94	65.55	65.51	65.50	65.86	66.50	66.59	66.40	66.39	66.41
Africa	74.38	73.89	73.55	73.44	73.75	73.89	73.42	74.30	74.29	74.78	74.64	74.49	74.23	74.43	74.44	74.75	75.33	74.38	73.63	74.33	74.70	74.87	75.28	74.95	74.68	75.09
Middle East	73.98	71.61	72.50	71.08	73.71	73.71	72.49	74.16	73.64	73.67	73.47	73.49	73.61	73.86	74.01	74.56	76.06	73.66	74.30	74.32	74.87	75.47	75.12	75.02	76.23	74.93
South/Central America & Carribean	72.20	70.64	71.00	72.17	72.15	71.16	71.33	71.98	72.61	72.16	71.94	72.48	71.93	71.40	71.18	72.11	72.30	72.15	72.13	72.49	72.78	73.89	73.62	73.42	72.68	73.20
Asia	68.20	67.26	67.87	68.35	69.06	68.03	67.72	67.74	68.06	67.91	68.31	67.78	68.71	68.87	68.09	68.73	68.82	67.65	67.24	67.84	67.81	68.67	68.85	68.46	68.46	68.67
Australia/South Pacific	62.22	61.20	60.96	61.58	62.03	62.10	61.86	61.82	62.17	61.88	61.86	62.34	62.07	62.68	61.76	62.65	62.30	62.13	61.74	62.89	62.85	62.51	62.99	62.97	62.82	63.32
North America	56.29	55.58	54.12	54.76	57.50	56.57	55.52	56.31	55.96	55.59	55.78	56.38	57.14	56.42	55.32	55.22	56.25	56.56	58.10	55.43	55.22	57.46	58.29	57.92	57.01	56.78
Europe	52.04	51.54	50.14	51.44	51.87	52.25	53.02	51.98	52.51	52.21	51.79	51.77	52.12	52.91	52.49	52.37	50.54	52.32	51.44	51.21	52.77	52.62	52.01	52.05	52.85	52.86

World Cities Average Yearly Temperature Trend Line Chart



World Cities Average Yearly Temperature per Month (Overall)



World Cities Ranking of Ocurrance of Average Highest Temperatures

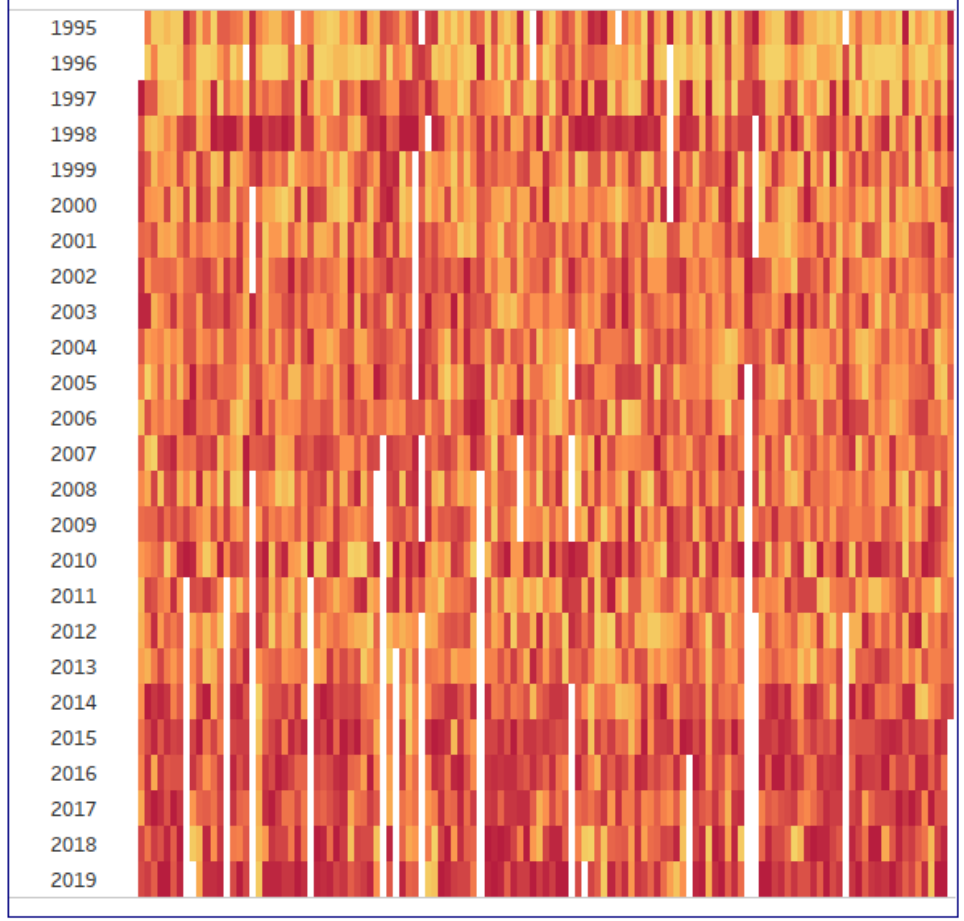
World Cities Ranking of Warmest Years

(grouped by Region)

	Africa	Asia	Australia/S..	Europe	Middle East	North Ame..	South/Cent..
1995	20	24	24	20	24	18	25
1996	23	17	25	25	22	25	24
1997	24	11	23	22	25	24	11
1998	21	1	16	17	15	4	14
1999	19	15	14	11	14	9	23
2000	25	22	18	1	23	19	21
2001	16	21	20	16	11	13	17
2002	17	14	12	7	18	15	7
2003	6	16	17	12	16	17	12
2004	10	12	19	18	21	16	18
2005	11	20	10	19	20	12	9
2006	18	6	15	13	19	6	19
2007	13	2	7	2	13	11	20
2008	12	13	21	8	12	21	22
2009	7	5	8	9	8	23	16
2010	1	4	11	24	2	14	10
2011	14	23	13	10	17	10	13
2012	22	25	22	21	10	2	15
2013	15	18	4	23	9	20	8
2014	8	19	5	5	7	22	5
2015	5	8	9	6	3	5	1
2016	2	3	2	15	4	1	2
2017	4	9	3	14	5	3	3
2018	9	10	6	4	1	7	6
2019	3	7	1	3	6	8	4

World Cities Ranking of Warmest Year

(Average Temperature per Countries)



World Cities Average Temperature per Year

City	Avera..	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Atlanta	62.92	62.65	62.27	61.00	63.35	62.87	61.71	62.14	62.34	61.44	62.38	61.87	63.16	64.04	62.11	61.68	62.05	63.86	65.01	61.69	61.75	64.17	65.21	64.85	63.81	65.5
Atlantic City	55.22	53.52	52.73	53.28	56.44	55.03	53.38	55.10	55.66	53.34	54.16	54.60	56.54	55.74	55.88	54.93	56.22	57.21	57.19	54.03	53.27	55.77	56.30	56.90	56.75	56.6
Auckland	59.85	59.68	59.46	58.70	61.25	60.21	59.89	59.79	59.52	59.30	58.55	60.49	59.03	59.73	59.88	58.86	60.25	60.11	59.11	60.44	59.67	59.76	60.88	60.52	60.58	60.5
Austin	68.27	68.28	67.98	66.59	70.42	69.45	68.47	66.71	66.89	67.35	67.67	68.95	70.10	66.42	68.08	68.43	67.09	69.81	69.35	67.54	66.86	67.46	69.26	70.29	68.56	68.1
Baltimore	56.29	56.93	53.54	55.21	58.16	56.28	54.67	56.16	56.70	54.17	55.64	55.73	57.54	56.66	55.88	55.01	57.11	57.61	58.62	55.72	54.35	56.25	57.25	57.48	56.57	57.9
Bangkok	83.91		84.32	85.99	83.84	81.71	82.30	82.65	84.73	84.49	84.70	85.06	85.14	84.24	83.19	83.21	84.15	82.78								
Bangui	78.77	78.36	77.78	78.83	79.21	78.56	78.34	77.97	78.13	78.29	78.32	78.54	78.52	79.12	78.68	79.19	79.90	79.24	79.10	78.77	78.77	79.08	79.29	79.36	78.48	79.4
Banjul	79.04	77.94	77.98	79.76	79.81	78.52	78.89	79.83	79.05	79.67	79.43	80.12	78.96	79.56			79.91	78.74	79.00	78.91	78.80	78.38	78.85	79.31	77.84	78.7
Barcelona	61.88	62.02	61.13	62.61	62.04	61.64	60.07	59.28	59.78	63.58	62.88	62.04	61.99	60.99	60.52	61.99	60.67	62.83	63.03	62.25	62.88	62.68	62.57	62.51	62.72	62.3

All Highest Average Temperature per Year

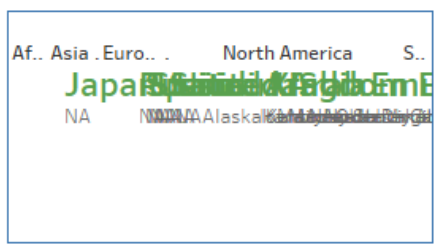
	Avera..	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Abidjan	86.32	86.70	86.10	85.10	87.20	87.20	86.70	86.00	85.40	88.20	87.30	88.60	86.50	84.90	85.00	85.20	87.30	85.70	85.90	85.40	85.10	86.30	86.90	86.40	85.80
Abilene	80.57	80.80	80.70	80.20	82.80	81.20	82.20	82.80	80.80	81.70	80.80	80.50	80.80	84.50	80.80	81.00	80.40	84.20	83.70	80.10	80.80	80.70	80.50	80.20	82.80

All Highest Average Temperature per Month

	Average	January	February	March	April	May	June	July	August	September	October	November	December
Abidjan	85.02	85.70	88.20	88.60	87.20	87.20	84.20	81.30	80.10	81.80	83.70	84.90	87.30
Abilene	73.33	67.80	72.80	77.00	80.20	82.80	84.20	83.70	83.80	80.80	74.80	71.80	69.20

All Highest Average Temperature per Day of the Month

	January																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Abidjan	83.8	85.0	84.6	85.2	84.3	84.3	84.9	84.2	84.1	84.5	84.5	84.2	84.9	85.2	85.5	85.3	84.9	84.1	83.9	84.7	84.2	84.5	84.4	84.7	85.7	84.3	85.1	85.4
Abilene	64.5	63.9	67.7	67.5	59.2	63.2	63.2	62.8	59.1	65.1	64.0	64.9	55.6	58.5	58.3	63.6	62.8	59.8	60.7	62.5	62.4	60.5	67.9	63.8	58.9	58.3	61.5	67.5

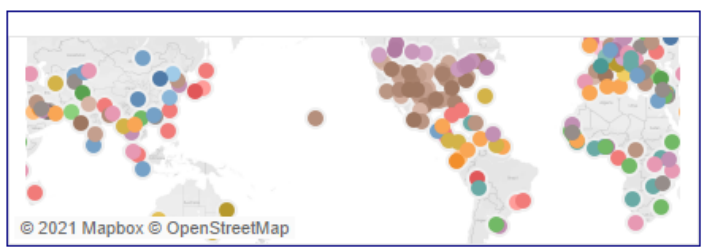


Overall Avg Temp

15.76 °F

Highest Avg Temp

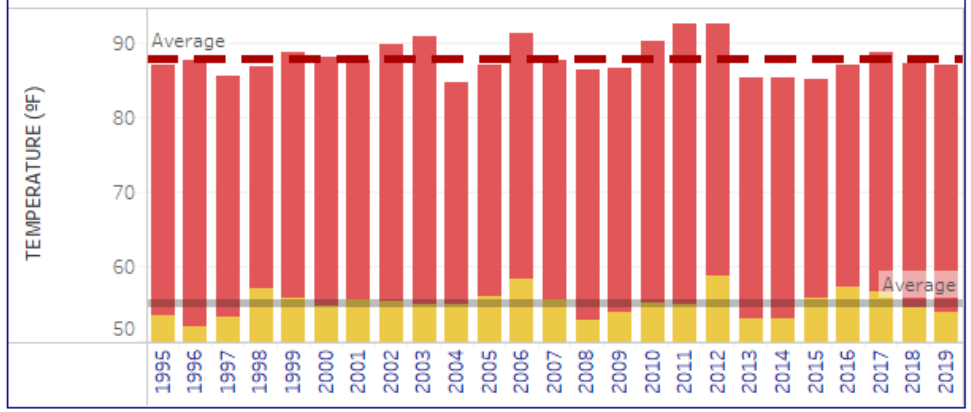
110 °F



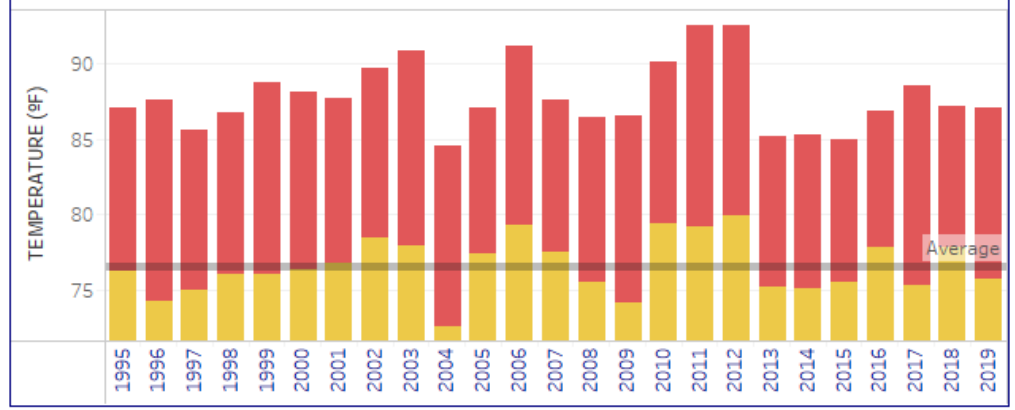
World Cities Average Temperature per Year

City	ra..	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2
Jakarta	.46	82.31	81.89	82.59	83.10	82.48	83.03	82.73	85.47	84.45	84.78	84.08	84.52	83.26	83.14	83.58	83.28	83.56	83.67	83.19	83.47	83.36	83.58	83.49	83.57	
Juneau	.39	41.98	40.11	43.87	42.69	42.43	42.17	42.20	42.09	42.31	43.91	43.66	40.40	41.20	40.31	41.57	42.73	40.88	40.34	42.60	43.28	44.70	44.92	41.74	43.13	
Kampala	.56	71.91	71.29	72.65	73.80	72.11	71.87	71.74	72.53	72.56	72.73	72.37	72.37	72.35	72.19	72.78	72.98	72.33	72.68	72.92	72.62	73.22	73.81	72.88	72.18	
Kansas City	.10	53.58	51.92	53.35	57.19	55.80	54.77	55.60	55.33	54.95	54.91	56.06	58.28	55.69	52.82	53.87	55.22	54.95	58.80	53.16	52.99	55.87	57.25	56.60	54.62	
Karachi	.35	79.40	79.16	79.26	81.02	81.01	82.25	80.96	80.31	80.55	80.88	80.15	80.71	80.97	79.86	80.93	80.45	79.48	79.07	79.87	79.75	80.71	80.58	80.02	80.92	
Katmandu	.04	64.76	64.22	58.15	67.64	68.21	65.77	66.00	66.31	67.15	67.50	68.19	64.54	65.04	68.59	70.07	69.62	67.06	67.09	65.03	64.58	64.57	65.51	65.56	64.85	

Average & Highest Average Temperature per Year

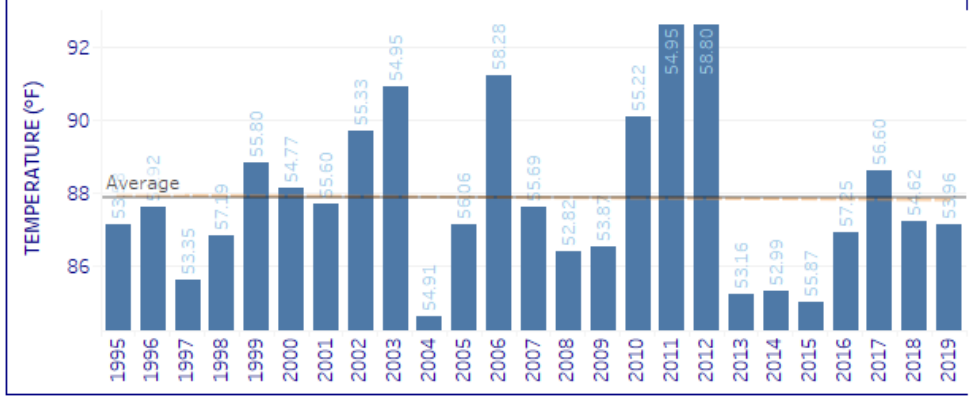


June, July, August Average & Highest Average Temperature per Year

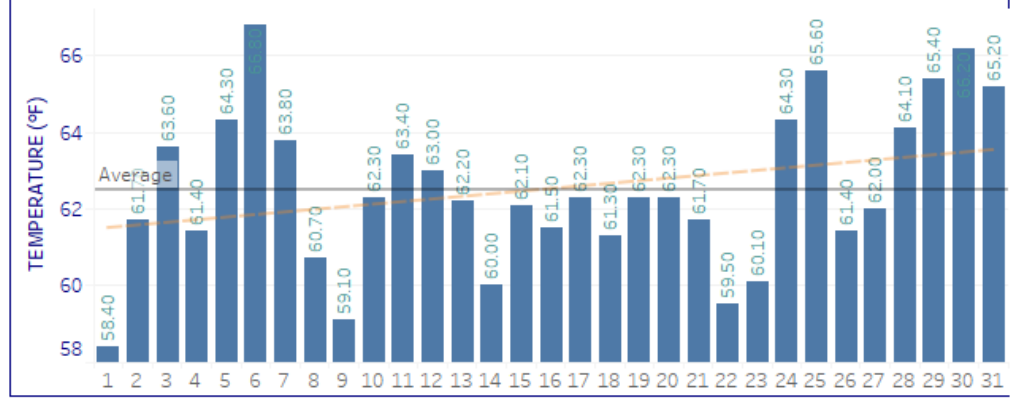


Measure Names
Avg. Temperature
Max. Temperature

Highest Average Temperature in a day for each Year



None July Highest Average Temperature per Day



Year
2011

Month of Date
July

Temperature Deltas

City	count of te..	Max. Temp..	Min. Tempe..	Median Te..	Avg. 1995 A..	Avg. Tempe..	Delta Year ..	Avg. Avera..	Delta Year ..	
Lilongwe	2,641	90.7	50.9	70.2	68.90	70.03	1.14	70.15	1.25	70.03
Frankfurt	2,331	85.2	13	52.8	52.68	52.41	-0.27	52.38	-0.30	52.41
Georgetown	2,136	90.6	67	83.7	Null	83.35	Null	83.35	Null	83.35
Bonn	1,083	86.9	4.7	52.1	54.83	51.81	-3.02	51.33	-3.50	51.81
Bujumbura	884	89.1	48.2	78.1	79.33	73.69	-5.64	70.97	-8.36	73.69

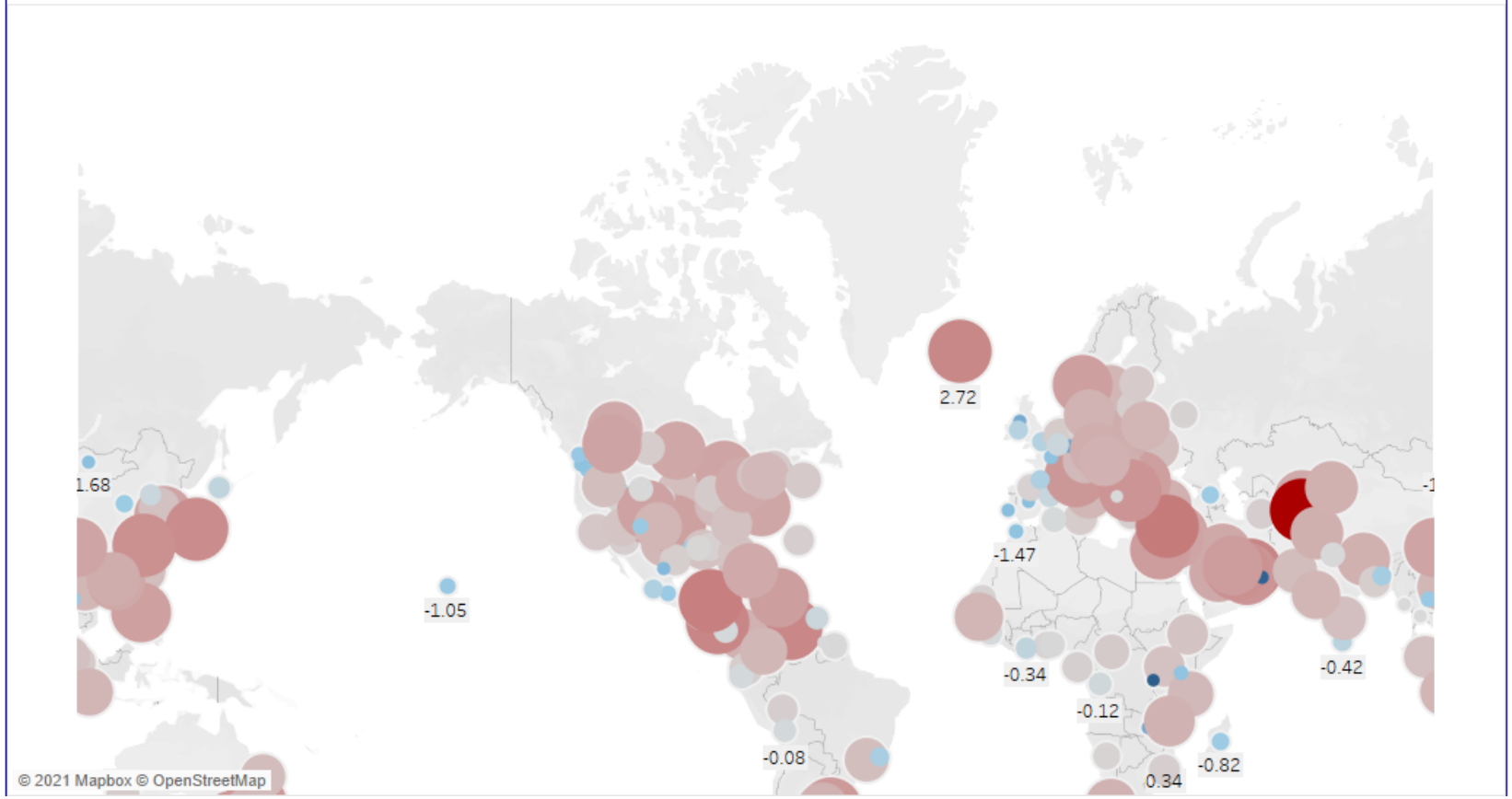
YEAR
1995 to 2020

Region
All

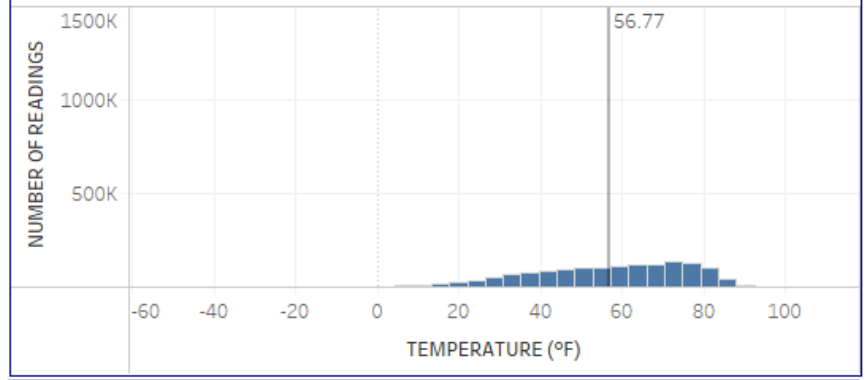
City
All

Delta Year Temp minus ..
-8.36 8.43

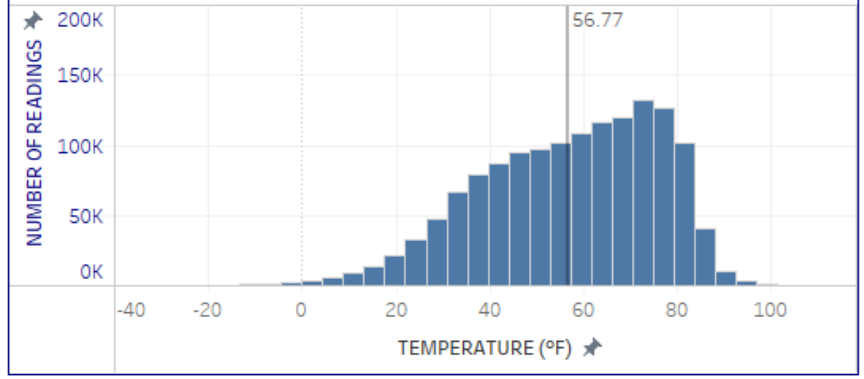
Average Temperature Increase from 1995



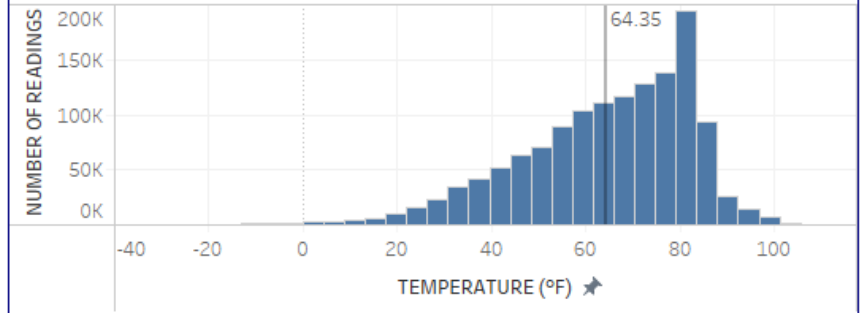
Avg Temp and Frequency of Occuring Average Temp for All



US Cities Avg Temp and Frequency of Avg Temperatures



World Cities Avg Temp and Frequency of Avg Temp (excluding the US)



Findings

1. Many cities, including London, have low average temperatures due to offsetting high temperatures. But London experienced record-high temperatures in 2019.The average temperature of most cities shows an increasing trend.
2. The average temperature of most cities has increased when compared to 1995.
3. We conclude that the average temperature of world cities is increasing.

References

1. Sudalaira, K. (2021, December 12). Daily Temperature of major cities. Miami, FL; https://www.kaggle.com/sudalairajkumar/daily-temperature-of-major-cities/metadata.

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6. Weather Underground. (2021, December 12). https://www.wunderground.com/history/daily/EGLC/date/2019-7-24