What is Going On?

This is the seventh report on the changing weather conditions in the area known as Mow Cop on the border between Cheshire and Staffordshire, England. It has been researched and compiled by Knud Møller at **KVM Research,** website: www.kvmresearch.co.uk, email: knudvmoller@gmail.com

Introduction

The photograph on the title page is an impression from my garden one summer's day during the year 2017.

It looks in a south-westerly direction on a day when the local atmosphere has become saturated with dust apparently blown to these shores from the Sahara desert.

Global warming and climate change are much talked about, and the concepts are still viewed with scepticism by many.

Global warming is the long-term rise in the average temperature of the Earth's climate system. It is a major aspect of climate change, and has been demonstrated by direct temperature measurements and by measurements of certain effects of the warming, notably flooding following excessive rain. Global warming and climate change are often used interchangeably. But more accurately, global warming is the mainly human-caused increase in global surface temperatures and its projected continuation, while *climate change* includes both global warming and its effects, such as changes in precipitation." (Copied from *Wikipedia:* 'Global warming'.)

"The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report concluded, "It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century"." (Ibid)

"These findings have been recognized by the national science academies of the major industrialized nations and are not disputed by any scientific body of national or international standing." (Ibid)

It is increasingly recognised as a problem to which responsible local, national and international leaders must find solutions.

In the autumn of 2023 the BBC reported: Staying below (the 1.5°C marker) long-term is widely considered crucial to avoid the most damaging impacts of climate change. But 2023 is "on track" to be the hottest year on record, and 2024 could be hotter still. It is a sign that we're reaching levels we haven't been before," says Dr Melissa Lazenby, from the University of Sussex. (McGrath, Matt et al, *World breaches key 1.5C warming mark for record number of days,* BBC, 7th of October 2023.

Even as I am writing this essay the ALJAZEERA organisation reports:

At the opening of the G7 summit meeting in Tokyo the UN General Secretary issued this warning: "G7 countries are (also) central to climate action. With the present policies, we are heading for a temperature rise of 2.8 degrees by the end of this century. The next five years are likely to be the hottest on record. Climate action is working but not enough and we are clearly off track to limit temperature rise to 1.5 degrees Celsius by the end of the century." (Copied from Wikipedia: 'UN Secretary-General's opening remarks at press encounter at G7 Summit'.)

Following this summit the G7 members set out their commitment in a statement: "We remain steadfast in our commitment to the Paris Agreement*), keeping a limit of 1.5°C global temperature rise within reach through scaled up action in this critical

decade."… "While acknowledging various pathways according to each country's energy situation, industrial and social structures and geographical conditions, we reiterate that these should lead to our common goal of net zero by 2050 at the latest in order to keep a limit of 1.5°C within reach." (Copied from Wikipedia: 'G7 Leaders' Statement: 6 December 2023')

*)The **Paris Agreement** (French: *Accord de Paris*), often referred to as the **Paris Accords** or the **Paris Climate Accords**, is an international treaty on climate change. Adopted in 2015, the agreement covers climate change mitigation, adaptation, and finance. The Paris Agreement was negotiated by 196 parties at the 2015 United Nations Climate Change Conference near Paris, France. As of February 2023, 195 members of the United Nations Framework Convention on Climate Change (UNFCCC) are parties to the agreement……
The Paris Agreement's long-term temperature goal is to keep the rise in mean global temperature to well below 2 °C (3.6 °F) above pre-industrial levels, and preferably limit the increase to 1.5 °C (2.7 °F), recognizing that this would substantially reduce the effects of climate change. (Copied from Wikipedia: 'Paris Agreenent'.)

The following is an attempt to catch these changes at a local level, over a relative short period in my particular locality, Mow Cop, on the northern outskirts of the City of Stoke-on-Trent and inside Cheshire County, England.

Global warming and climate change are not abstract constructs, but part of everyday realities that affect us all. I will not claim that this in any way is a scientific study, and I am not a meteorologist and only know about weather patterns what I hear and see on radio and TV.

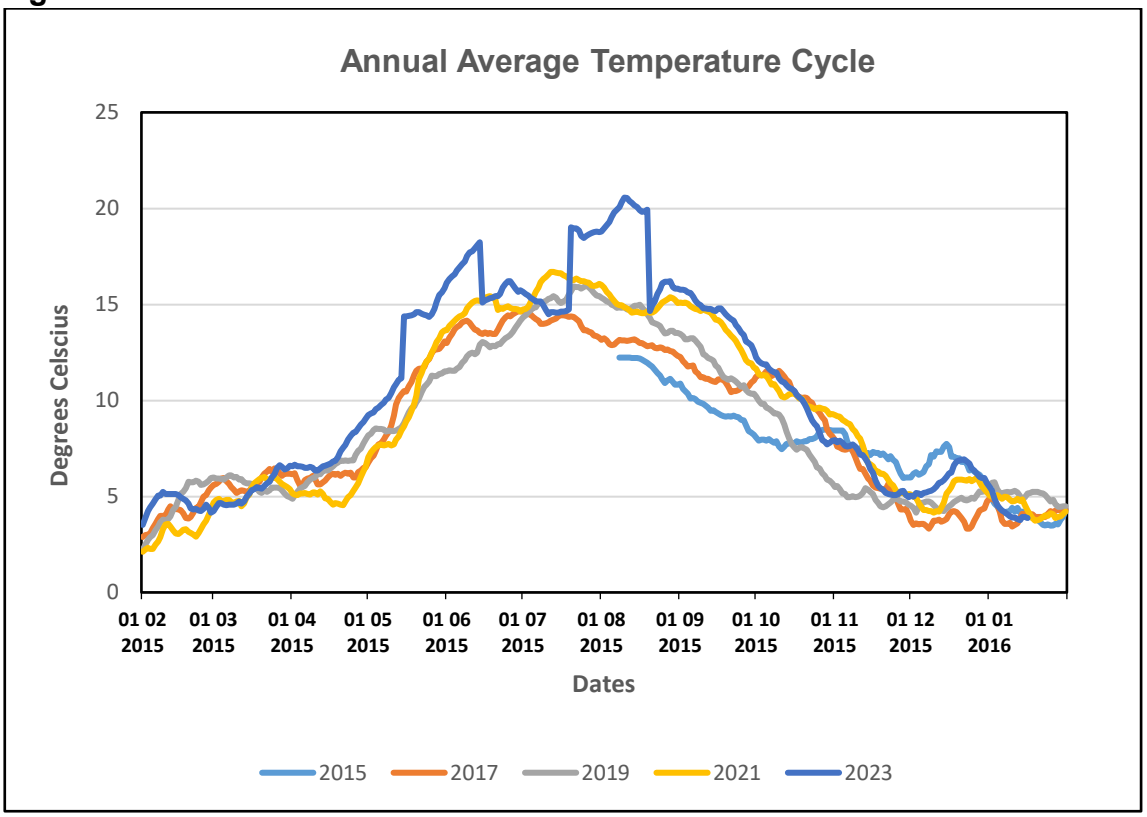
However, since 2015 one of my first activities every morning has been to take originally just a reading of the thermometer placed in my backyard. From 2020 this reading has been supplemented by reading from a rain gage also placed in my back yard.

The thermometer, I use, is a simple plastic plate with a glass tube in the middle. The scale is the simple Celcius scale with 0°at the freezing point and 100° at the boiling point, and as indicated above I take the reading soon after getting out of bed. I started that exercise in August 2015 and supplemented it with the reading of the rain gage.

Temperature

Annual Cycle

Figure 1



The above diagram show the annual cycle for every second year starting with the year 2015, and it will not come as a surprise that it shows the summer months – June, July, August - to be warmer than the winter months – December, January, February. What is also noticeable is that during the last year – 2023 showing dark blue - the early months were somewhat colder than in other years, due at the time to the socalled 'Beast from the East'.

These observations are shown in a tabular form below. It is noted that the annual average temperature fluctuates, but 2023 has been the warmest year so far recorded, and the 3rd quarter (July-September) of 2023 was the warmest 3 months so far recorded.

Table 1: Temperature changes by regular 3 months quarters.

	2015	2016	2017	2018	2019	2020	2021	2022	2023
	<---------- Degrees Celcius ---------->								
Quarter 1		3.22	4.41	2.49	4.5	4.65	3.86	5.29	4.93
Quarter 2		8.91	8.7	11.31	9.49	10.59	9.92	10.92	12.08
Quarter 3	10.33	13.95	13.27	14	14.08	13.69	14.98	15.15	16.16
Quarter 4	7.46	6.17	7.88	6.79	5.77	6.65	7.34	8.63	7.58
Annual	8.58	8.02	8.64	8.66	8.37	8.91	9.26	9.66	10.13

Table 2 show the same changes arranged differently by 3 monthly seasons rather than quarters defined by calendar months.

Table 2: Temperature changes by seasons.

	2015	2016	2017	2018	2019	2020	2021	2022	2023
	<---------- Degrees Celcius ---------->								
Spring		5.48	7.43	7.12	6.94	7.54	6.77	7.59	8.78
Summer		13.6	13.68	15.59	14.36	14.35	15.31	15.24	15.08
Autumn	8.12	8.71	9.07	8.37	7.89	9.23	10.32	10.36	10.07
Winter	4.51	4.44	2.92	4.66	4.64	3.97	5.12	5.13	5.08
Annual	8.58	8.02	8.64	8.66	8.37	8.91	9.26	9.4	10.01

Note: Spring ~ March-May; Summer ~ June-August; Autumn ~ September –November; Winter~ December-February.
*) 2015/16, 2016/17, 2017/18 etc.

It is noted that the Autumn (September-November) of 2022 was the warmest so far recorded.

Extremes

Another way of looking at the changes is by comparing the extremes year by year.

Table 3 shows the warmest and the coldest days for each of the four years 2016-2019 and the relevant temperature measurement. The pattern is not very clear, but it is worth noting that the two warmest days occurred in 2021 and 2022 at the end of the period under observation.

Table 3: Warmest and coldest days.

	Warmest		Coldest		Average
	Date	Temperature	Date	Temperature	
2016	18-Jul	22	07-Mar	-2.5	8.02
2017	17-Jun	20	27-Jan	-1.5	8.64
2018	02-Jul	24	28-Feb	-7	8.66
2019	29-Jun	22	02-Feb	-4	8.37
2020	26-Jun; 13-Aug	21	25-Dec	-2	9.02
2021	05-Jun	30	02-Feb	-4	9.26
2022	19-Jul	26	05-Dec	-5	9.66
2023	08-Jul; 07-Sep	21.5	02-Dec	-2	10.13

In table 4 below we have counted the number of days temperatures within three intervals were recorded.

It is noted that the number of days when temperatures of below 5° C were recorded have 'shrunk' from 187 in total during 2016 and 2017 combined to 154 during 2022 and 2023 combined. Conversely the number of days when temperatures of more than 15° C were recorded have increased from 41 during 2016 to 2017 to a total of 90 during 2022 to 2023.

Table 4: Number of days by recorded temperature.

	< 5° C	5° C-15° C	> 15° C	Other	Total
	<----------		No of days	---------->	
2016	106	214	22	24	366
2017	81	251	19	14	365
2018	97	201	51	16	365
2019	81	239	35	10	365
2020	78	253	34	1	366
2021	87	214	56	8	365
2022	78	232	44	11	365
2023	76	229	46	14	365

Longitudinal evidence

We can now aggregate the readings for all eight years into one graph to provide a longitudinal view of the temperature variations. The diagram is shown in Appendix 1 with an inserted trend line in red.

The line shows the trend increasing from just 81°C in January 2016 to close to 10°C at the end of 2023 which add up to an average annual rise of +0.18°C.

As I have referred to above, the readings are taken first thing in the morning, in winter months even before sunrise. They are therefore likely to be lower than national temperatures discussed in scientific literature and referred to in radio and TV broadcasts.

Rain

For the fourth year I have recorded daily rainfall. As four years is a relatively short timespan compared to the period in which daily temperatures have been collected any conclusions should be considered with caustion.

Precipitation was collected in the morning at the same time as I have recorded temperature and barometer readings. Each observation therefore represents precipitation during the previous 24 hours.

For this I use a simple plastic gauge bought from a local garden centre. The results so far are shown in the diagram below, figure 2.

It may be surmised that with regard to seasonal precipitation there may not be the same regularity as shown by seasonal variation of temperatures.

Figure 2

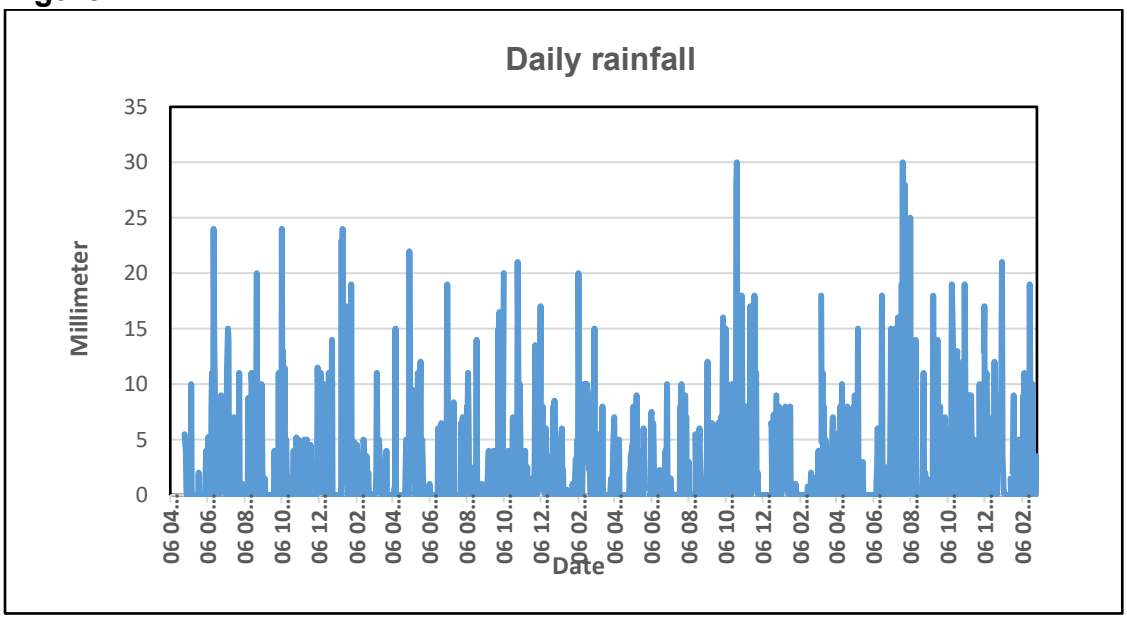


Figure 3

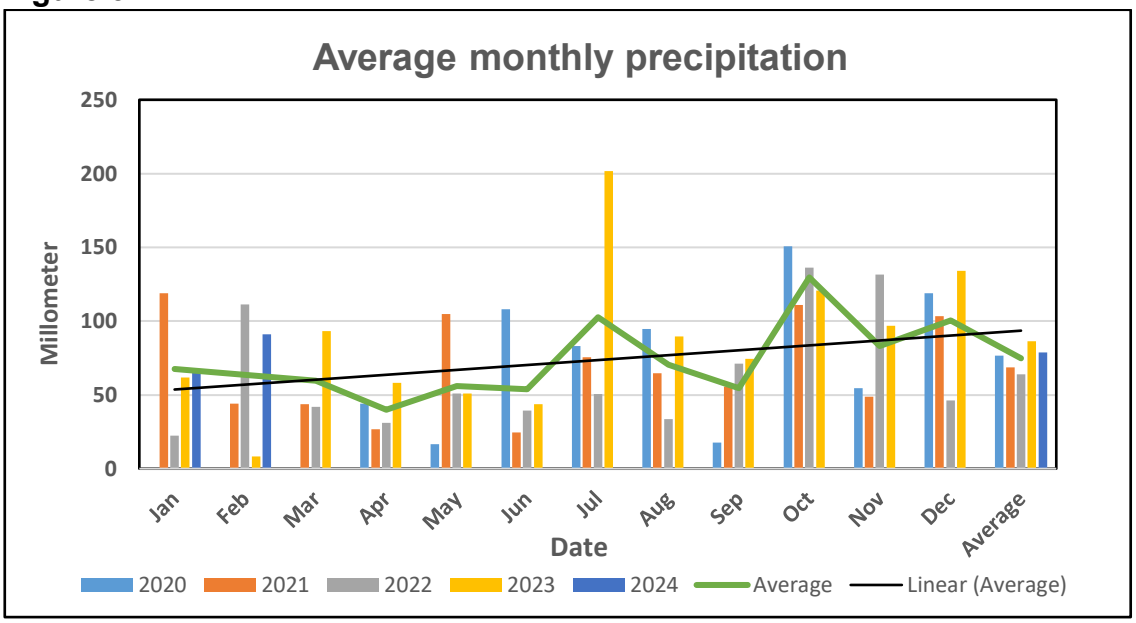


Figure 2, page 7 shows daily variation in rainfall, whereas figure 3 overleaf shows the monthly pattern of precipitationI. It now appears that during the winter months towards the end of the year more rain is falling than earlier in the year.

This is confirmed when as in the following tables and diagrams we set the observations against the calendar year and variations in seasons.

Quarters

With each calendar year being 12 months it follows that each quarter consists of three months, the first being January, February and March, the last being October to December.

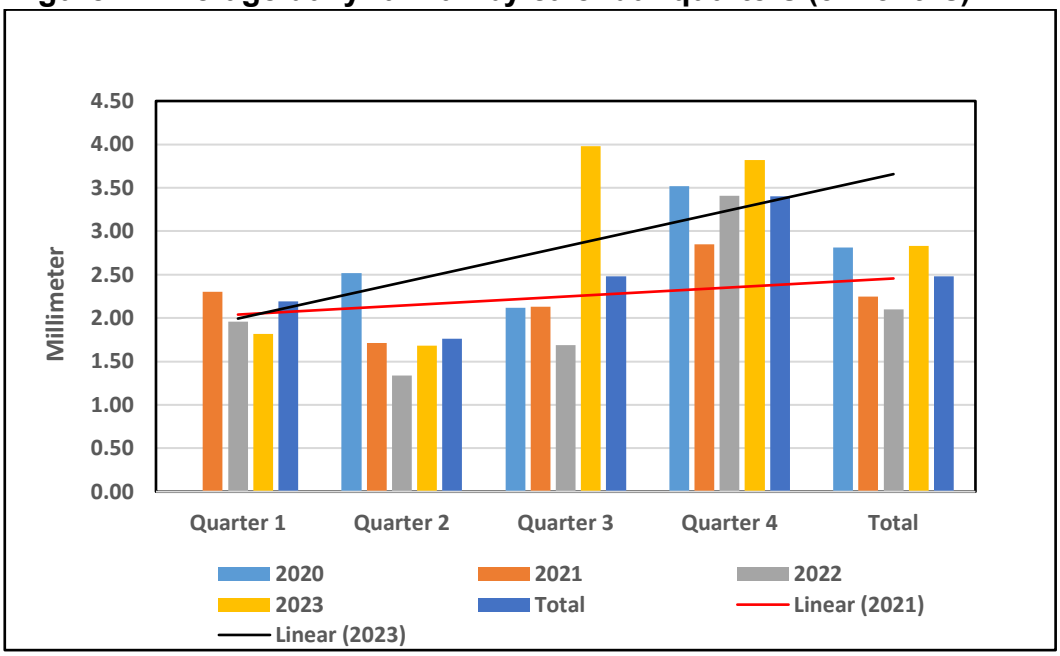
Table 5: Average daily rainfall by calendar quarters (3 months)

	2020	2021	2022	2023	2024	Total
	Recorded rainfall (Millimeter)					
Quarter 1	2.00	2.30	1.96	1.82	2.63	2.19
Quarter 2	2.52	1.71	1.34	1.68		1.76
Quarter 3	2.12	2.13	1.69	3.98		2.48
Quarter 4	3.52	2.85	3.41	3.82		3.40
Total	2.81	2.25	2.10	2.83	2.63	2.48

In the first full year of observations, 2021, the average daily rainfall was found to be 2.25 millimeter, in 2023 increased to 2.83 millimeters. Similarly within the year 2021 the quarterly increase was from 2.30 millimeters during the first quarter to 2.86 millimeter during the fourth quarter.

Figure 4 is based on extracts from table and it is noticed that the trend line based on observations in 2023 is noticeably more steep than the line based on the year 2021.

Figure 4: Average daily rainfall by calendar quarters (3 months)



Seasons

By general consent "the meteorological calendar, spring will always start on 1 March; ending on 31 May" and the four seasons are therefore defined as follows: "summer (June, July, August), autumn (September, October, November) and winter (December, January, February)", see Wikipedia.

The outcome of arranging the observations on this basis is shown in table 6 below and it is noted that high daily averages are recorded for the year 2023.

Table 6: Average daily rainfall by the four seasons each of 3 months

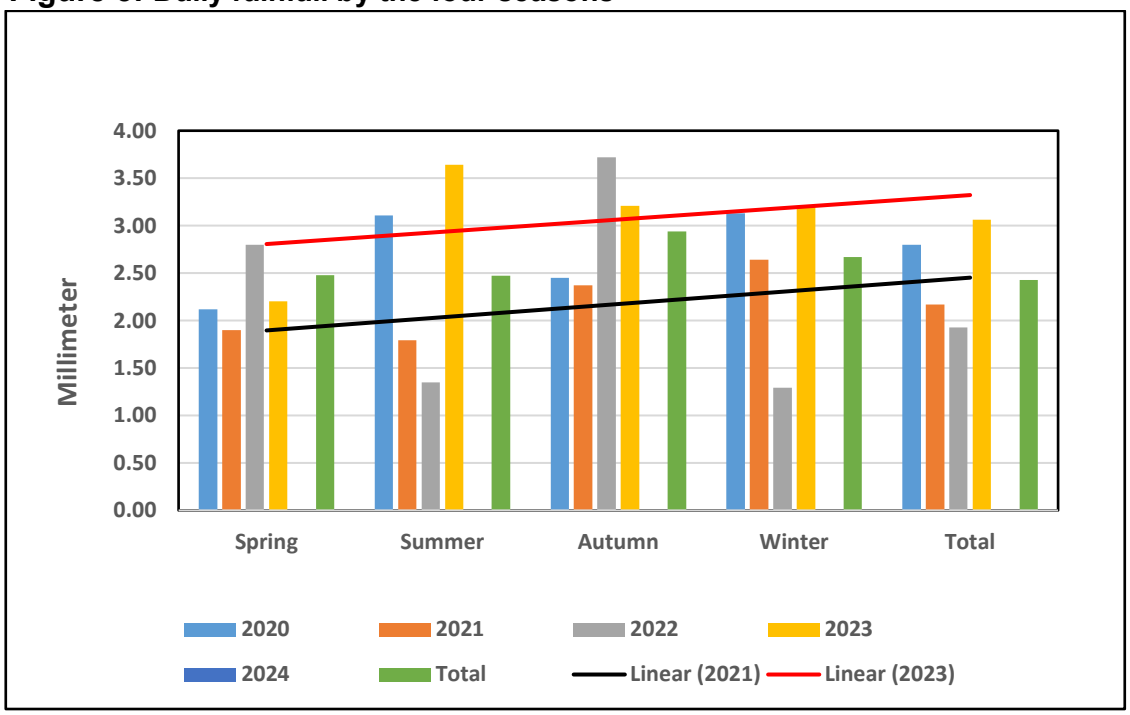
	2020	2021	2022	2023	2024	Total
	Daily recorded rainfall (Millimeter)					
Spring	2.12	1.90	2.80	2.20		2.48
Summer	3.11	1.79	1.35	3.64		2.47
Autumn	2.45	2.37	3.72	3.21		2.94
Winter*)	3.13	2.64	1.29	3.21		2.67
Total	2.80	2.17	1.93	3.06		2.43

*) 20/21, 21/22, 22/23, 23/24

Note: Observations for January and February 2024 are included in the winter 2023/24. There are no observations for the rest of the year 2024.

A graphic illustration of the arrangement by season is shown below, figure 5.

Figure 5: Daily rainfall by the four seasons



Barometer

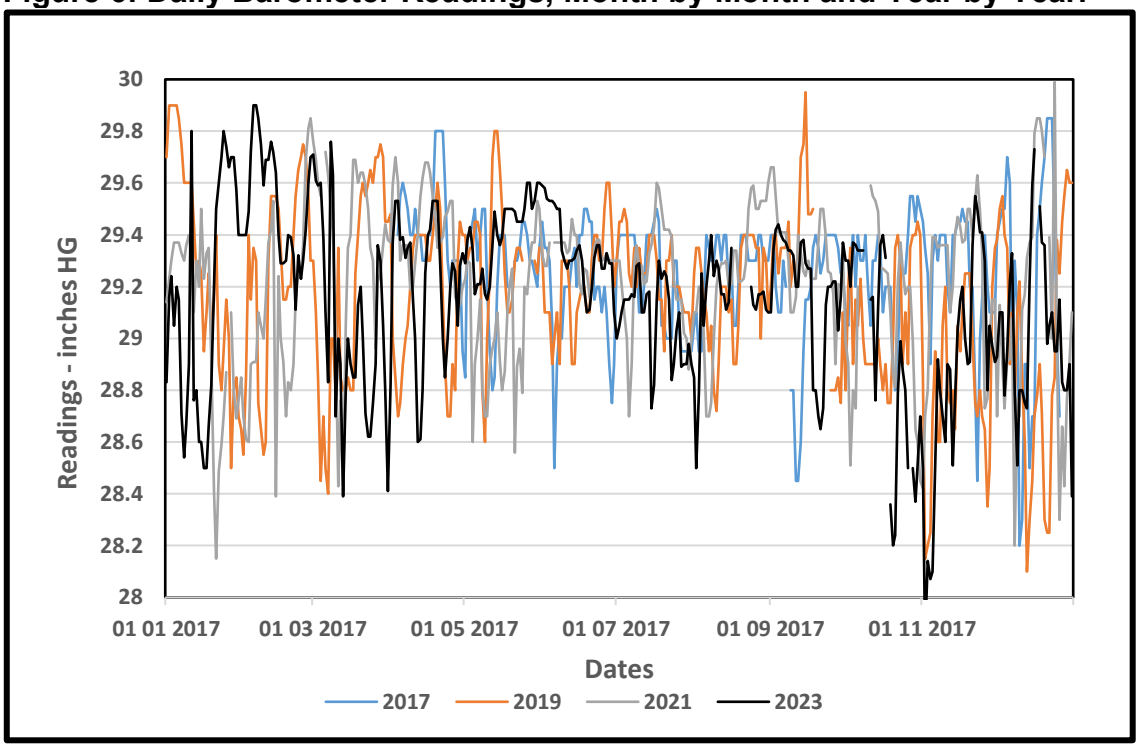
In addition to monitoring variations in temperature and rainfall, I began from mid-2017 to monitor variations in atmospheric pressure as is done by a barometer. In this case it is a standard Aneroid barometer of a type found in most family homes.

Inches of mercury refers to the height of a column of mercury measured in hundredths of inches. This is what you will usually hear from the NOAA Weather Radio or from your favorite weather or news source.

Most of the time, in human-inhabited places, the barometric pressure will stay close to the normal range (29.8 inHg - 30.2 inHg), and will rarely exceed 30.5 inHg or fall below 29.4 inHg. The average barometric pressure is 29.92 inHg (or 1 atmosphere!). At sea level, standard air pressure is 29.92 inches of mercury.

Measurements of atmospheric pressure - like all - statistics can be presented in many various ways, but it has been the experience of this presentation that no conspicuous or glaring trend or pattern emerges. An example is shown in Fig 6.

Figure 6: Daily Barometer Readings, Month by Month and Year by Year.



The only thing one might surmise from this illustration is that summer months and early autumn is more quiet than the rest of the year. (A calculation of standard

deviations or the variance for each year might show some statistically interesting differences each year and between years.)

Figure 6 above shows the daily readings of the barometer arranged by calendar months, and appendix 3 similarly show daily readings, but arranged as a consecutive sequence of the readings in all more than 7 years.

More interesting details can be derived about this statistics if it is arranged by quarters of a calendar year or by seasons of a year as shown below in table 7 and 8.

Table 7: Change in barometer readings, calendar quarters

	2017	2018	2019	2020	2021	2022	2023	2024	Average
	<----------			inchesHG			---------->		
Quarter 1		29.06	29.24	29.15	29.17	29.33	29.23	29.00	29.17
Quarter 2	29.30	29.27	29.23	29.29	29.26	29.25	29.32		29.27
Quarter 3	29.22	29.31	29.24	29.23	29.27	29.29	29.13		29.24
Quarter 4	29.93	29.19	28.96	29.02	29.14	29.05	28.94		29.05
Annual	29.47	29.29	29.16	29.17	29.21	29.23	29.16	29.00	29.21

It is noted that the 4th quarter year by year – apart from the year 2017 - is the period with the lowest barometer readings while the 2nd and 3rd quarter combined makes the warmer period.

Table 8: Seasonal changes in barometer readings

	2017	2018	2019	2020	2021	2022	2023	2024	Average
	<----------			inchesHG			---------->		
Spring	29.36	29.40	29.22	29.31	29.27	29.31	29.22	29.68	29.35
Summer	29.23	29.32	29.21	29.19	29.27	29.30	29.19		29.25
Autumn	29.22	29.26	29.04	29.17	29.22	29.07	28.67		29.09
Winter	29.19	28.92	29.07	28.66	29.23	29.25	29.04		29.05
Annual	29.33	29.22	29.14	29.09	29.25	29.23	29.03	29.68	29.25

With the readings arranged in four seasons of three months each e find the lowest readings in the winter season of December, January and February, while the highest readings are found in the Spring and Summer seasons.

Extremes

In table 9, overleaf, we find a record of the highest and the lowest barometer readings for each year.

While the distribution of highest and lowest temperatures (Table 3) show a clear division with high temperatures in the Spring and Summer months, no such division can be found in the distribution of barometer readings.

Table 9: Extreme barometer readings

	Highest		Lowest		Average
	Date	inHG	Date	inHG	inHG
2017	21.-23. Dec	29.85	10. Dec	28.20	29.25
2018	25. Sep	29.95	15. Mar	28.45	29.21
2019	15. Sep	29.95	13. Dec	28.10	29.16
2020	11. Mar	29.95	28. Dec	28.80	29.17
2021	24. Dec	29.99	21. Jan	28.15	29.21
2022	16. Aug	29.94	8. June	28.00	29.23
2023	5. Feb	29.90	2. Nov	27.84	29.16

Conclusion

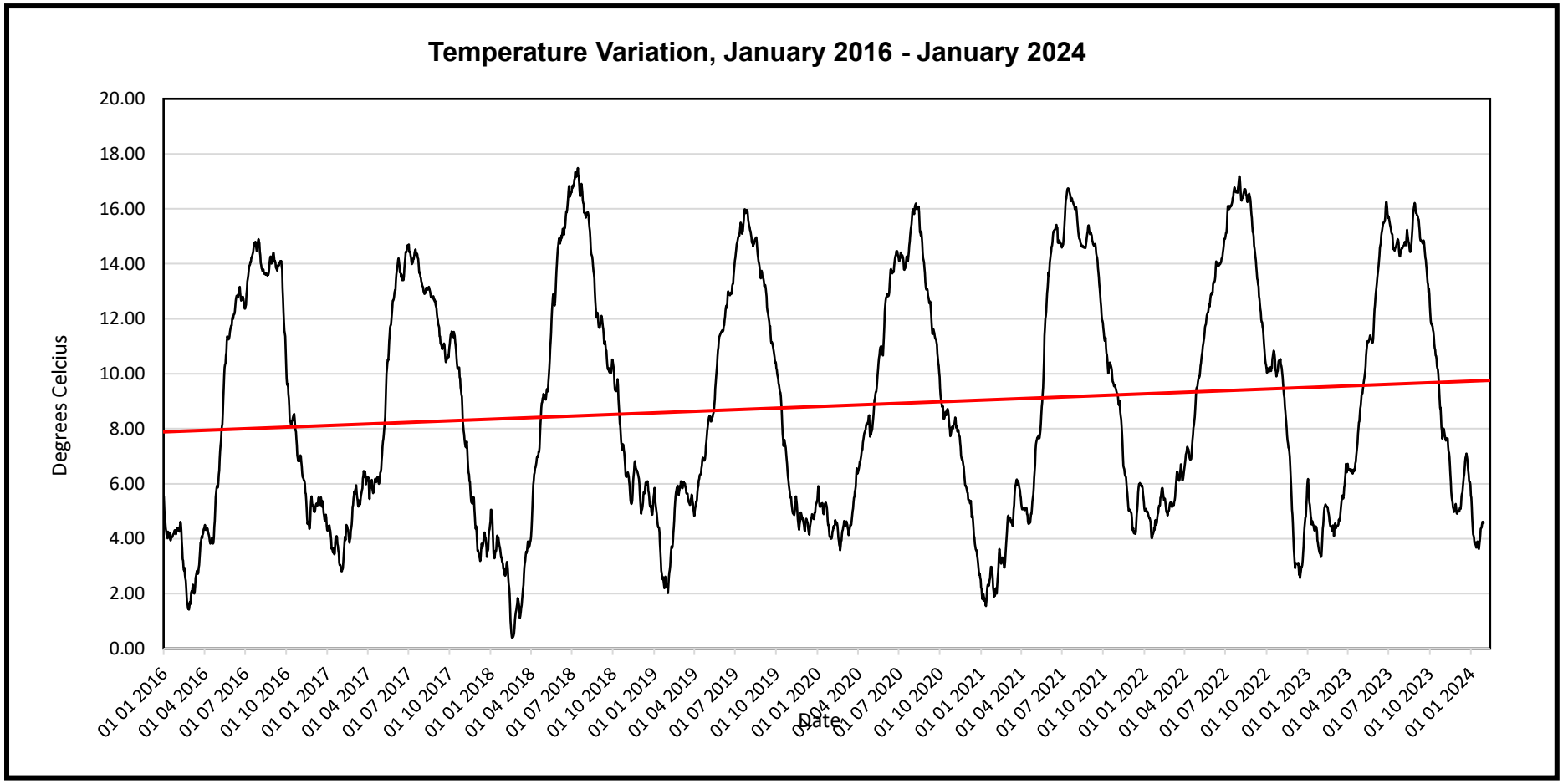
As already indicated the above study is not scientific, even less a proof of anything. However, despite its shortcomings it is at least evidence. As such it is clear that 2023 was the warmest of the nine years included in the study, nearly 2° C warmer than 2016 which was the coldest. Likewise in 2023 there were 46 days with temperatures exceeding 15° C, but only 22 such days in 2016. However, in 2021 there were 56 such days.

Observations of precipitation (rain) and readings of barometer (atmospheric pressure) have not happened for as long so it is not possible to draw firm conclusions from these series of measurements.

Despite being inconclusive, the material may be weighty enough to make you the reader stop and think. If Global Warming and/or Climate Change mapped in this way is caused by man, then we cannot afford to ignore that possibility, and perhaps it is time we cut out our bad habits? If the observed phenomenon are parts of long term cyclical patterns, just maybe cutting out the bad habits will help to alleviate the consequences of global warming. If the phenomenon are definitely caused by man, then we need to stop, think and find alternatives to the way, we live at present.

The above information has been researched and compiled by Knud Møller at **KVM Research**. If you want to know more please look at my website www.kvmresearch.co.uk, give me a ring on 01782 499384 or send me an email on knudvmoller@gmail.com

Appendix 1


Temperature Variation, January 2016 - January 2024
Degrees Celcius
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
01 01 2016
01 04 2016
01 07 2016
01 10 2016
01 01 2017
01 04 2017
01 07 2017
01 10 2017
01 01 2018
01 04 2018
01 07 2018
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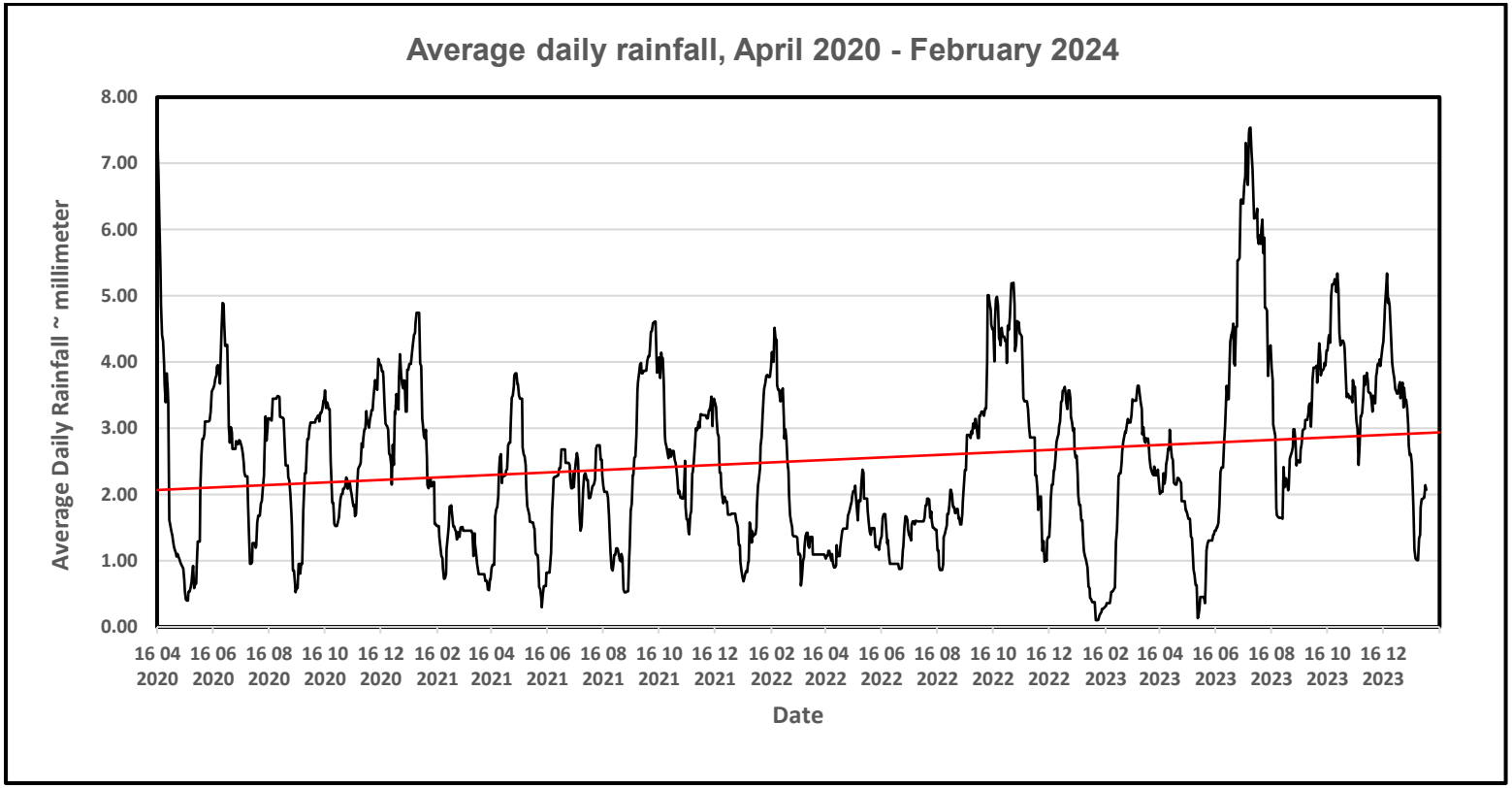
01 01 2024
Date

Appendix 2


Average daily rainfall, April 2020 - February 2024
Average Daily Rainfall ~ millimeter
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
16 04 2020
16 06 2020
16 08 2020
16 10 2020
16 12 2020
16 02 2021
16 04 2021
16 06 2021
16 08 2021
16 10 2021
16 12 2021
16 02 2022
16 04 2022
16 06 2022
16 08 2022
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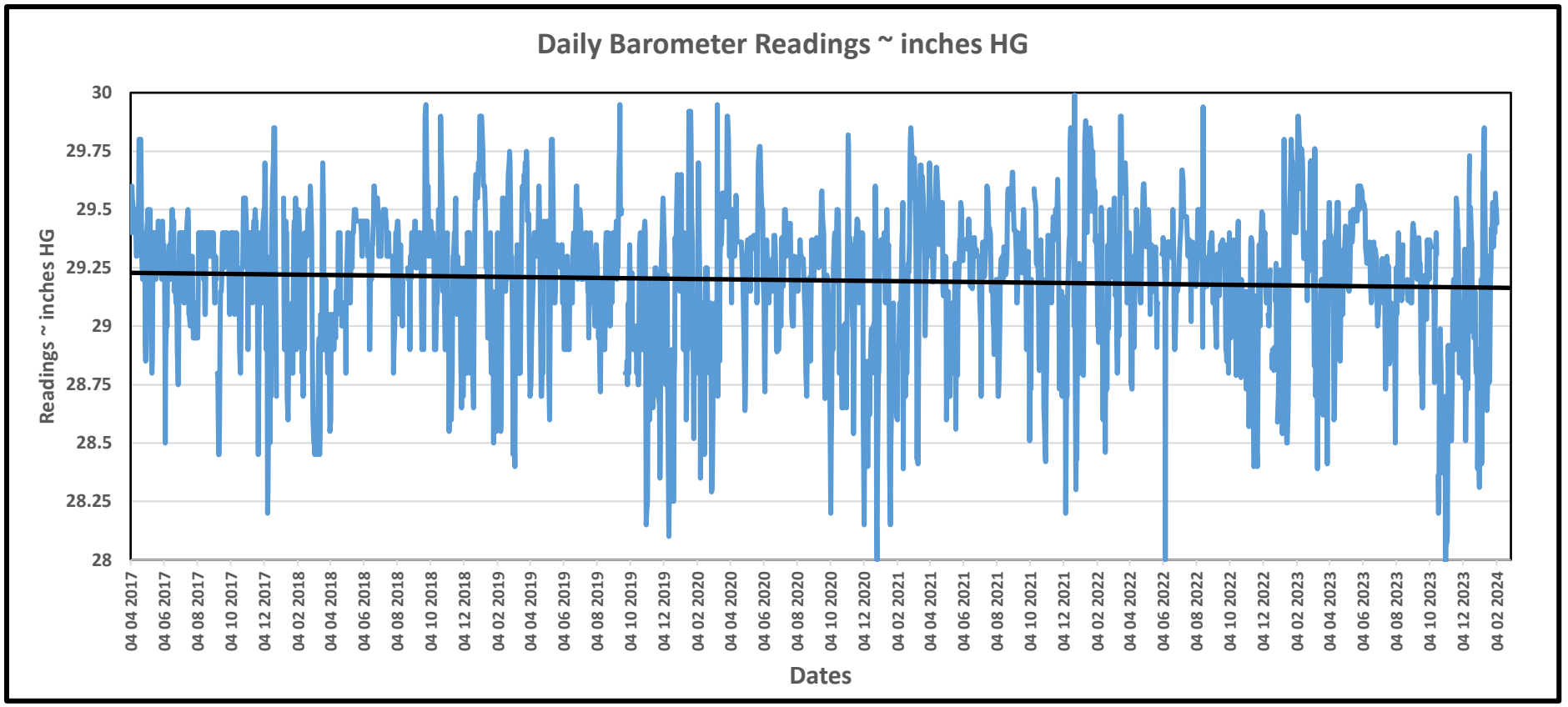
16 02 2023
16 04 2023
16 06 2023
16 08 2023
16 10 2023
16 12 2023
Date

Appendix 3


Daily Barometer Readings ~ inches HG
Readings ~ inches HG
30
29.75
29.5
29.25
29
28.75
28.5
28.25
28
04 04 2017
04 06 2017
04 08 2017
04 10 2017
04 12 2017
04 02 2018
04 04 2018
04 06 2018
04 08 2018
04 10 2018
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04 08 2023
04 10 2023
04 12 2023
04 02 2024
Dates