

## Climate Change at Halesowen from 1956 to 2000

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Halesowen climate station lies at 52.4° north 2.1° west at a height of 155m AMSL, and has been a co-operating station within the Meteorological Office network since January 1946. As such it is subject to the stringent conditions laid down by that authority for such items as instrumentation, siting and timing of observations. During its lifetime there have been great changes in both the manner of observation and in the values of the elements under observation

Today we hear much talk about '*Global Warming*', a term which personally, I dislike, since it creates the immediate impression that warming is occurring everywhere, and that it is likely to continue so. However, this is not strictly true, and some places will get cooler depending upon exactly what effects the melting of the Polar icecaps have. For us in Europe it is the melting of the ice near the North Pole that is likely to have the greatest impact on how our climate changes. So I prefer to use the term '*Climate Change*' to describe current and continuing trends, since there can be no doubt in any but the most hardened sceptics, that climate is changing.

For convenience I shall adhere to the Meteorological Office practice of using decades for the purposes of comparison, looking also at the more general patterns of the 30-year statistics, very convenient since we have just ended one such period, for 1971 to 2000. Since I began readings in 1955, that decade cannot be studied in full, so I shall use as the base line for this article, the decade from 1961 to 1970 as this then enables a full 40 year period to be examined in detail.

The 1950's saw little in the way of extreme weather apart from the summer of 1956, which was the '*summer that never was*', ranking as the worst on file even to this day. That season saw 275.6mm of rain with just 4.7 hours of sunshine daily. 1958 was little better, though in contrast the autumn of 1959 remains the third most open on file. The maximum temperature during the period was 28.9°C on June 29th 1957 whilst the lowest reached was -12.8°C on February 3 1956. During the period 1956 to 1960, 33 days were recorded with maximum temperatures in excess of 25°C, the defining point for a "hot" day.

### **The Decade from 1961 to 1970**

For the main article looking at the decades from 1961 to 2000, I shall limit the study to the main elements of rainfall, sunshine, temperature, snow and frost, plus any other outstanding data that would be deemed of interest. So we begin with the decade of 1961 to 1970, one that began with record rainfall

in 1960, a feature that was not even breached by the wetness of the year 2000. In all, 1033.7mm of rain fell with three months, January, September and October all exceeding 100mm each, whilst six individual days saw precipitation in excess of 25.4mm (1 inch), figures that have not been equalled to this day.

There followed the winter of 1962–63, one of the worst in well over a century. Though not producing the large snowfall of 1946–47, it was one of extreme length combined with penetrating and persistent frost. The cold spell lasted for 73 days with snow falling on 28 and lying on 62 of them. There were 76 instances of air frost and 82 ground frosts, with 1377 hours of sub-zero temperatures. The mean daily temperature for the entire winter was a mere  $-1.2^{\circ}\text{C}$ . Permafrost was widespread with garage doors unopenable and greenhouses and verandas suffering broken panes. In many places rivers and waterfalls froze solid, and on parts of the East Coast even the sea froze.

A temperature chart showing the maximum, mean and minimum daily temperatures in Halesowen throughout the month of February that year is shown in *fig.1* below.

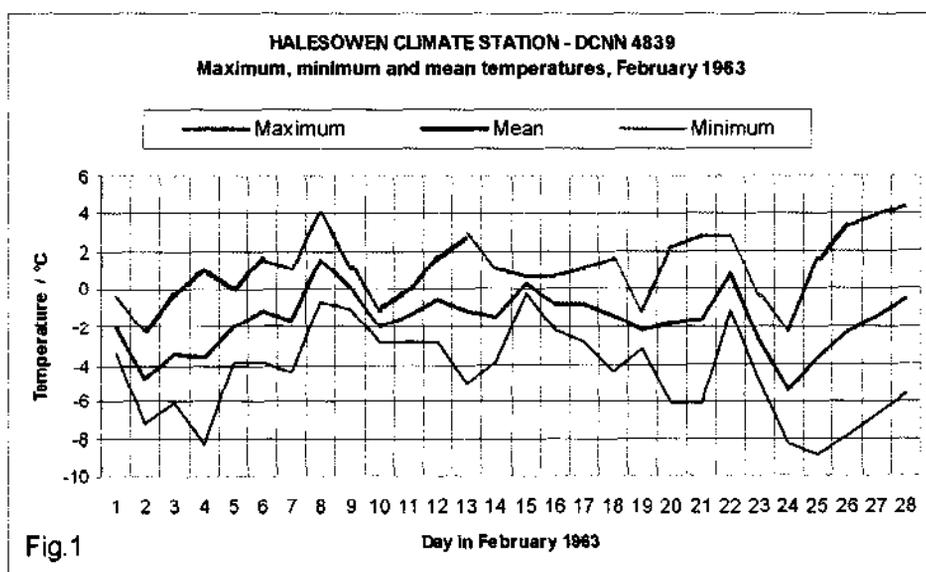


Fig.1

### The Decade from 1971 to 1980

The 1970's as a decade saw some extremes in both temperature and rainfall. 1975 heralded the start of much hotter, drier summer weather than any recorded hitherto. Up until the first few days of June nothing exceptional had occurred, and these few days actually produced no less than three ground

frosts, the most severe of  $-3.2^{\circ}\text{C}$ . To cap this, snow actually fell on June 2, with the Ciant hills carrying a noticeable covering; the cricket match at Derby was actually halted because of snow!

After this point, conditions changed dramatically, with a maximum air temperature of  $24.6^{\circ}\text{C}$  on the 6th. From then until the end of the month temperatures remained high with 15 days producing maxima over  $21^{\circ}\text{C}$  ( $70^{\circ}\text{F}$ ). Both July and August remained sunny, dry and hot, temperatures peaking at  $28.7^{\circ}\text{C}$  on July 29, with an exceptional  $32.6^{\circ}\text{C}$  on August 8. The summer season as a whole produced only 30 days with rain, totalling 90.7 mm - just 47% of the 30-year mean. Additionally, sunshine totalled 681.1 hours, 30% above the long-term average, with just 2 days suffering no sun at all. The mean maximum of  $22.4^{\circ}\text{C}$  (+2.6), mean minimum of  $11.6^{\circ}\text{C}$  (+1.2), and daily mean of  $17.0^{\circ}\text{C}$  (+1.9) resulted in one of the hottest, driest and sunniest summers that I had recorded to that date.

The summer of 1976 exceeded even that of the previous year, and gave one of the most exceptional seasons in two centuries for the UK as a whole. The 3-month period was characterised, at least in its latter stages, by the acrid smell of peat smoke hanging in the air as underground fires burned out of control. The sun beat down from a clear blue sky day after day as temperatures soared to the mid 30's celsius. It was not a pleasant experience, made worse by the critical shortage of water as reservoirs ran dry. Both spent bath water and that from the kitchen sink had to be put to use on parched vegetable plots. England passed from green to brown as shallow-rooted trees succumbed to the heat and drought, and grassland became scrubland.

Statistics on the summer of '76 have gone into the annals. Here are just a few. The mean maximum temperature of  $23.5^{\circ}\text{C}$  was  $3.7^{\circ}\text{C}$  above average, with the mean minimum of  $11.2^{\circ}\text{C}$  some  $0.8^{\circ}\text{C}$  up. The daily mean of  $17.3^{\circ}\text{C}$  ended at  $2.2^{\circ}$  above the long-term mean. In all, 35 days produced maxima in excess of  $25^{\circ}\text{C}$ , eight of these consecutive, with 11 days seeing maxima above  $30^{\circ}\text{C}$  of which seven were consecutive with the season's maximum peaking at  $32.6^{\circ}\text{C}$ , the same as for 1975. (Figs.2 & 3)

Rainfall totalled 87.2 mm (45% of average) and fell on a mere 18 days. In all there were 34 consecutive dry days and only 4 consecutive wet ones. Sunshine totalled 737.8 hours (41% above average) with only 3 sunless days. 46 days produced over 9 hours of sunshine each with 28 days producing over 12 hours, seven of these consecutive; all in all an exceptional three month period. In total contrast, once the spell had broken in late August, September was extremely wet with a fall of 204.9 mm of rain, a record, which still stands today.

The penultimate winter of the decade was the worst since that of 1962-63, the severe snap beginning in mid-December, though a warmer interlude over

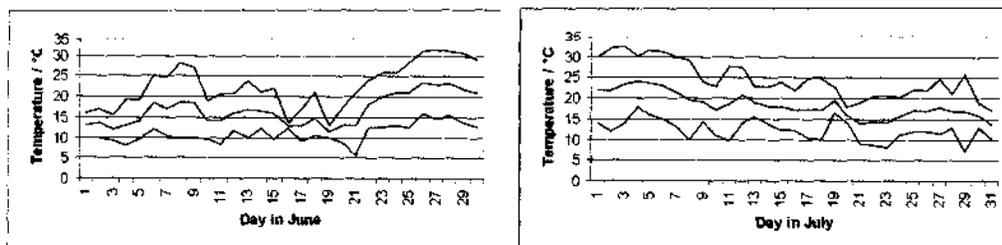


Fig.2 - Maximum, mean and minimum temperatures during the months of June and July 1976, as recorded at Halesowen Climate Station, DCNN 4839

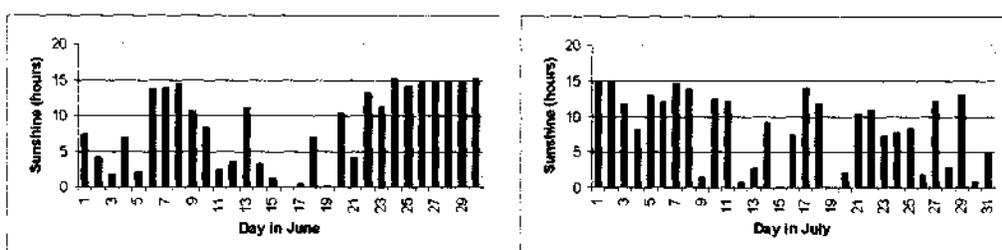


Fig.3 - Daily hours of sunshine during the months of June and July 1976, as recorded at Halesowen Climate Station, DCNN 4839

Christmas soon dispelled any idea of it being 'white'. From the 29th onwards winds became easterly and biting cold, resulting in the coldest January for 16 years and the fourth coldest since 1900! On January 13 temperatures plunged to  $-11.3^{\circ}\text{C}$ , with substantial snowfall occurring throughout the month. February was cold and dull, the sun failing to appear at all for 13 days and with 68 hours of continuous frost from noon on the 16th to 1800 hr on the 19th. The winter overall saw a mean daily temperature of  $1.3^{\circ}\text{C}$  ( $-2.3^{\circ}$  on normal) and a total of 85 cm of snow. There were 67 ground frosts and 66 air frosts, the worst of the former being  $-14.2^{\circ}\text{C}$  on January 13.

### The Decade 1981 to 1990

With the onset of the 80's the pattern of seasons seemed to be changing appreciably. Weather became far more extreme, with stormier spells in winter and very cold interludes. On the other hand summers seemed warmer, drier and sunnier. Was this the manifestation of the newly introduced ideas of 'Climate Change'?

The winter of 1981-82 was another cold one, coming third in the ranking of extremes behind 1962-63 and 1978-79, whilst that of 1988-89 was a very mild winter ending as the second most open on record here. As far as the summers of the decade are concerned, 1989 ranked third in merit behind

1976 and 1975, though the summer of 1983 actually produced six days with maximum air temperatures above 30°C. The figures for days with maximum temperatures over 30°C are interesting. In the 60's there was but one such occurrence, in the 70's, 16, and in the 80's, 8. Much of the 60's high total came from the two exceptional summers of that decade.

Several dry spells were noted during the 1980's, with sequences of 22 consecutively dry days in both 1985 and 1989. From October 9, 1985 to November 4, 1985, only 1.5 mm of rain fell whilst from November 11, 1989 till December 10, 1989 just 7.1 mm were recorded, both unusual for so late in the year. A further long dry spell occurred between March 3 and March 28 1980, when a mere 1.3 mm of rain fell and 19 consecutive days were dry.

Coupled with this were occasions when daily maximum temperatures exceeded 25°C. In 1983 the total was 33 for the period between June 19 and August 8 with a maximum temperature of 32.1°C on July 12. 1989 was another hot year with 29 occasions having maxima above 25°C between May 2 and September 6, peaking at 31.7°C on July 22.

Sunshine totals also continued to improve during the 1980's if we use the number of days totalling in excess of 12 hours as our yardstick. In 1983 there were 15 such occasions, with a maximum of 15.0 hours on June 19. 1984 provided a total of 21 days, peaking at 14.1 hours on July 5, whilst 1989 saw 26 occasions and a maximum daily of 15.6 hours on June 19, these figures giving some credence to the theory of '*Climate Change*'.

#### **The Decade 1991 to 2000**

The weather of the 90's was characterised by its run of warm, dry and sunny summers. Out of the ten best summers on file no less than four have been in the 1990's. Similarly, the most open spring and autumn seasons have also come in the 90's, as have two of the less severe winters.

The decade began with a hot, dry and sunny summer in 1990 ranking as sixth in line of excellence. In all 32 days produced maximum temperatures in excess of 25°C with a peak of 34.7°C on August 3, the hottest day on file here. The summer of 1995 was to be even more spectacular with a total of 37 hot days, including a maximum of 32.6°C on August 1.

The 90's have seen a run of several dry years, no fewer than five significant dry spells having been recorded. In 1990, in a spell of 43 days from July 5 to August 16, there were 24 successive dry days with a total rainfall for the period of only 11.1 mm. 1992 produced a spell of 20 consecutive dry days from June 6 to June 28 when no rain at all was recorded, similar spells being observed from April 27 1993 to May 8 1993 and from April 24 to May 15 1995, the latter producing 23 successive dry days.

Sunshine totals have also risen appreciably. Looking at days with more than 12 hours sunshine each, we had 27 occurrences in 1990 between April 29 and August 4 peaking at 14.7 hours on July 14. 1993 produced 22 days between May 4 and September 1, with a maximum daily of 15.5 hours on July 29. The sunniest year on record, 1995, provided a total of 35 days between April 12 and August 17, reaching a maximum of 15.6 hours on June 29, the sunniest day on record here.

The most spectacular year was 1995, which ended as the warmest year ever after an astonishing summer. The season was the hottest on file with a mean daily temperature of 17.4°C. From July 24 to August 6, every day was hot (above 25°C), the longest such period on record. Drought conditions existed at the end of August with only 53 mm of rain recorded over the three month summer period (25% of average). No rain at all fell from July 18 to August 21, a total of 35 consecutive dry days itself a new record.

Sunshine also reached record levels with a total of 744 hours, beating 1976 by over 6 hours. Only one summer day was totally sunless, with 45 days enjoying totals in excess of 9 hours and 28 days in excess of 12 hours. The period July 29 to August 6 yielded a mean of no less than 12.5 hours daily. Fortunately, the long run of hot, dry and sunny weather did not bring in its wake the surge in woodland and heath fires for which the summer of 1976 had been noted.

The season was more notable for its dearth of water supplies as reservoirs firstly became depleted, then dried up altogether. Stand pipes became the norm in several water supply areas, and hose-pipe bans meant that gardens once more had to depend on bath, or washing-up water to maintain some semblance of life in scorched plants struggling to survive in parched soil.

All of this would seem to suggest that the climate is changing appreciably in favour of warmer, drier and sunnier summers, with the autumns and winters becoming appreciably more stormy and rainy.

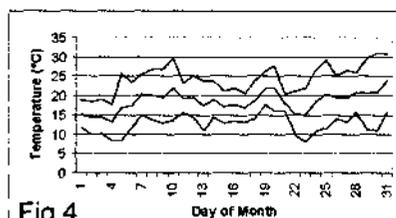


Fig.4

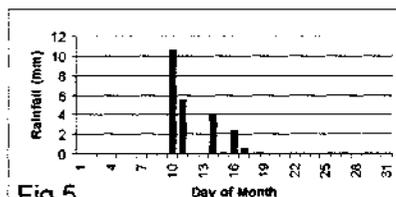


Fig.5

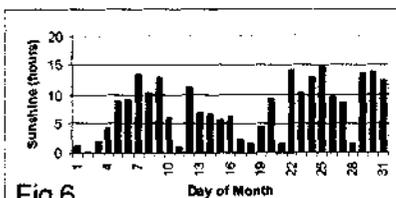


Fig.6

Graphs of temperature (top), rainfall (centre) and sunshine (foot) for July 1995

## The Future

The table below draws all these features together, showing the four separate decades and, in summary, the changes that have occurred over the 40 years.

**Climate Change in Halesowen over the Past 4 decades**

Decade	Mean Daily Temperature (°C)	Mean Annual		Daily		Mean Annual	
		Rainfall (mm)	Sunshine (hours)	mean max (°C)	mean min (°C)	air frost	lying snow
1960-1969	8.8	778.7	1320.9	12.5	5.0	62.1	17.8
1970-1979	9.4	738.4	1416.0	13.2	5.6	52.1	13.3
1980-1989	9.3	783.9	1403.2	13.3	5.3	53.4	15.9
1990-2000	9.9	723.6	1534.7	13.9	5.9	45.5	6.8
<b>% Change</b>	<b>+12.5</b>	<b>-7.1</b>	<b>+16.2</b>	<b>+11.2</b>	<b>+18.0</b>	<b>-26.7</b>	<b>-61.8</b>

Some very interesting features arise from studying this table, perhaps the more impressive being the 62% drop in the incidence of lying snow. Surprising also, in view of the exceptional wetness experienced in 2000, is the 7% fall in annual rainfall. The reason for the wetness in 2000 lies in the fact that over 100 mm of rain fell in each of the final four months of the year, a feature that ties in well with one of the possible scenarios of 'Climate Change'. It must also be fair to assume that some of the increase in temperature may well be accounted for by the fact that the surrounding area to the station has changed from purely rural in the 1950's, to a mixture of rural and urban today. Unfortunately this change in temperature is unquantifiable.

Howbeit, some conclusions can be drawn, and these can be summarised as follows.

Climate change does not necessarily mean that the climate of a particular spot will get warmer.

It does mean that future climate is likely to show marked deviations from any seen hereto. One possible scenario for this is likely to be:

- more stormy weather, especially during autumn and winter
- warmer summers with potentially more severe thunderstorms
- more gales around the equinoxes, with higher rainfall rates
- more sunshine overall, even in winter
- less frost and lying snow
- more intense rainfall leading to 'flash floods' as the ground will be unable to absorb the rainfall.

Much of this will depend upon what effect these changes have on the melting of the Polar ice-caps.

- a) If the northern ice cap melts appreciably it is likely to lead to interference with the North Atlantic Oscillation, which could cause changes to the normal patterns of the Gulf Stream. This would ultimately lead to considerable cooling of the European coastal landmasses from Spain northwards.
- b) Another possible outcome is tied in with the widespread melting of both Polar ice caps. This would lead to considerable [metres] rises in sea levels over time and all of the consequences which that would bring worldwide to low-lying areas and Pacific islands. Increased solar radiation would lead to increased evaporation and hence rainfall in areas which had previously seen relatively light falls.

Which way these changes will go is uncertain, as are the precise reasons for the changes themselves. Greenhouse gases are being blamed as are the activities of man on the Planet. The only thing certain at this stage is that changes are taking place, and whichever scenario takes precedence for Europe, our children and grandchildren are going to be living in a world with a markedly different climate to that experienced by us.

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*Some of the main comparisons between the decades, referred to in this article, are summarised in fig.7, fig.8 and fig.9 below.*

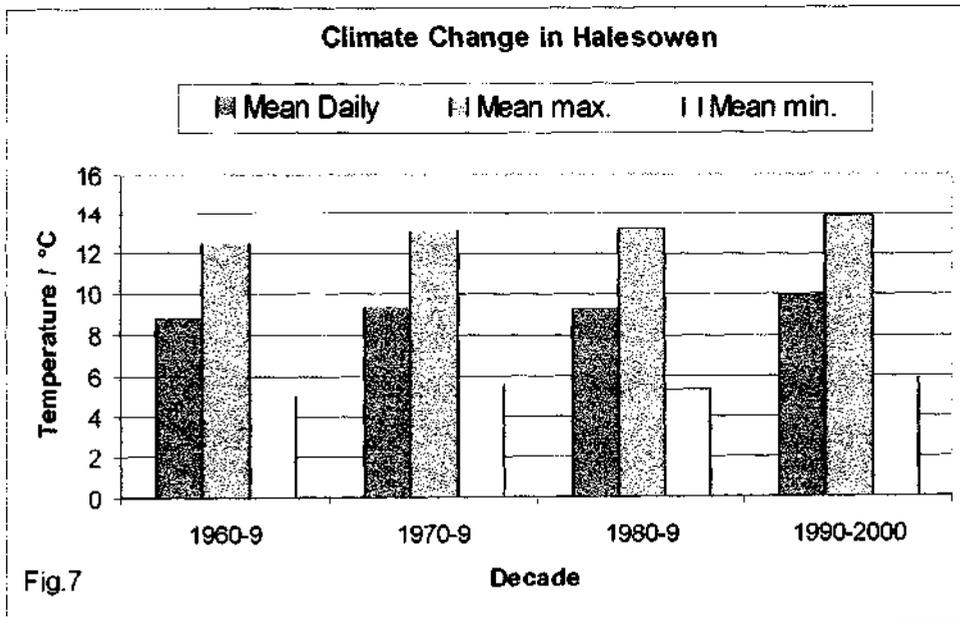


Fig.7

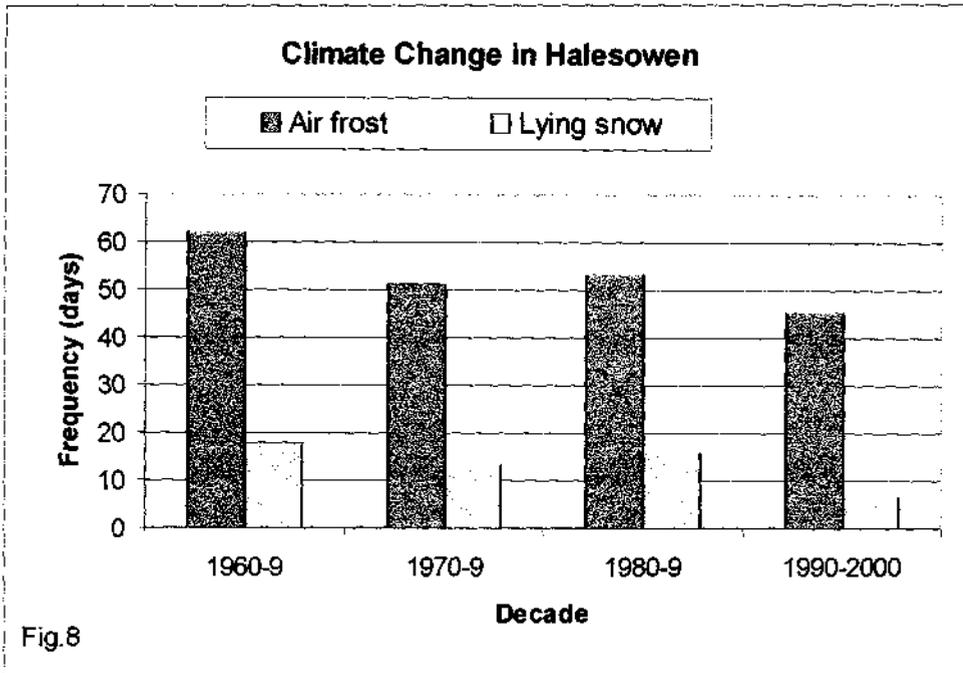


Fig.8

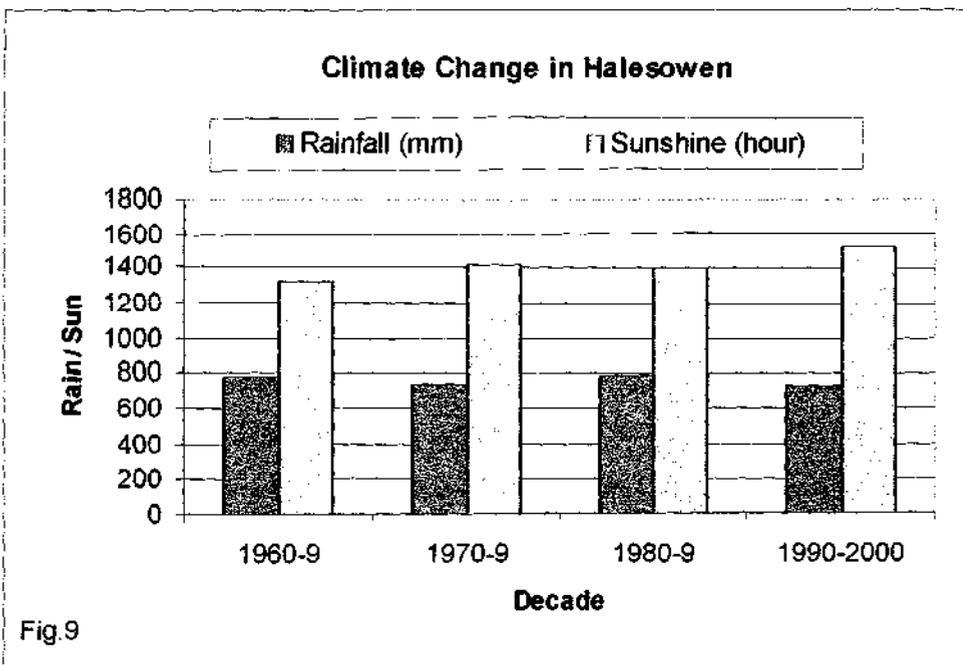


Fig.9

HALESOWEN CLIMATE STATION.

SIGNIFICANT FEATURES OF THE CLIMATE FOR 1956 TO 2000.

TEMPERATURES

1. EXTREMES.

Month with maximum mean daily temperature:	July 1983	19.8C
Month with minimum mean daily temperature:	January 1963	-2.0C
Month with maximum no of hot days $\geq 25C$ :	July 1983	20days
Month with maximum no of very cold days $\min \leq -5$ :	January 1963	15days
Month with maximum no of very cold nights $\min \leq -10$ :	January 1963	5 nights

2. EVENTS

Latest air frost of "spring"	June 2 <sup>nd</sup> 1991	-0.1C
Most severe air frost in June	June 1 <sup>st</sup> 1962	-1.1C
First air frost of "autumn"	September 16 <sup>th</sup> 1975	-0.2C
First occasion to reach 21C (70F)	April 14 <sup>th</sup> 1980	21.6C
First occasion to exceed 25C (77F)	May 3 <sup>rd</sup> 1990	27.0C
First occasion to exceed 30C	June 26 <sup>th</sup> 1976	31.2C
Latest occasion to exceed 30C	August 22 <sup>nd</sup> 1975	31.6C
Latest occasion to exceed 25C (77F)	October <del>1985</del> <sup>1985</sup>	<del>25.0C</del> 26.3C
Latest occasion to exceed 21C (70F)	October 19 <sup>th</sup> 1997	21.9C

There has been a ground frost at some time during every month of the year.  
 August 31<sup>st</sup> 1964 -2.2C    July 31<sup>st</sup> 1965 -1.7C    June 1<sup>st</sup> 1962 -4.4C    June 29<sup>th</sup> 1975 -3.1C eg

Since 1956 (45 years) there have been totals of ground frosts as follow:  
 January 554    February 500    March 455    November 368    December 450

Over the same period there have been the following totals for air frosts:  
 January 327    February 313    March 184    November 180    December 266

The maximum no of monthly air frosts:	January 1963 and February 1963	28days
The maximum no of ground frosts:	January 1963	31days

SUNSHINE.

Sunniest month July 1990	289.7 hours	Dullest month December 1989	10.5 hours
Maximum no of sunless days:		December 1956; January 1996	21days

RAINFALL.

Wettest month	September 1976	204.9mm	Driest month	April 1957
	3.3mm			
Wettest year	1960	1033.7mm	Driest year	1975
Maximum daily rainfall			August 19 <sup>th</sup> 1970	551.9mm
No of days with rain in a month			January 1948	74.9mm
				29days

WEATHER FEATURES.

All monthly values:

Maximum days with lying snow	January 1963	31days
Maximum days with falling snow	February 1969	19days
Maximum days with snow or sleet	February 1969	24days
Windiest month	February 1990	mean of 12.1 knots
Most thunder	June 1982	10days
Most fog	February 1975	10day
Most gales	January/February 1962	4days

EARTH TEMPERATURES.

Maximum 30cm soil temperature	June 31 <sup>st</sup> 1976	20.8C
Minimum 30cm soil temperature	February 27 <sup>th</sup> /28 <sup>th</sup> 1963	0.9C
Maximum 100cm earth temperature	July 30 <sup>th</sup> 1976	16.9C
Minimum 100cm earth temperature	February 26/27/28 <sup>th</sup> 1963	3.8C