Weather and Climate – Past Present and Future
Alex Hill, Chief Advisor’s Office
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History

Present day

The Future – Climate change
Weather has defined us – it made us what we are.

The glass is falling hour by hour, the glass will fall forever,
But if you break the bloody glass, you won’t hold up the weather.

*Louis Macniece*
“Marching through the middle of the mud where they sank up to their knees.”
16th Century

• The Spanish Armada July 1588
Napoleon in Russia 1812
1854 formation of the Met Office

- Francis Beaufort
- Vice Admiral Robert Fitzroy
- Board of Trade
- 1st World War
- Air Ministry 1920
- 1st radio broadcast
- NWP & Richardson 1922
- Sutcliffe development theory
Group Captain Sir James Martin Stagg

Forecasting for Overlord
Are we mad or what?

“The trouble with weather forecasting is that it’s right too often for us to ignore it and wrong too often for us to rely on”
(©Patrick Young)

“Isn’t it interesting that the same people who laugh at Science Fiction listen to weather forecasts and economists”
(©Kelvin Throop 111)
Weather Forecasters are Everywhere!
What have you done today?
Weather Matters

Effect
- Summer Temperatures
- Winter Temperatures
- Winter Rainfall
- Summer Rainfall
- Sea Level

Impact
- Energy Usage
- Energy Generation
- Water
- Agriculture
- Transport
- Built Heritage
- Flora & Fauna
- Health
- Flooding & Drought
Sceptics

The Global Warming Sceptics Society

Rising sea levels can't be considered a result of global warming until the water reaches the ceiling.
It has NOT been getting cooler

Global ranked temperatures

1998 El Nino

2008 La Nina

2009

Anomaly (°C) wrt 1961–90

Rank

0 50 100 150

0.6

0.4

0.2

0

-0.2

2000–2008

1990–1999

1970–1989

1950–1969

1930–1949

1910–1929

1890–1909

1850–1889
It has NOT been getting cooler
We’ve been here before - Not

Carbon Dioxide Variations

The Industrial Revolution Has Caused A Dramatic Rise in CO₂

CO₂ Concentration (ppmv)

Year (AD)

Thousands of Years Ago

Ice Age Cycles
It ain’t the Sun wot did it!!

[Graph showing temperature anomalies and solar irradiance over time]
Sea Level Rise

~20cms
The Future - Climate Change
- Apocalyptic 4 Horseman
Why it matters

“The effects of climate change is a bit like crystal ball gazing with some widespread and varying predictions for the future”.

ACPOS 2007
Kilbirnie 1st Aug 2008
UKCP09 is big. Really big. You won’t believe just how vastly, hugely, mindbogglingly big it is.

(with apologies to Douglas Adams & Hitchikers Guide to the Galaxy)
UKCP09

Three different emission scenarios

Seven different timeframes

25km grid, 16 admin regions, 23 river-basins and 9 marine regions
By the 2050s...

Not overly dependant on emissions

<table>
<thead>
<tr>
<th></th>
<th>Eastern Scotland</th>
<th>Northern Scotland</th>
<th>Western Scotland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer average temp</td>
<td>+ 2.3°C</td>
<td>+ 2.0°C</td>
<td>+ 2.4°C</td>
</tr>
<tr>
<td>Winter average temp</td>
<td>+ 1.7°C</td>
<td>+ 1.7°C</td>
<td>+ 1.9°C</td>
</tr>
<tr>
<td>Summer precipitation</td>
<td>- 12%</td>
<td>- 10%</td>
<td>- 12%</td>
</tr>
<tr>
<td>Winter precipitation</td>
<td>+ 10%</td>
<td>+ 13%</td>
<td>+ 15%</td>
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By the 2080s...

Rather more speculative and dependant how successful mitigation is

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<td>Summer average temp</td>
<td>+ 3.5°C</td>
<td>+ 3.0°C</td>
<td>+ 3.5°C</td>
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<tr>
<td>Winter average temp</td>
<td>+ 2.3°C</td>
<td>+ 2.2°C</td>
<td>+ 2.6°C</td>
</tr>
<tr>
<td>Summer precipitation</td>
<td>- 16%</td>
<td>- 11%</td>
<td>- 15%</td>
</tr>
<tr>
<td>Winter precipitation</td>
<td>+ 12%</td>
<td>+ 17%</td>
<td>+ 21%</td>
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UKCP09 Risks

- Temperature difference for the warmest day summer in the 2080s
- High Emissions Scenario
UKCP09 Risks

Total rainfall in an event with a 1 in 30 year return period

1980’s

2080’s

wetter

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In the future

Europe Temp anomaly (wrt 1961-90) °C

observed data
Met Office Projections

© Crown copyright   Met Office
Deaths and Heatwaves - Summer 2003

Peaks in death rate coincides with peaks in temperatures

2000 extra deaths in the UK

Average daily deaths

Daily deaths 2003

Maximum temperature

(>London)
UKCP09 Risks

- The sea level in Eastern Scot is expected to rise:

  13.9 cm by 2050
  24.4 cm by 2080
  30.5 cm by 2095
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<tr>
<td>Wick</td>
<td>1.11</td>
<td>1.02</td>
<td>0.92</td>
<td>0.91</td>
<td>0.82</td>
</tr>
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<td>Aberdeen</td>
<td>1.25</td>
<td>1.05</td>
<td>0.84</td>
<td>0.82</td>
<td>0.65</td>
</tr>
<tr>
<td>North Shields</td>
<td>1.66</td>
<td>1.12</td>
<td>0.67</td>
<td>0.96</td>
<td>0.58</td>
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<tr>
<td>Whitby</td>
<td>1.98</td>
<td>1.19</td>
<td>0.60</td>
<td>1.09</td>
<td>0.55</td>
</tr>
<tr>
<td>Immingham</td>
<td>2.14</td>
<td>1.60</td>
<td>0.75</td>
<td>1.52</td>
<td>0.71</td>
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<tr>
<td>Lowestoft</td>
<td>2.36</td>
<td>1.89</td>
<td>0.80</td>
<td>1.85</td>
<td>0.78</td>
</tr>
<tr>
<td>Felixstowe</td>
<td>2.50</td>
<td>2.01</td>
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<td>Dover</td>
<td>1.77</td>
<td>1.60</td>
<td>0.91</td>
<td>1.44</td>
<td>0.81</td>
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<tr>
<td>Newlyn</td>
<td>1.02</td>
<td>0.70</td>
<td>0.69</td>
<td>0.65</td>
<td>0.64</td>
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<td>Ilfracombe</td>
<td>1.49</td>
<td>1.20</td>
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<td>0.88</td>
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<td>1.44</td>
<td>1.05</td>
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<td>0.85</td>
<td>0.59</td>
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<tr>
<td>Holyhead</td>
<td>1.51</td>
<td>1.18</td>
<td>0.78</td>
<td>1.03</td>
<td>0.68</td>
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<tr>
<td>Heysham</td>
<td>3.16</td>
<td>2.32</td>
<td>0.73</td>
<td>1.60</td>
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<td>Millport</td>
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Storm Surge & 02 v CP09

- Size of surge expected to occur on average about once in 50 yr is projected to change by less than 0.9 mm yr (not including relative mean sea level change).

- Cannot be clearly distinguished from natural variability.

- This component much less important than implied by UKCIP02.

- Hence H++ Scenario.

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Adapting now, mitigating for the future?

Change in temperature in south east England (°C)

- Low emissions
- Medium emissions
- High emissions

IPCC 2°C

Adaptation
Mitigation
Aim:

To clearly identify the needs and objectives and the extent of the project, including the required outcomes and expectations.
STEP 2 – Scoping

Aim:
To explore how available data sets can meet the key requirements.
STEP 3 – BASELINE CLIMATE RISK

Aim:
To assess the present risk due to the current weather and climate.
STEP 4 – FUTURE CLIMATE RISK

Aim:
To assess in detail how the key risks identified in step 1 are likely to change in the future.
Aim:
To explore potential adaptation options associated with the key risks.
Note that although the Met Office can advise on the effectiveness of the owner/client will take the lead in identifying these options and exploring their feasibility.
Aim:

To communicate the project results and outcomes.
Aim:
To review that the assessment has met the requirements owner/client, and identify future steps to be taken.
## Weather Matters

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The Challenge

“The past is a foreign country, they do things differently there”

(L.P. Hartley)

So Must We

http://www.metoffice.gov.uk/climatechange/guide/ukcp/business_advice/