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Education case study The Russian heatwave of summer 2010

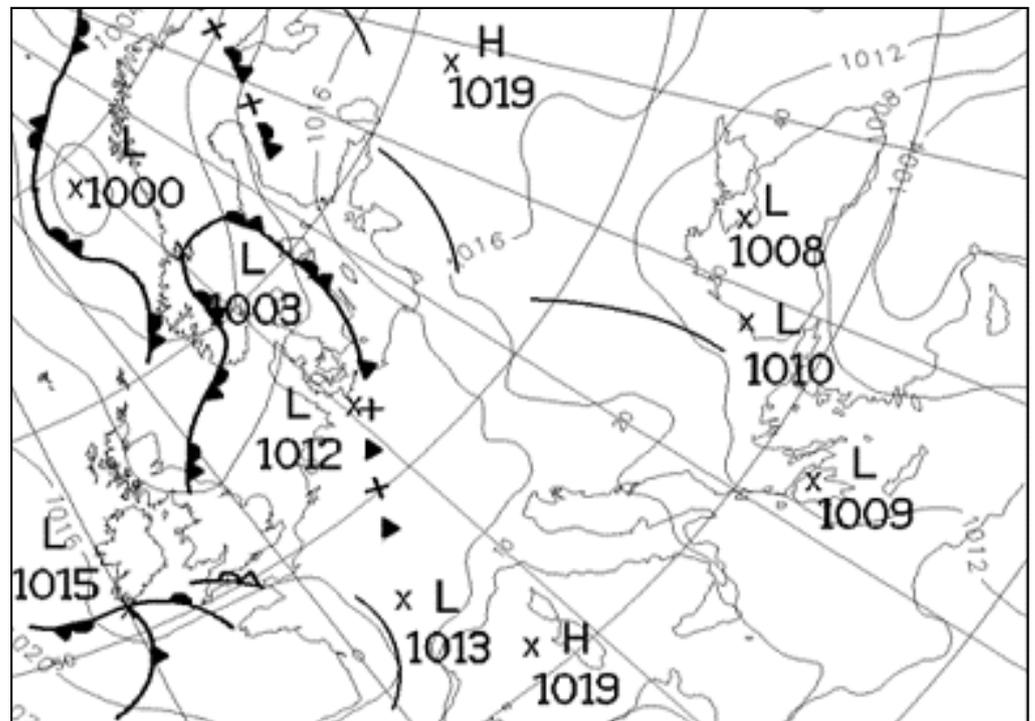
The UK may have had another uneventful summer in 2010 but much of the European continent experienced an extreme heat wave. This case study will focus on events in Russia specifically. Russia was badly effected through July and the first half of August.

What is a heatwave?

A heatwave is period of excessively hot weather. Different countries have different definitions. The World Meteorological Organisation defines a heatwave as “a period of more than five consecutive days where the daily maximum temperature exceeds the average maximum temperature by 5 °C or more”.

Meteorological situation.

The heat wave was caused by a ‘blocking high’ situation. Every now and again an area of high pressure intensifies to the point that it can become difficult for low pressure systems to break it down. Blocking highs can persist for weeks or even months.



The weather chart above is for 1 August 2010. It shows cool Northwesterly winds across the UK with high pressure dominating over Eastern Europe.



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In a UK summer if we get a few days of high pressure it can give some very pleasant warm and sunny weather. If the high pressure persists for more than a few days, temperatures tend to rise and air quality begins to suffer as the atmosphere turns hazier. In blocking high situations the air becomes very stagnant. The air continually circulates around the high and the supply of fresh and clean air is diminished.

Imagine the conditions in Russia in 2010 with soaring temperatures, pollution and forest fires.

The photo below shows the extent of the Pollution in Moscow in summer 2010. A lovely day for a wedding.



Drought

The weather conditions in summer 2010 gave Russia the worst drought conditions in roughly 40 years. Around nine million hectares of crop perished. Not only did the crops perish but the desiccated crop remnants were prone to catching fire.



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Temperatures

The table below shows the eight hottest temperatures experienced in Russia in summer 2010. As a guide the average maximum July temperature for Moscow (1971–2000 average) is around 23°C.

Location	Date	Temperature °C
Yashkul	11 July 2010	44.0°C
Belogorsk	25 June 2010	42.3°C
Volgograd	1 August 2010	41.1°C
Voronezh	2 August 2010	40.5°C
Samara	30 July 2010	40.1°C
Ryazan	1 August 2010	40.1°C
Rostov On Don	1 August 2010	40.1°C
Blagoveschensk	25 June 20 10	39.4°C

Impacts

With temperatures soaring what kind of impacts can you think of?





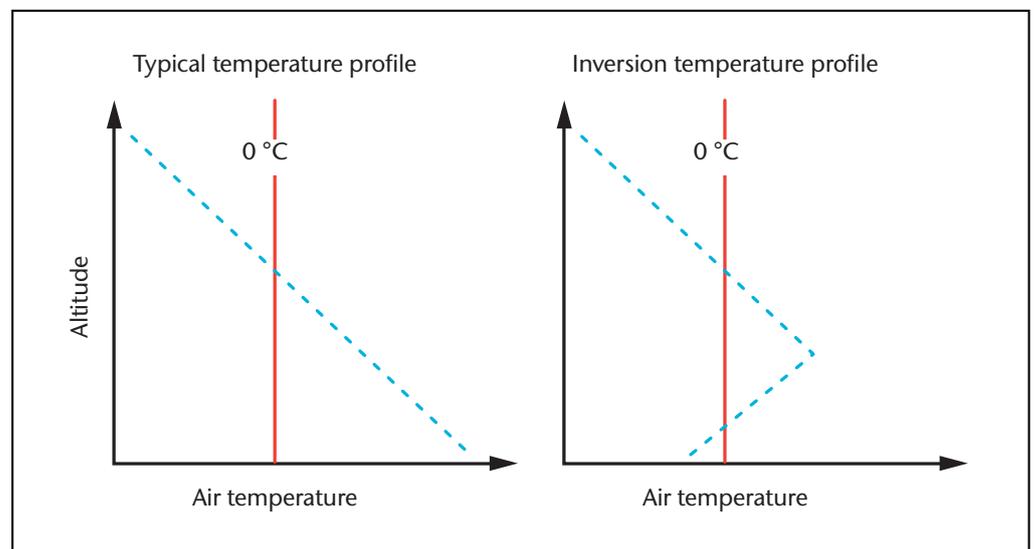
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Pollution, smog and fires

In general air temperatures tend to decrease with height. In high pressure systems the air is gradually subsiding. This ultimately leads to temperatures increasing with height rather than cooling. This causes a temperature inversion to form.

The image below shows the typical atmospheric temperature profile and the temperature profile associated with a temperature inversion.



Just above the ground surface temperatures will decrease with height. At the base of the temperature inversion temperatures then rise markedly. At the top of the inversion temperatures then begin to decrease again with height.

As a result pollution and smoke can become trapped below the inversion layer and cannot disperse. Also in high pressure situations light winds means that fresher, cleaner air is not brought into the region.

Industrial pollution cannot disperse. Another problem which arose in this event was due to smoke from forest and peat fires.

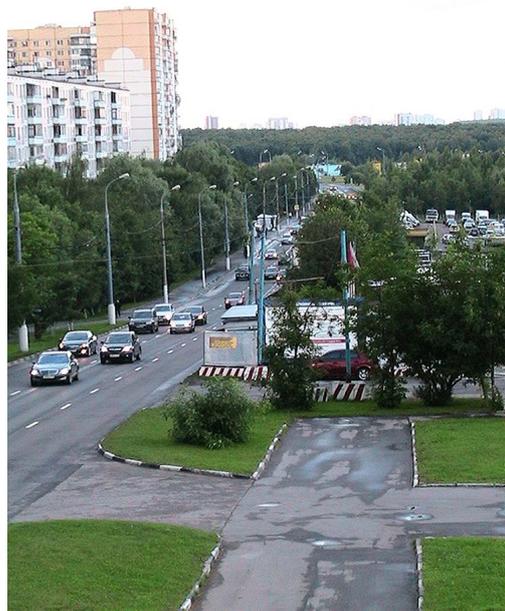
The worst of the heat wave lasted through July and the first half of August. The worst period for peat and forest fires was from late July to the middle of August. With soaring temperatures and extremely dry ground, fires can break out and spread easily. By the end of July 2010 more than 40 peat fires had broken out to the south and east of Moscow. These fires claimed many lives and many people were left homeless.



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The photo above shows the same street in Moscow on the 17 June and 7 August 2010. What a contrast.

Health

Such a heavily polluted atmosphere takes its toll on the health of the population. People with heart conditions, asthma and severe allergies are most at risk. Such temperatures, coupled with the pollution, took its toll with an increased mortality rate. In July 2010 Moscow recorded over 14,000 deaths. This figure was nearly 5,000 greater than the previous July. Pollution levels in July 2010 were five times greater than normal. With temperatures so high people became desperate to cool off. Between 1 June and 15 July it is estimated that around 2,000 Russians had drowned whilst swimming. A statement from the Russian Emergency Ministry said that 95% of those drowning had consumed alcohol.

More information

BBC News - Death rate doubles in Moscow as heatwave continues

BBC News - Russian deaths mount as heatwave and vodka mix

BBC News - Russian heatwave decimates harvest

BBC News - Russia forest fires leave 23 people dead amid heatwave