



General Certificate of Education
Advanced Level Examination
June 2012

General Studies (Specification A)

GENA4/PMR

Unit 4 A2 Science and Society

Case Study Source Material

For use with **Section A**

- The material consists of five sources (A, B, C, D and E) on the subject of **climate change**. These extracts are being given to you in advance of the Unit 4 examination to enable you to study the content and approach of each extract, and to consider issues which they raise, in preparation for the questions based on this material in Section A.
- A further Section A source (F) will be provided in the examination paper.
- Your teachers **are** permitted to discuss the material with you before the examination.
- You may write notes in this copy of the Source Material, but you will **not** be allowed to bring this copy, or any other notes you may have made, into the examination room. You will be provided with a clean copy of the Source Material at the start of the Unit 4 examination.
- You are not required to carry out any further study of the material than is necessary for you to gain an understanding of the detail that it contains and to consider the issues that are raised. It is suggested that three hours' detailed study is required for this purpose.
- In the examination room you are advised to spend approximately one hour and fifteen minutes reading a previously unseen extract and answering a range of Section A questions based on all the source material.

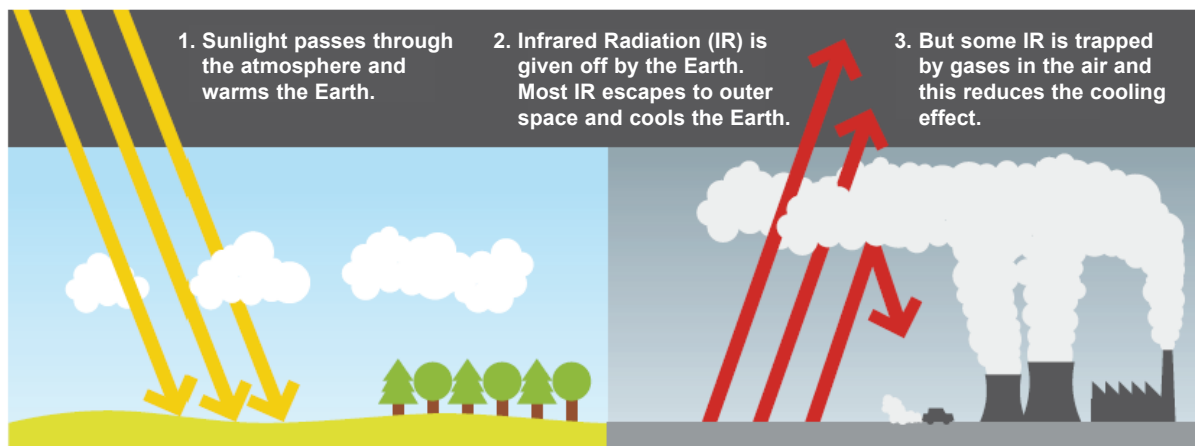
Source A (Figures 1–7)

Figure 1 – Climate change and the greenhouse effect

Key dates in climate change

- Late 1950s – CO₂ measurements were made on a mountain top in Hawaii. In the 1960s, these measurements confirmed that levels of CO₂ in the atmosphere were rising year on year.
- 1970s/1980s – improved climate models confirmed the link between CO₂ emissions and global warming.
- 1979 – the first major international climate science conference was held. The conference called on governments “to foresee and prevent potential man-made changes in climate”.
- 1988 – the United Nations set up the Intergovernmental Panel on Climate Change (IPCC) to analyse and report on scientific findings.
- 1997 – the Kyoto Protocol was the first international treaty to set legally binding emissions cuts for the industrial nations.
- 2006 – the Stern Report, published in the UK by the Treasury, was the first report of its kind on the economic impact of climate change.
- 2009 – World climate change summit in Copenhagen ended in disagreement.
- 2010 – Climate change summit in Cancun where there was more focus on agreement to reduce CO₂ emissions.

Source: www.direct.gov.uk/en/Environmentalgreenerliving/Thewiderenvironment.htm



What is the greenhouse effect?

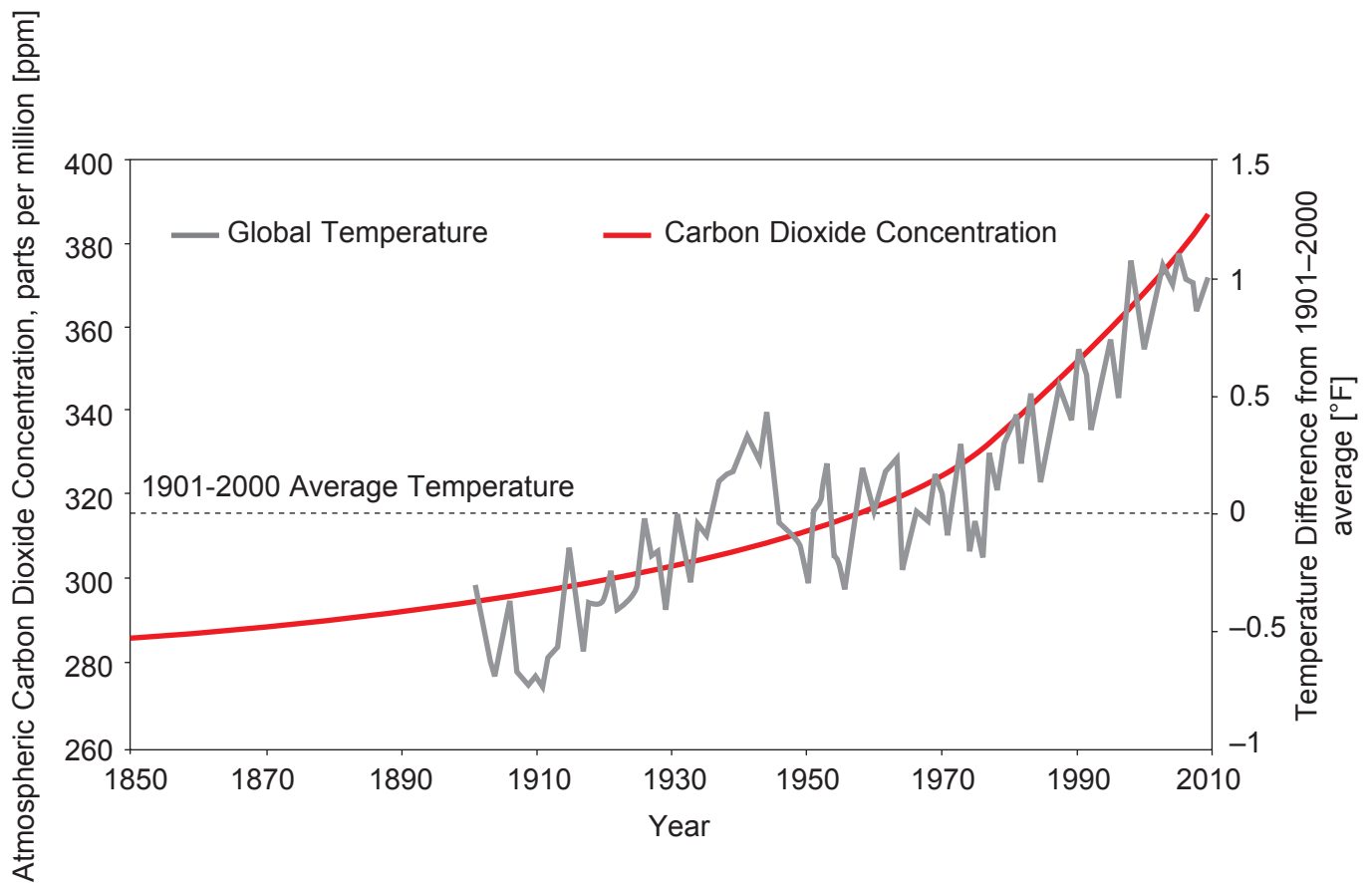
The greenhouse effect is the natural process of the atmosphere letting in some of the energy we receive from the Sun (ultraviolet and visible light) and stopping it being transmitted back out into space (infrared radiation or heat). This makes the Earth warm enough for life.

For several thousands of years the atmosphere has been delicately balanced, with relatively stable levels of greenhouse gases. Human influence has now upset that balance and, as a result, we are seeing climate change.

Even if global temperatures rise by only 2°C, 20–30% of species could face extinction.

Source: ‘Warming Climate Change – the facts’, Met Office

Figure 2 – The link between Carbon Dioxide and Temperature



Emissions of carbon dioxide, an important greenhouse gas, have been increasing since the Industrial Revolution. These emissions are causing carbon dioxide levels to build up in the atmosphere and global temperatures to rise. In particular, temperatures have gone up at an increased rate over the past 30 years. Temperature data show the difference from the average temperature between 1901 and 2000.

Source: United States Environmental Protection Agency
epa.gov

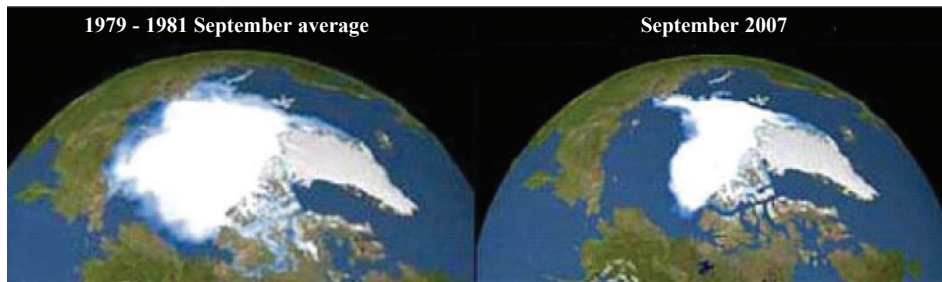
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Figure 3 – Global warming trend statistics

Arctic Sea Ice

Using data reported from the National Snow and Ice Data Center, we can track the decline of Arctic sea ice. The image below shows the month of September with the 1979–1981 averages on the left, and Arctic sea ice from September 2007 on the right, which produced the smallest area of Arctic sea ice to date. This equates to a decline of nearly 32% in the Arctic sea ice. While the sea ice area has since increased from the record low of 2007, the level remains far below those recorded since 1979.

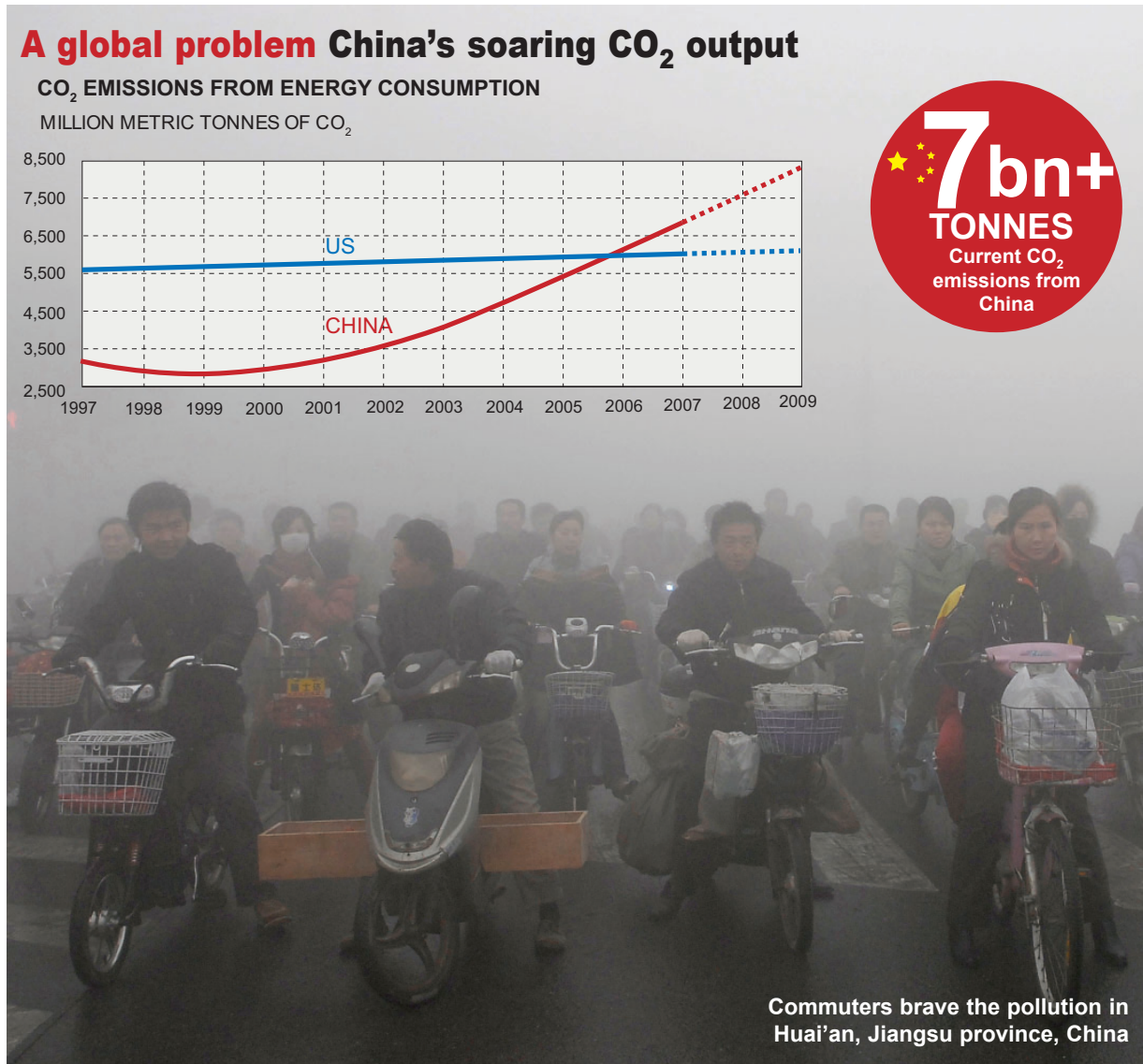


Predicting Sea Level Rise

The latest report of the Intergovernmental Panel on Climate Change (IPCC), reflecting the views of scientists from over 130 countries, confirmed that global sea level has already been rising at an average rate of 1.7 mm per year during the 20th century. With continued growth in global greenhouse gas emissions and associated warming, sea level could rise by another one to three metres this century. Most of this anticipated increase is attributable to glacier melt and thermal expansion of oceans. The additional possibility of warmer temperatures unexpectedly breaking up the Greenland and West Antarctic ice sheets, still widely debated among climate scientists, could lead to a devastating five-metre increase.

Source: Climate Change 2007: The Physical Science Basis, Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, FAQ. 5.1, Figure 1, Cambridge University Press

Figure 4 – A global problem: China's soaring CO₂ output

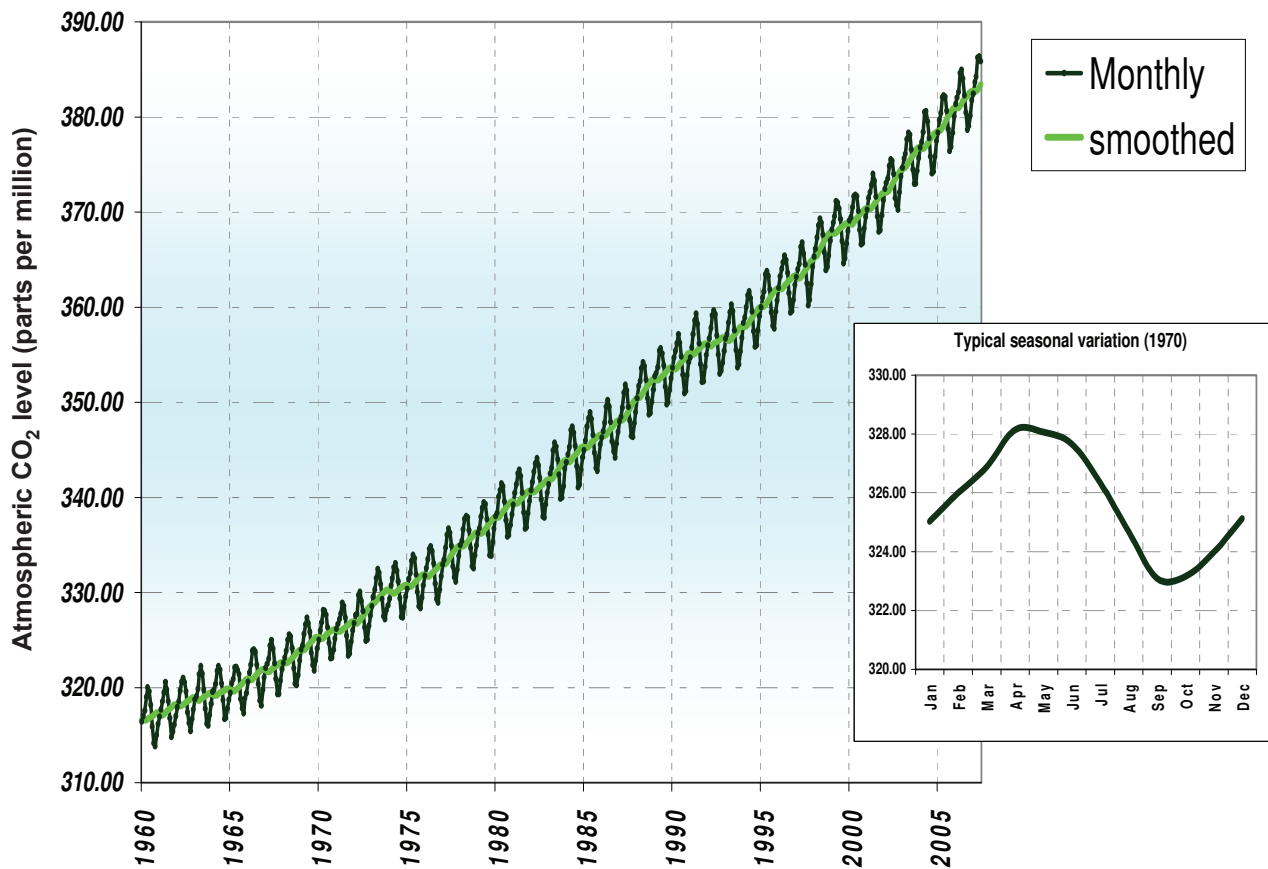


Source: CLIFFORD COONAN, 'China sets ambitious target on emissions', *The Independent*, 27 November 2009

IMAGE: REUTERS/Patty Chen (CHINA ENVIRONMENT SOCIETY)

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Figure 5 – Cancun Conference in numbers



14.54 °C

The combined global land and ocean average surface temperature for October 2010, the eighth warmest on record

14.0 °C

The average combined surface temperature for the 20th Century

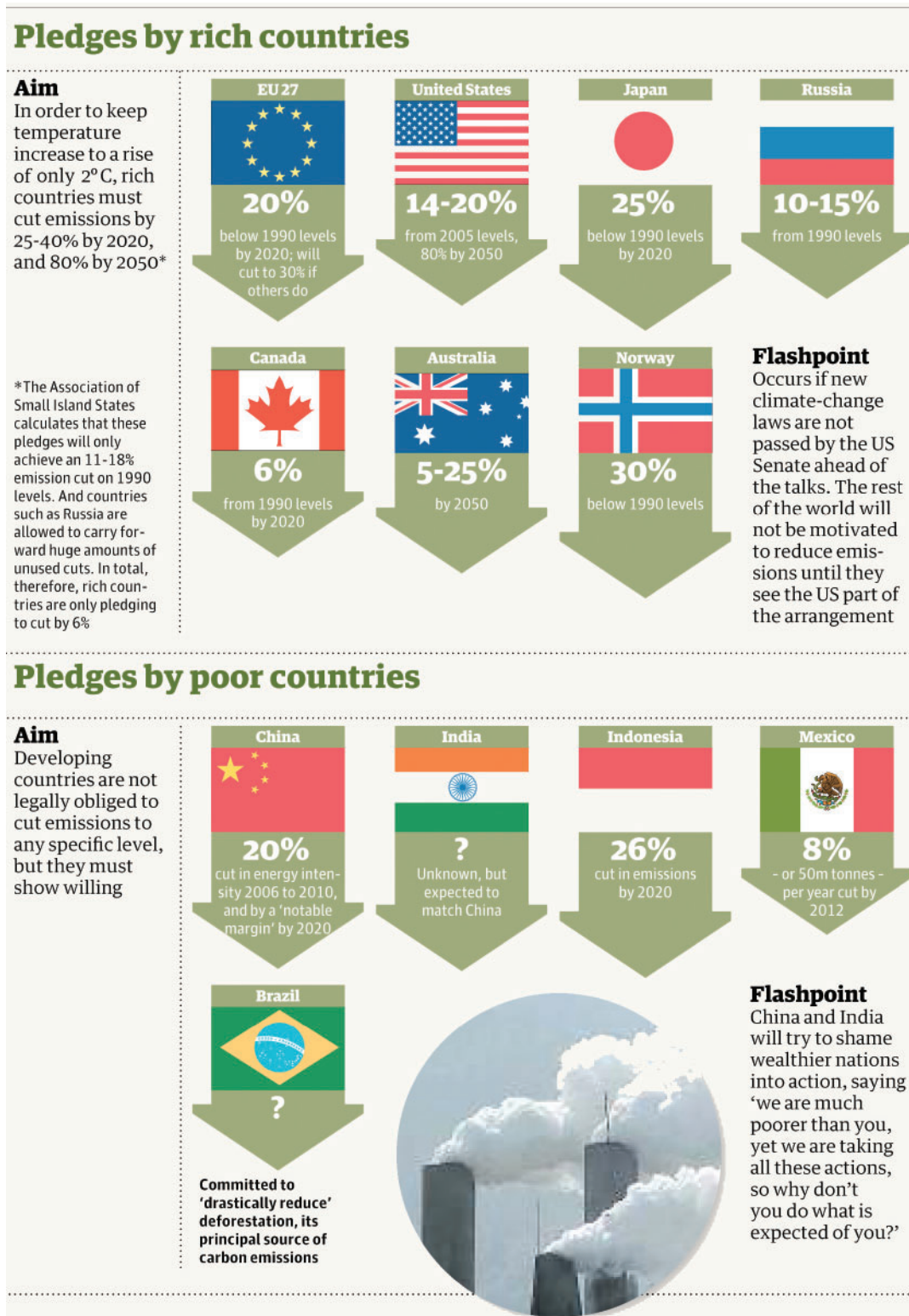
0.16 °C

The global average temperature rise per decade between 1970 and 2000

11

The number of years among the previous 12 years that feature in the 12 hottest years on record.

Figure 6 – Pledges by rich and poor countries



Source: JOHN VIDAL, 'Countdown to Copenhagen', *The Guardian*, 2 November 2009
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Figure 7 – The climate scandal that never was



Photographer: Gordon Wiltsie

- In the grand saga of political battles over climate research, there is no event more pivotal, or more damaging, than what has come to be called “climategate” – the late-2009 theft and exposure of a trove of emails from the Climatic Research Unit (CRU) at the University of East Anglia.
- Fred Pearce’s *The Climate Files* is the first book-length attempt to cover the furore.
- In truth, climategate was a pseudo-scandal, and the worst that can be said of the CRU scientists who were accused of falsifying data is that they wrote some ill-advised things.
- The scientists also resisted turning over their data when battered by requests to do it – requests from climate sceptics who dominate the blogosphere and don’t play by the usual rules.
- A “bunker mentality” developed among the scientists. They were under attack. In this situation, the scientists proved all too human – not frauds, criminals or liars.
- So why were their hacked emails such big news? Because they were taken out of context and made to appear scandalous. Pearce repeatedly faults the sceptics for such behaviour.
- Pearce is an ace climate journalist, deeply conversant with every debate in the field going back several decades. This expertise, however, makes the arcane climategate emails a kind of kryptonite for him.
- And so we plunge into debates about the validity of certain data from Chinese weather stations and about whether bristlecone pine tree rings show evidence of climate change.
- This is precisely where the sceptics want journalists to go because it confuses the public. But with a heavily politicised issue like climate change there is a huge risk in growing over-focused on small corners of climate research to the detriment of the big picture.
- Climategate is certainly a story for our science-politicising times. But so is our failure to zoom out – way, way out – and understand it.

Source: adapted from CHRIS MOONEY, ‘The climate scandal that never was’, *New Scientist*, 5 July 2010

Source B

The UN climate-change process is back on the road. Try not to crash it this time.



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Source C**Climate change deal agreed at Cancun**

Photographer: Wendy Connett

A new “green fund” to help poor countries to adapt to the effects of global warming formed the centrepiece of a small packet of measures on climate change agreed at the Cancun conference. But although governments have agreed on the form of the fund, which should eventually supply \$100 billion a year to the developing countries, the question of how the money for it will be raised has still not been resolved.

After a marathon final negotiating session, governments emerged with a deal that surprised many participants and observers, who had been expecting that wide-ranging disagreements among countries would prevent any significant outcome from the two-week talks.

UK energy and climate secretary, Chris Huhne, said: “Cancun shows countries want to get on with getting an international deal. A global deal on climate change is now back on track.”

Governments also made progress on the important issues of preserving forests, fostering international cooperation on low-carbon technology, and providing assurance to the \$20 billion international carbon markets. Some of the options under discussion include levies on global shipping and aviation, carbon trading and a tax on international financial transactions.

Several other potentially controversial issues have also been left hanging, including the question of the legal form that any new global climate agreement should take, and the future of the Kyoto Protocol – both subjects on which there are deep rifts among countries.

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In advance of Cancun, governments acknowledged that no final agreement could be reached in 2010, despite progress made at the 2009 Copenhagen climate summit. Some still hope that, given the progress made at Cancun, a deal could be struck in 2011, while others think it could take until the 2012 meeting. Only one country – Bolivia – objected to the final outcome at Cancun.

Governments have been working since 2007 on writing a new global agreement on climate change, which would be the first since the 1997 Kyoto Protocol, which failed to achieve its full effect partly because it was not supported by the US. Any new pact would be ground-breaking in that it would bring together for the first time developed and rapidly emerging economies with targets to reduce greenhouse gas emissions.

However, green campaigning groups said that countries needed to go much further. According to Nnimmo Bassey of Friends of the Earth International, the agreement reached at Cancun “is wholly inadequate and could lead to catastrophic climate change. The rich countries are primarily responsible for climate change and this is a slap in the face for those who already suffer from its effects. In the end, all of us will be affected by the lack of ambition and political will of a small group of rich countries”.

Source: adapted from FIONA HARVEY, Climate change deal agreed at Cancun, *The Financial Times*, 11 December 2010

Source D**Climate change – the way we must live now**

All great causes involve a tension between collective belief and individual action. A shared agreement that something must be done is not enough to win the battle if people do nothing. This is especially true of the fight against climate change, which must involve all of humanity over many decades, working together to achieve something that none can see or touch and that can only be measured by scientists: an end to the rapid increase of climate change gases in the atmosphere. Faced with this, even the most generous-spirited of people could be forgiven for feeling daunted – surrendering, perhaps, to the hope that someone else will solve the problem.

Urged to do their bit, individuals may wait instead for governments to act, or engineers to come up with technical fixes, or they may just give in to the comforting but scientifically-unsupported gamble that calamity may be avoided if things go on as they are. With the Copenhagen summit coming up in December, if international agreement is going to mean anything, the way people live in this country must change.

All calls for individual environmental responsibility tread a tricky path. On the one hand there is a large and committed green movement, represented this week by the climate camp in the place where the Peasants' Revolt once gathered in south-east London. Many of the camp's supporters want human life to change radically and immediately: an end to the global free market, to air travel, to meat-eating, to all coal-produced electricity. They disapprove of mechanisms like the European Union's carbon trading scheme: some dislike technological solutions such as carbon capture and storage.

The trouble with these ambitions is that they are never likely to be supported by the majority of the population who, if told that such things are essential to stop climate change, may simply give up trying altogether. But at the other extreme lies an even more unrealistic response: to pretend that all the individuals need to do is to make tiny adjustments to their lives – change a light bulb and save the world. Even if it eventually repays its costs, as Lord Stern has argued, the bills will arrive first and the savings later.

The Guardian's 10:10 campaign – named after its target of helping people to reduce their individual carbon emissions by 10% in 2010 – seeks to show that individuals have a moral obligation to act which can be met without abandoning the good things about life as it is lived today. Our heated houses must also be insulated; perhaps we could eat less meat and less often; and, where possible, food should have travelled less far. Walk more, drive less – such things are so obvious that they can seem petty, yet, if enough people and organisations in Britain do them regularly, the effect can be immense.

Britain's emissions have fallen since 1990. They must keep on falling sharply: current emissions of over 10 tonnes per capita must drop to 2 tonnes by 2050. This new campaign will not be enough to achieve that. But it is more than a start; it is the direction Britain must take if the world as we know it is to survive.

Source: adapted from EDITORIAL, 'Climate change – the way that we must live now', *The Guardian*,
1 September 2009

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Source E

Climate sceptics launch campaign to overturn green targets



© Thinkstock

Climate Sense (www.climate-sense.com), a loose coalition of 'climate sceptic groups', is calling for the Climate Act, that commits the UK to cutting greenhouse gases by 80% by 2050, to be repealed. Philip Foster, a retired clergyman who is leading the campaign, said the legislation will cost taxpayers £480 billion over the next 40 years because of the cost of new technologies like wind farms.

Rev'd Foster said that Conservative backbench MPs John Redwood, David Davies and Christopher Chope have agreed to attend the launch of 'Climate Fools Day' in the House of Commons. Labour MP Graham Stringer, who is a member of the Science and Technology Select Committee, also supports the campaign. Television presenter Johnny Ball is expected to attend the launch.

"There is no evidence that human input has anything to do with global temperatures," Rev'd Foster said. "Therefore we should not be wasting money on climate change through things like this legislation."

The group, made up of Copenhagen Climate Challenge, Weather Action and the Campaign Against Carbon Capitalism, has also written a letter to the Prince of Wales on behalf of climate sceptics. It asks the Prince, who has accused sceptics of "peddling pseudo science", to prove climate change is happening and is signed by 166 scientists, including David Bellamy.

However, Bob Ward, Policy and Communications Director at the Grantham Research Institute on Climate Change and the Environment at the London School of Economics, said the group misunderstood the point of science, which is to disprove theories. He said that UK legislation was overwhelmingly backed by Parliament and is leading the world.

"Nobody thinks that climate change is not a problem. The discussion has moved on to what is the best way of tackling the problem and making a transition to low carbon growth," Ward said. "These guys are a remnant group of dinosaurs trying to argue something while, frankly, the public and political debate has moved on."

Meanwhile a complaint against an Oxfam advert warning of the risk of climate change was not upheld. The advert read: “People dying thanks to climate change is a long way off. About 5000 miles, give or take.” The complainant claimed that it had not been proven that people were dying as a result of climate change. The complaint was not upheld by the Advertising Standards Authority.

The 10 challenges that sceptics have asked ‘supporters of the hypothesis of dangerous human-caused climate change’ to prove are:

1. Variations in global warming in the last 100 years are significantly outside the natural range experienced in previous centuries.
2. Humanity’s emissions of CO₂ and other ‘greenhouse gases’ (GHG) are having a dangerous impact on the global climate.
3. Computer-based models can meaningfully replicate the impact of all of the natural factors that may significantly influence the climate.
4. Sea levels are rising dangerously at a rate that has accelerated with increasing GHG emissions, thereby threatening small islands and coastal communities.
5. The incidences of malaria and other infectious diseases are increasing due to recent climate changes.
6. Human society and natural ecosystems cannot adapt to foreseeable climate change as they have done in the past.
7. Worldwide glacier retreat, and sea ice melting in polar regions, is unusual and related to increases in human GHG emissions.
8. Polar bears and other Arctic and Antarctic wildlife are unable to adapt to anticipated local climate change effects, independent of the causes of those changes.
9. Hurricanes, other tropical cyclones and associated extreme weather events are increasing in severity and frequency.
10. Data recorded by ground-based stations are a reliable indicator of global surface temperature trends.

Source: adapted from LOUISE GRAY, Climate sceptics launch campaign to overturn green targets, *The Telegraph*, 27 October 2010.

END OF SOURCES

There is no material printed on this page