



The Royal Academy
of Engineering

Adapting the UK to Climate Change

Response from The Royal Academy of Engineering to the Royal Commission on
Environmental Pollution

January 2008

1. The Royal Academy of Engineering is pleased to respond to the Royal Commission on Environmental Pollution's invitation to submit information for its study on "adapting the UK to climate change". While it is right that most of the current effort by Government and other agencies is on mitigation, primarily through the decarbonisation of both national and international economies, it is also timely to consider the likely effects of climate change and how the UK will need to adapt to these changes.
2. Given the considerable inertia of the planet's climate systems, increases in greenhouse gases will continue to raise global temperatures for a number of years to come, regardless of any attempts to reduce emissions. This will have a variety of inevitable and unavoidable consequences. Predicting the nature, timing and extent of these effects will be a challenge and there will be many physical and social implications resulting from them. Considering how best to forecast the adverse effects of climate change and the most appropriate adaptation strategies will ultimately be crucial for the continued well being of the UK's economy and population.
3. The most obvious and direct consequence of increases of greenhouse gases will be increases in temperatures. Since pre-industrial times the global temperature has already increased by approximately 0.76°C and is set to rise by a further 1.8 – 4.0°C by the end of the century¹. These figures are global averages and models suggest that local variations could be even more pronounced. Also, as was previously stated, the inertia of the planet's climate systems means that rises over the next few decades are unavoidable.
4. Temperature rises in the UK will have a number of direct consequences. An increased frequency of summer heat waves, similar to that seen in Europe in 2003, will have considerable health implications, particularly for the more vulnerable in society. However, milder winters may prove less dangerous. Offsetting the worst effects of high summer temperatures is possible, as can be seen in a number of countries around the world which regularly endure very high temperatures. Unfortunately, this often results in increases in energy demand and the associated rises in greenhouse gas emissions.
5. Steadily rising temperatures will also have significant consequences for agriculture and biodiversity. The timing and length of seasons will change which in turn will effect the growing season of certain crops. This may have both positive and negative outcomes, but without sufficient forecasting to determine the most suitable crops, the effect on the agriculture industry could be devastating. Changing temperatures will also affect biodiversity. Some species will die out in the UK while new ones will appear. Modelling how this will evolve is still in the early stages of development and the changes can be somewhat unpredictable.
6. As well as raising temperatures, climate change will also have a considerable effect on water in a number of different ways. Steadily rising temperatures are expected to lead to a reduction in rainfall levels over Europe. This will lead to water shortages for many regions of the UK, particularly South East England

¹ IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

where the high population density puts an added strain on the resource. Measures such as reducing demand and fixing leaks can help to alleviate these shortages, but if the situation continues to worsen, more extreme measures may be required such as desalination plants (which again will lead to increases in energy demand).

7. It is also predicted that levels of precipitation will not only reduce gradually, but that the instances of extreme events will rise. Thus, the flooding seen throughout England in the summer of 2007 will become an increasingly common occurrence along with the associated costs to the economy and society.
8. In addition to changing weather patterns, rising temperatures will also result in rising sea-levels. This in turn will lead to increases in coastal erosion and flooding as well as increases in the salinity of river estuaries. Moreover, the effects of rising sea-levels could be exacerbated by extreme weather conditions which, in certain conditions, could result in storm surges capable of breaching current coastal flood defences.
9. Hence, there are a wide variety of environmental, social and physical systems under threat and a range of measures will be required to deal with the predicted effects of climate change, some of which have already been touched upon. In engineering terms, most at risk are: infrastructures such as the transport network; the electrical and gas grid systems; the water and sewerage systems; and coastal and river flood defences. Industrial processes may also be affected by rising temperatures, leading to potentially serious drops in efficiencies or production. Furthermore, in terms of future planning, the construction industry will need to give greater consideration as to how the natural environment could change in the years ahead.
10. What is also clear is that, while not all of the consequences of climate change will be negative, many of the issues involved will be inter-related. Mitigation policies and adaptation measures will interact and affect each other and previously diverse fields, such as agriculture and medicine, will need to work more closely. Overall, a truly holistic approach must be adopted which spans all Government departments and which is capable of presenting coherent, socially acceptable and flexible policies to meet the challenges the UK will face.
11. In conclusion, The Royal Academy of Engineering supports the proposed study and would be keen to be included in any further consultations. Adapting to the effects of climate change is an important and growing concern and engineering will clearly play a crucial role in providing solutions to the challenges ahead.

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