

**The Royal Society of Edinburgh  
Christmas Lecture  
Lochaber High School, Fort William**

***Facing up to Climate Change*  
Professor Paul Jowitt FRSE**

16 December 2009

**Report by Matthew Shelley**

This year's Christmas lecture was given at Lochaber High School, Camaghael, Fort William, as part of the RSE's programme to organise events and discussions outside the Central Belt.

*Humanity faces cataclysm and conflict unless it faces up to climate change. Professor Paul Jowitt FRSE, of Heriot Watt University, and President of the Institution of Civil Engineers, considered what will happen if we fail to act and the merits of different approaches to tackling the problem. Introductions were provided by Jim Sutherland, the school head teacher, and RSE President Lord Wilson of Tillyorn KT GCMG.*

"Climate change is real" – these were the first words in a declaration by 11 national science academies including those of the UK, France, Russia and China in 2005. It went on to cite World Health Organisation evidence that the bulk of greenhouse gas emissions, the root cause of the problem, come from the developed world but that most deaths linked to climate change are in developing countries.

Professor Jowitt stated that UK carbon emissions are 50 times greater than those of Bangladesh. But if global warming results in the predicted 50cm sea level rise it will inundate vast areas of Bangladesh, exposing six million people to disease and hunger, and forcing mass migration. While the immediate impact of climate change will be most severe for those nations, and people, least responsible for its creation, the results could be catastrophic for all. While Hurricane Katrina was probably not directly caused by global warming, similar events are likely to become more frequent and severe as the planet gets hotter.

The hurricane caused £125 billion of financial damage to New Orleans but "the social cost was far greater because a whole city was reduced to chaos," he said.

Professor Jowitt showed how structural failings had contributed to the rapid collapse of the New Orleans flood defences, causing a chain reaction as power and clean water supplies were cut. With no access to money, fuel, food or other necessities there was a swift breakdown in law and order – even though it took place in the richest and most powerful country in the world. "What happens is that people's behaviour reduces to depths it would not normally do," said the Professor and warned: "it could happen here too. It takes about eight hours".

Science is advancing all the time, but the expectation is that we are heading for global temperature rises of 2–4 degrees centigrade, sea level rises of 0.5m and the vanishing of the Arctic summer ice by the end of the century. Because the Earth takes time to adapt, some effects of climate change are already locked in and would take place even if CO<sub>2</sub> emissions were halted today. Nonetheless, the economic evidence shows it is much more cost-effective to act now rather than to try to clear up afterwards.

Turning to the role of engineering solutions in confronting the problems we could face, Professor Jowitt showed slides of the huge extent of flooding in Holland caused by the great storm surge of 1953. The Dutch responded by creating defences which allowed them to protect vulnerable areas of the country. However, such solutions are not always possible. The courses followed by large rivers in the low-lying delta regions of Bangladesh are constantly shifting, making it impractical to build barriers.

Left unchecked, climate change will massively increase the amount of water in some areas and reduce it in others. Parts of Western Europe could be submerged, while areas of southern Europe might become desert. Fragile ecologies in areas of Africa, Asia and elsewhere could cease to be able to produce food.

Professor Jowitt then asked the audience to vote on a series of questions about their perceptions of the impact of climate change.

● **What is the biggest threat from global warming?**

- a) Food security
- b) Terrorism
- c) Access to fresh water (*most votes*)

● **Is population growth a bigger threat than climate change?**

- a) Yes
- b) No (*most votes*)

● **Can carbon offset compensate for greenhouse gas emissions?**

- a) Yes
- b) No (*most votes*)

The Professor likened carbon offset (planting trees to soak up CO<sub>2</sub> while still using polluting energy sources) to “giving money to the hostel for fallen women while still using the brothel”.

● **Bio fuels are not a solution but the source of new problems?**

- a) Yes (*most votes*)
- b) No

Commenting on bio fuels, the Professor Jowitt highlighted that the land used for growing the crops to produce them is vital to world food production.

● **What is the most effective source of carbon-free energy?**

- a) Wind
- b) Nuclear (*most votes*)
- c) Wave

● **The best response to climate change is:**

- a) Move to high ground?
- b) Build defences regardless of cost?
- c) Tell society that it needs to take tough decisions and prepare for the consequences? (*most votes*)

One of the chief difficulties for humanity is that the future is tough to predict. Professor Jowitt gave the example of how, as recently as 1957, most intercontinental transport was by ship and there was little expectation of the mushrooming of cheap air travel. This presents immense challenges, because while we know that the climate is changing, we do not know the direction that society will take – perhaps becoming more selfish or possibly more co-operative. Nor can

we predict how power and influence will be shared out between important players like politicians, multi-national corporations or ordinary people.

Professor Jowitt argued that the answers to these questions will help determine where we end up. He used scenario-planning techniques to look at possible outcomes. One option was to take a free-market approach which relies on profit and competition to drive the development of future technologies that will solve the world's problems. Another was to act in a more co-operative fashion, treat markets as servants not masters, and to act now. Asked to vote on which they favoured, around 75% of the audience chose immediate action.

The audience were asked to look at the kinds of world that could result from the success or failure of policies that were optimistic or pessimistic about the capacity of future technologies to solve climate change problems. These were characterised as a Star Trek world of slick and reliable technology, a Mad Max social breakdown, a green Ecotopia, or overbearing Big Government. In common with findings from the USA and Sweden, the audience regarded Ecotopia as the best possible outcome and was concerned that reliance on future technological developments could result in social collapse. Ecologically-minded approaches, said Professor Jowitt, were likely to be the most reliable in addressing seven major pressures facing the world. These are:

- Land demand;
- Changing demography;
- Fossil fuel depletion;
- Changing diet;
- Climate change;
- Presence or absence of water; and
- urbanisation.

More than half the human race now lives in cities, often in slums, and people are continuing to abandon the countryside in millions. These changes and pressures require concerted action which takes account of a whole variety of factors if we are going to cater for human need without destroying our environment. Professor Jowitt argued that the solutions require fundamental changes in the operating systems driving human society. "There are lots of interacting systems going on here ... and we need to rethink what we are going to do," he said.

Addressing the issue of how to combat climate change Professor Jowitt said the need is for far-reaching changes in our behaviour and the technology we use. Change has to happen at all levels from individuals to businesses and to whole nations. We must also ask searching questions. For example, if nuclear energy is to be part of the solution, then it is important to consider what will happen if there is a sudden expansion in demand for enriched uranium, leading to high prices and shortages. There also has to be planning for risks, such as terrorist attacks or accidents. We also need to look at options like carbon capture technology that permit clean energy production from coal.

At the same time measures must be taken to ensure buildings become energy efficient. This is not just about ensuring that new and iconic structures are environmentally friendly, but retrofitting existing buildings as most of them will remain in use for decades to come. We also need to consider the problems that can arise from clean energy projects. In Africa the traditional sources of energy, such as charcoal, are vanishing. A plan to generate 40GW of hydro-power from damming the Congo could bring immense gains. But we have seen how the *Three Gorges Dam* project in China has resulted in mass displacements of people, damage to biodiversity, land loss and the destruction of archaeology.

Professor Jowitt concluded with a call to engineer the world away from the environmental crisis and to tackle poverty. This demands the creation of entirely new infrastructures which reduce carbon emissions, mitigate the locked-in effects of climate change and prepare us for

down-stream consequences such as population movements. He added that a new golden age of engineering is needed if we are going to achieve these goals and guide the world safely to the end of the present century and beyond.

### **Questions:**

Professor David Sugden, who is heading a major RSE inquiry on climate change, joined Professor Jowitt in taking audience questions.

- Asked if more robust flood defences could have prevented the flooding of New Orleans Professor Jowitt said many factors led to the disaster. These included a failure to take account of the area's rising sea and sinking ground levels. If the levees hadn't been the fatal weakness it would have been something else.
  - Professor Jowitt agreed that one reason for scepticism about technology's ability to help us avert climate change is that so much was promised in the past, but failed to deliver. He added that there is sufficient tried and tested technology available to do the job and all that is required is the political will.
  - On the broader issue of scepticism about the reality of climate change, Professor Sugden said that back in 1990 the evidence had been strong enough to convince Margaret Thatcher. Since then it has become more compelling – yet the number of doubters appears to have grown.
  - Asked if he endorsed the wider use of nuclear energy Professor Jowitt said he was open minded, but questions about security and safety needed to be addressed. Its benefit is that it provides a constant supply when other sources, such as wind, can be variable. He expressed concern that the revival of nuclear power could lead to the choking off of R&D funds for alternative technologies, as had happened in the past.
  - Questioned about his RSE inquiry, Professor Sugden said it is looking at the gap between the policies necessary to deal with climate change and what the public will currently accept. For further information visit [www.rse.org.uk/enquiries/climate\\_change/index.htm](http://www.rse.org.uk/enquiries/climate_change/index.htm).
- The evening ended with a vote of thanks.

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