The Oil Drum: Europe
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Dealing with Climate Risks: Adaptation

Posted by Chris Vernon on May 14, 2009 - 11:05am in The Oil Drum: Europe
Topic: Environment/Sustainability
Tags: adaptation, climate change, rob hopkins [list all tags]

The Earth system is currently under going changes associated with climate change. Changes are of rates and magnitudes not previously experienced by today's globalised industrial society and so present a new and unique challenge to industry, settlement and society.

On a timescale important to today's globalised industrial society the Earth system has experienced a significant forcing resulting from the very activities of this society. These forces arise from agriculture, industry, energy, transport and settlement based activities and apply pressures with resulting changes to the Earth system. As nothing can exist in total isolation from the Earth system industrial society must then cope with these changes.

This post considers adaptation with a comparison of a recent publication from the UK's Institute of Mechanical Engineers and Rob Hopkin's Transition Handbook.

The impacts on all aspects of society are not equal but depend on vulnerability and resilience. Adger (2006) describes vulnerability as the state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt. Resilience refers to the amount of change a system can absorb before its state becomes changed. In this paper the adaptation of industrial settlement and society to climate risks is discussed.

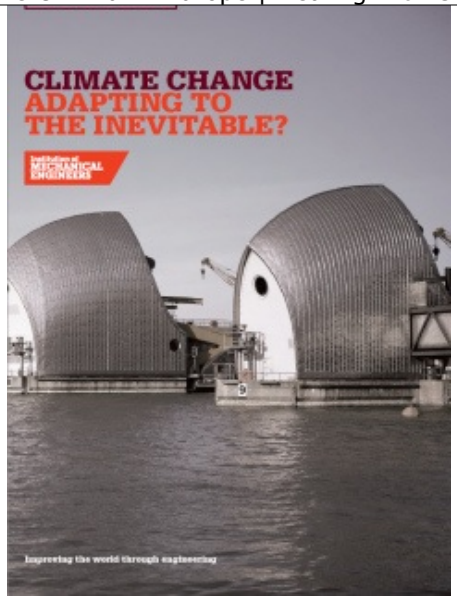
Smit and Wandel (2006) describe adaptation in this context as a process, action or outcome in a system in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity. Smit and Wandel (2006) go on to describe adaptations as manifestations of adaptive capacity which reduce vulnerability. The adaptive capacity is the ability of a system to adjust to the changing external condition.

The definitions from Adger (2006) and Smit and Wandel (2006) are not wholly consistent. Adger's understanding of vulnerability is a function of inability to adapt whereas Smit and Wandel (2006) suggest vulnerability can be reduced through adaption. This inconsistency could be explained by differing points of view of the authors, perhaps Adger's adaptation is considered to be a rapid and automatic response whereas Smit and Wandel's adaption is a slower proactive response arrived at through a community's recognition of impact and governance.

In the following section two recent publications on adaptation are reviewed. A 2009 report from the UK's Institute of Mechanical Engineers "Climate Change: Adapting to the Inevitable" (available here) and a 2008 book "The Transition Handbook" written by Rob Hopkins, originator of the Transition Culture initiative. Both consider the adaptation of industry, settlement and society to forecast global change; however their approaches could hardly be more different.

Institute of Mechanical Engineers

The Institute of Mechanical Engineers state that greenhouse



gas emissions are not reducing and the climate is changing which lead them to suggest that secure long term human survival depends on adaptation. The report takes a pessimistic view on mitigation suggesting CO2 concentrations could rise to 1700ppmv within a business as usual scenario and forecasts the effects over the next 1000 years on London, Shanghai and Botswana. Energy, water, the built environment and transport are individually assessed with the focus being engineering design changes required to increase resilience. GENIE-1 (Grid-ENabled Integrated Earth system) and HadCM3L (a coupled atmosphere-ocean general circulation model) models were used to evaluate the climatic response to an extreme CO2 emission scenario. This scenario results in 8°C global average temperature increase and over 7m sea level rise. It is conceded that the climatic impact en route to 8°C warming may disrupt the business as usual scenario.

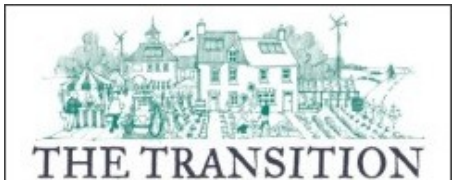
Energy infrastructure is often built in coastal locations or on floodplains due to cooling requirements. Existing facilities can be raised in the same location, protected with substantial sea walls or abandoned/relocated. This is particularly relevant to nuclear power stations being built in China and likely the UK in the coming decade. More significant adaptation is a move to smaller, more distributed power generation which does not require such cooling and can therefore be more closely integrated into the built environment, increasing its resilience and removing the need for the specific adaptation required for a nuclear power station at present day sea level.

The report suggests changes to precipitation resulting in spatially distributed wetting and drying can be adapted to through increased trading of food as food represents a large amount of embodied water. Desalination can be used where energy is available. Common to the three locations considered is a need for increased water distribution, a North-South pipeline in Botswana, a major network of canals and pipelines in China and in the UK increased interconnectedness is suggested as a way of linking areas of abundant groundwater to more arid areas. The energy intensiveness is noted.

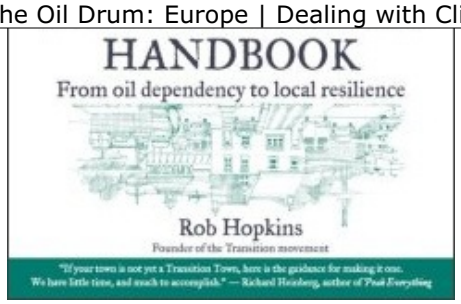
The built environment consists of legacy infrastructure and new buildings. Legacy infrastructure is anticipated to pose more of a problem. Master plans are seen as instrumental. These cover building regulations, planning regulations and ultimately the decision between protection and abandonment as sea levels rise. Such planning is complex with many stakeholders to consider. Two thirds of UK homes in 2050 have already been built highlighting the importance of adaptation. Increased resilience to extreme weather events including flooding will be required. The most effective way to increase the resilience of the transport system is suggested to be through increased capacity. Vulnerabilities are considered to be flooding and extreme temperatures, especially for urban underground systems.

The common theme throughout the Institute of Mechanical Engineers' report is the application of hard engineering, hard systems. Behavioural change isn't covered, the proposed solutions call on increased infrastructure and increased energy use. This seems like a brute force approach which is likely to suffer diminishing returns on investment.

Transition Culture



The Transition Handbook brings together the thinking behind the Transition initiative. This is a recent, grass roots initiative which has gained impressive support through its simple response to a commonly perceived problem. The Transition initiative recognises the impact that climate change and fossil



fuel depletion can have on a community and works to increase resilience. Hopkins defines resilience as "...the ability of a system, from individual people to whole economies, to hold together and maintain their ability to function in the face of change and shocks from outside".

Specific changes and shocks are not evaluated in detail but the fact that impact will be felt and that today's communities are not as resilient as they can be is argued as reason to adapt. Critically it is argued that resilience can be increased without defining the precise nature of the impact. Strong communities are proposed as key to resilience and Hopkins outlines what can be changed within communities in adaptation to climate change and fossil fuel depletion and more importantly in my opinion how, socially, this adaptation can be realised.

The adaptations a community should work toward to increase resilience are focused on becoming more local and small scale, this includes adaptations such as local composting, local procurement of local produce, local currencies, local building materials, playing football etc. This is in contrast to other adaptations such as centralised recycling, internationally imported organic food, imported 'green building' materials and Sky Sports, none of which make a community more resilient to external shocks. David Fleming, quoted by Hopkins, wrote "Localisation, at best, stands at the limits of practical possibility but has the decisive argument in its favour that there will be no alternative"

The contrast to the Institute of Mechanical Engineers' report is striking. The proposed increase in transport capacity to increase resilience is countered by reducing the amount of transportation. The increased imports of food as areas become less suitable for agriculture is counted by adapting local agricultural methods, improving soil and adapting diets. The most significant difference between the two approaches is that the engineers' proposals are limited to hard systems, never suggesting in the report any adaptation of soft systems. Hopkins' approach involves soft systems at every stage, it is inspirational and hopeful and to date has been remarkably successful at bringing communities together in a common cause.

References

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