THE PANEL OF THE UNITED NATIONS COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

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Sussex Energy Group
SPRU - Science and Technology Policy Research

Tyndall Centre
for Climate Change Research
Low Carbon Development: The Role of Innovative Capabilities

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UN Commission on Science, Technology and Development
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Overview

- Context: Why focus on energy?
- Low carbon development
- The importance of innovative capabilities
- Conclusions
Why focus on energy?
Climate change

“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level” (IPCC)
Why focus on energy?

Climate change

- Global emissions need to peak by 2015, and reduce by at least 50% by 2050 (compared to 1990 levels)
- Key issue of impacts of climate change. These are expected to be most severe for some poorer countries
- Also might suffer impacts from others’ mitigation efforts (e.g. risks from some first generation biofuels)
- Whilst historical responsibility requires developed nations to act first, low carbon development pathways important for all countries
Why focus on energy?
Energy access

- 2.4 billion rely on traditional biomass fuels for cooking in the developing world. Negative impacts:
  - Time taken to gather woodfuel (several hours per day is common) which reduces opportunity for income generation
  - Indoor air pollution which causes 1.3 million premature deaths each year.

- Transition to ‘modern’ fuels such as electricity is happening in some countries – e.g. China’s levels of electricity access and car ownership rising fast

- But many countries making transition very slowly: ~ 1.6 billion people still do not have access to electricity
Why focus on energy?
Energy access

**People reliant on traditional biomass for cooking, 2004 (IEA):**

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>million</td>
<td>%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>76</td>
<td>575</td>
<td>93</td>
</tr>
<tr>
<td>North Africa</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>India</td>
<td>69</td>
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<td>China</td>
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<tr>
<td>Indonesia</td>
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<tr>
<td>Rest of Asia</td>
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<td>489</td>
<td>93</td>
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<tr>
<td>Brazil</td>
<td>13</td>
<td>23</td>
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<tr>
<td>Rest of Latin America</td>
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<td>62</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52</td>
<td>2528</td>
<td>83</td>
</tr>
</tbody>
</table>

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Why focus on energy?
Electricity access

• Only 15% of African households have an electricity supply. Urban areas: 54%, rural areas: 8%

• Some African rural electrification programmes have been successful (e.g. Morocco), others less so

• In China, around 96% of people have access to electricity. Rates of access in rural areas have caught up those in urban areas due to pricing policies (subsidies)

• In India, 84% of urban households used electricity in 1999/2000 but 47% in rural areas
Are energy technologies new and emerging?

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Low carbon development
Importance of context

• Some middle income countries have an established, carbon intensive energy system:
  – Need for transition away from carbon intensive growth (often linked to dominance of coal)
  – Poor level of energy efficiency, especially in industry
  – Development has improved resources to tackle problems

• Many less developed countries do not have extensive modern energy systems:
  – Many are very ‘low carbon societies’: label is problematic
  – Expanding access is a key concern (e.g. electrification)
  – Need for new, low carbon infrastructure
Low carbon development
What it could mean for China

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The role of innovative capabilities

- Low carbon innovation essential: research, development, demonstration and deployment (R,D,D&D)
- Improving innovative capabilities is therefore crucial: need for change often greatest in developing countries
- A key element of international discussions about climate change mitigation
- Long history of efforts to promote technology transfer, but emphasis on hardware / neglect of wider capabilities
- Private firms often share technology (within limits) for normal commercial reasons. Can new incentives favour low carbon / sustainable technologies?
The role of innovative capabilities

Source: Martin Bell

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Low carbon innovation case studies
Wind energy

• Suzlon very successful (ranks 5\textsuperscript{th} in the world)
• Accessed IP via acquisition & licensing e.g. R&D in Netherlands, marketing in Denmark
• Collaboration important e.g. Austrian company for large capacity induction generators
• Concerns expressed about access to state of the art technology
• Chinese wind firms (e.g. Goldwind) also thriving in recent years
Low carbon innovation case studies
Hybrid vehicles

• 20-50% reduction in emissions compared to conventional vehicles
• Growing market for cars and some buses in developed countries
• Two Indian companies active
• Toyota has joint venture in China, but imports parts. Other Chinese firms moving fast: e.g. BYD
• High R&D & production costs: IPRs may be a barrier
• Need for stronger standards within developing countries

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Low carbon innovation case studies

‘Clean coal’ technologies

• Technologies for efficiency improvement important:
  – Supercritical technology available now: Chinese and Indian firms have some capability
  – IGCC technology sometimes seen as better, but still at demonstration stage despite 30 years of govt support
  – Importance of industrial energy efficiency too – not just an issue for the power sector

• Carbon capture and storage for deeper emissions cuts:
  – Risks are very large: economic, technical, legal, regulatory
  – Earliest full-scale demonstrations in middle of next decade
Building innovative capabilities

- Complementary sources of capabilities: localised innovation and external (e.g. technology transfer)
- No ‘one policy fits all’ solution: varies by sector, stage of development etc.
- Need new institutional capabilities for innovation, e.g. through joint R,D,D&D or low carbon innovation centres
- Access to Intellectual Property Rights ‘necessary but not sufficient’ for technology transfer. Lack of access can slow rate of ‘catching up’ in specific technologies
- National and international policy environments (financial incentives, regulations etc) can have a large impact
Conclusions

• Strong rationale for a focus on energy: climate change and energy access

• ‘Low carbon development’ an important goal, that needs to be demonstrated: implications vary by country

• A range of low carbon energy technologies available: key is incentives for innovation and deployment

• From a development perspective, low carbon growth can mean industrial development and deployment

• International technology transfer is important, and should focus on capabilities not just hardware projects