The Role of science and scenario modeling in setting SDG priorities

Why scenarios?

Consistent pictures of:
- Earth system, social, economic dynamics
- Governance and resource allocation
- Building consensus
- Different futures from predictive to backcasting
- An art – not a science.
- However we need to take calculated risks …
Selected key issues

- Transparency and trust
- Communicating a consistent message
  - Our GHG schizophrenia
  - Clear mapping
- Mapping with policy levers
- Global trends, but national decisions
  - Translating to national needs
  - National sensitivities
- The sum of the parts ...
  - A move to integration
  - A complex system
- Challenges
  - Develop an inclusive process
Credibility of EU energy review questioned

By Pilita Clark

The credibility of a European energy review has been cast into doubt by experts who point out that long-term plans to cut carbon emissions are based on an economic model owned by a single Greek university that cannot be independently scrutinised.

Experts have “raised a host of questions” about how the European Commission’s use of a non-transparent model could affect the energy review, according to a leaked report by energy specialists chosen by Brussels to advise on the forthcoming “Energy Roadmap to 2050”.

The economic model, known as “Primes”, is owned by the National Technical University of Athens and is designed to show how using different mix of energy
Communicating a consistent message

- **The idea** that ‘society will pay more for energy for a better environment in the future’ is a deficient characterization. We compare costs with some ethereal state. We should compare costs with costs, and be explicit about our uncertainty.

- **Two common mistakes:**
  - There is the assumption that the future will look like the past.
  - The only cost often mentioned in many such studies is the cost of mitigation. Not the benefit of having to pay a lower cost than having to adapt to a dangerous future. To stylize, these tend to be kept in compartmentalized silos.

- **Business as usual is probably not business as usual.** A continuation of current trends builds debt that – according to our current understanding - humanity will pay. Our investments in the future need to be seen as investments with dividends quantified in the same terms. There is uncertainty around those dividends.
### Energy-related Climate Change

<table>
<thead>
<tr>
<th>Energy-related</th>
<th>Probable Impact</th>
<th>Ref</th>
<th>Energy-related</th>
<th>Probable Impact</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenhouse gas emissions from burning carbon-based fuels</td>
<td>Strong</td>
<td>A</td>
<td>Lowering emissions in the energy sector (including carbon capture)</td>
<td>Strong</td>
<td>B</td>
</tr>
<tr>
<td>Deforestation (and natural habitat loss) due to wood used for heating and cooking</td>
<td>Local</td>
<td>C</td>
<td>Forestry management, alternative fuels (e.g. LPG) and banning charcoal</td>
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<td>C</td>
</tr>
<tr>
<td>More biofuels production causing deforestation</td>
<td>Strong local</td>
<td>E</td>
<td>Bio-fuel production regulation including so called ‘sustainability criteria’</td>
<td>Strong regional</td>
<td>F</td>
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### Ocean Acidification

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<td>Increased atmospheric CO2 concentrations</td>
<td>Strong</td>
<td>A, C, E</td>
<td>Decreased atmospheric CO2 concentrations</td>
<td>Strong / local</td>
<td>B, D, F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Extraction of carbon from seawater (counter-acting acidification) for synthetic fuel production</td>
<td>Limited</td>
<td>G</td>
</tr>
</tbody>
</table>

### Stratospheric Ozone Depletion

- Increased biofuel production increasing fertilizer use due to the fertilizer. (local)
- Nitrogen is taken from the air when fuel is burned to produce biofuels and nitrogen-oxides (local)
- Increased biofuel production increasing fertilizer use (local)

### Water Use in Energy Production

- Water use in energy production (local)
- Water use in biofuel production (local)

### Land use change for large-area energy production

- Extensive pollution and ecosystem loss (local)
- Effects of hydropower dams on ecosystems and hydrology

### Effects of hydropower dams on ecosystems and hydrology

- Local | Q | Pollution standards abatement technology | Local | Q |

### Fine dust and smoke pollution from fuel burning and processing

- Local/regional | S | Pollution standards abatement technology | Local/regional | T |

### Rate of Biodiversity Loss

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<td>Local</td>
<td>P</td>
<td>Bio-fuel production regulation including so called ‘sustainability criteria’</td>
<td>Strong regional</td>
<td>F</td>
</tr>
<tr>
<td>Heavy pollution from fossil fuel extraction</td>
<td>Local</td>
<td>Q</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Heavy pollution from fossil fuel extraction</td>
<td>Local/regional</td>
<td>R</td>
<td>Pollution standards abatement technology</td>
<td>Local/regional</td>
<td>T</td>
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</tbody>
</table>

### Fine dust and smoke pollution from fuel burning and processing

- Local/regional | S | Pollution standards abatement technology | Local/regional | T |

### Atmospheric Aerosol Loading

### Chemical Pollution

- Local/regional | R | Pollution standards abatement technology | Local/regional | T |
Mapping with policy levers

- According to recent scenario work urban planning can have the highest impacts on sustainable development
  - Cities are the largest users of energy
  - The hubs of economic activities
- Unit costs for cleaner service supply are much lower in well designed cities than elsewhere
  - Larger ‘bang for development buck’ compared
  - To rural development strategies
- The trend of urbanization provides a strong opportunity to act now
  - Most of the world lives in cities and growing
- However poor / no planning can result in long lived infrastructure:
  - Locking people into unsustainable poor:
    - Energy use (and other resource, such as water) use
  - With a slow turn over rate
    - Social (slums)
    - Political (renewal policies)
    - and Physical (appliances, buildings and transport)
- Good planning can strongly reduce:
  - Costs, ecological footprint

Mapping with policy levers

science and scenario modeling

- Large opportunity, example: Africa:
  - Africa has a higher GDP & energy investment growth rate than any other continent
  - Some of the highest levels of renewable and other energy resource
  - Analysis shows large (profitable) investment opportunities

- But, Africa has: the lowest level of electrification and high levels of import based generation, why:
  - Low capital cost = dirty energy sources
  - Limited access to expensive energy-services and ecosystem damage

- Weak institutions and poor planning
  - Basic information and local capacity to synthesize this often lacking
  - Ability to rationalize these into implementable policy is weak
  - Understanding of government levers matching opportunities is limited
  - Little domestic related ‘higher education’ / research support

- With strong institutions
  - Clean(er) capital intensive options with lower investment risk
  - Lower cost (energy) services with rational mobilization
  - Equitable engagement with investors
  - Leverage GDP growth and investment at little marginal cost

- Strong resource interactions
  - Supply of food, energy and water are strongly interrelated
  - Systems are vulnerable to climate change
  - Threat: divergent development/Opportunity: efficient policy
Decision makers have constituencies and urgent decisions to make

The sum of local decisions develop the global picture

Yet:
- It is difficult for the national decision makers to incorporate global concerns
- There is often no value associated with the ‘global commons’

<table>
<thead>
<tr>
<th></th>
<th>Subnational</th>
<th>National</th>
<th>Regional and global</th>
</tr>
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<tbody>
<tr>
<td><strong>Project</strong></td>
<td>EIA, ESIA, almost universal and mandatory</td>
<td>SEA mandatory in Europe and selected other countries; CADO in selected developing countries</td>
<td>Ad hoc IA of cross-border projects</td>
</tr>
<tr>
<td><strong>Programme</strong></td>
<td>Isolated examples</td>
<td></td>
<td>EIA and PIA by UN, development banks, and global funds</td>
</tr>
<tr>
<td><strong>Policy</strong></td>
<td></td>
<td>Conventional energy and infrastructure planning</td>
<td>IA by OECD, UNEP, G20</td>
</tr>
<tr>
<td><strong>Sector</strong></td>
<td>Conventional sectoral planning</td>
<td>Conventional energy and infrastructure planning</td>
<td>Many energy, land-use, and water models.</td>
</tr>
<tr>
<td><strong>Multi-sector</strong></td>
<td>Significant number of academic applications</td>
<td>Few examples. CLEWS</td>
<td>Moderate number of IAs</td>
</tr>
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</table>
The sum of the parts

Navigating the nexus with sustainable development CLEWs: climate, land-use, energy and water strategies...

The danger of secoral goals ... efficient integration

An inclusive process

A clear convening agenda is needed

- Standardized data, indicators and scenarios
  - Benchmarking
  - Rationalizationing effort
- Accessible open toolkits and analysis
  - Review and revision
  - Adoption and Adaption
  - Mapping
- Transparent assessments to improve:
  - Integrated development with clear 'goals'
  - Economic efficiency
  - Affordable access to services
- Multi-service delivery methodologies
  - Consistent: lower cost
  - Isolated: counter productive
- Policy relevant evaluation of ecosystem services
  - To negotiate common resource management
  - Support short term decision with long term consequence

Metrics: what to measure, what are goals, in a complex system