Global Challenges for the 21st Century

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Figure 2: Risks Interconnection Map (RIM) 2009
The National Risk Register looks out five years

<table>
<thead>
<tr>
<th>Relative Likelihood</th>
<th>Relative Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (1)</td>
<td>Random forest fire</td>
</tr>
<tr>
<td>Medium Low (2)</td>
<td>Major terrorist attack</td>
</tr>
<tr>
<td>Medium (3)</td>
<td>Significant terrorist attack</td>
</tr>
<tr>
<td>Medium High (4)</td>
<td>Catastrophic terrorist attack</td>
</tr>
<tr>
<td>High (5)</td>
<td>Small scale CBR attack</td>
</tr>
</tbody>
</table>

But what are the chances of ‘something’ happening over 20 years...
Emergencies: the 2009 H1N1 influenza virus (swine flu)

- 6 pandemics in 120 years.
- Approximately 65% chance of another in 20 years...
- Severity highly variable

Recorded human pandemics (early sub-types inferred)

- H2N2
- H1N1
- H3N8
- H3N2
- H1N1

Recorded new avian influenzas

- H5
- H7
- H9*

Recorded human pandemics of influenza

Source: NIID and ECDC 2009
New diseases, animals and plants

Plant diseases also spreading globally: e.g. *Chalara fraxinea*

Animal and human diseases:

- Hepatitis E virus
- Human Herpesvirus 6
- Sin Nombre virus (Hantavirus pulmonary syndrome)
- Guanarito virus (Venezuelan haemorrhagic fever)
- Avian influenza A virus in humans (H5N1)
- Human Herpesvirus 8 (Kaposi Sarcoma virus)
- Escherichia coli O157:H7
- HTLV-2
- Borrelia burgdorferi (Lyme disease)
- Human T-lymphotropic virus (HTLV-1)
- Enterocytozoon bieneusi
- Common chimpanzee subspecies organ XTV virus
- Pigmented mecosporidium
- Vibrio cholerae O139
- Bartonella henselae
- SARS coronavirus
- Nipah virus
- West Nile virus in USA
- Ebola virus
- EBV
- Novel coronavirus
- Plasmodium knowlesi
- Novel Lujovirus in southern Africa
- Simian foamy retroviruses
- Novel Bunyavirus in China

Pre 1980:
- Monkeypox virus
- Campylobacter jejuni
- Cryptosporidium parvum
- Legionnaire's disease
- Ebola virus
- Parvovirus B-19
- Hantaan virus

Toxic Shock Syndrome associated
- *Staphylococcus aureus*

Hepatitis C virus
- *Ehrlichia chaffeensis*
- *Photobacterium asymbiotica*
Economic Losses related to selected Natural Catastrophes

Source: 2011 Munich Re, Geo Risks Research, NatCatSERVICE

Increase in severe weather events and cost of natural catastrophes
US Shale oil/gas reserves having significant impact on US economy

Bakken formation (North Dakota)

Comparison:
• Minneapolis
• Dallas

Major reserves of fossil fuels

Potentially huge Arctic resources

Coal Reserves ($10^{12}$ BTU)

Government Office for Science
• There are uncertainties around predicting precise impacts due to difficulties of:

  • **Scenario uncertainty:**
    • Setting targets
    • Achieving consensus
    • Keeping to targets

  • **Model uncertainty:**
    • Knowledge limitations
    • Chaotic nature of the climate system

![Graph showing contributions to uncertainty in decadal mean surface air temperature change estimated from the CMIP3 ensembles.](image-url)
Food security risk index, 2010

Rank Country Category
1 Afghanistan extreme
2 DR Congo extreme
3 Burundi extreme
4 Eritrea extreme
5 Sudan extreme
6 Ethiopia extreme
7 Angola extreme
8 Liberia extreme
9 Chad extreme
10 Zimbabwe extreme

- Extreme risk
- High risk
- Medium risk
- Low risk
- No data

Source: Maplecroft
Global Supply Chain Resilience
Multi-factoral Resilience

- Legal: Legal shutdown, injunction
- Social: Strike, caught in another’s dispute, sabotage, criminal activity
- Political: Political instability, unrest, re-nationalisation, closing of borders, tariffs
- Environmental: Natural/manmade disaster, weather, pandemic flu, port close down, transport close down
- Economic: Firm go bankrupt, failure of tier 2 supplier, exchange rate fluctuations, take over
- Technical: Breakdown of equipment, IT failure, loss of key staff member, product tampering, quality problems, utility failure

FROM CONTINUITY CENTRAL
Challenges for Cities

• Density of everything
  – People, buildings and diversity
  – Means of transport
  – Energy consumption
  – Waste production
  – Water consumption
  – Data generation and Information exploitation

• Attractiveness for inward migration

• Interdependency of everything
Conclusions

• The man made world and the natural world are richly interdependent and intrinsically complex, and should be treated as one system

• Nations and cities need to collaborate on assessing the risks and opportunities that are presented by change of all types

• As global human population grows and cities become denser, the effect of extreme natural events, good public health, minimising the use of natural resources and ubiquitous education become critical

• We seem to be at a critical time for getting all these factors right – the next twenty years or so is crucial
Thank you