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Science advice in government: the next five years

A work in progress

Sir Mark Walport, Chief Scientific Adviser to HM Government

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Government Chief Scientific Adviser

1. Knowledge translated to economic advantage
2. Infrastructure resilience
3. Underpinning policy with evidence
4. Science for emergencies
5. Advocacy and leadership for science

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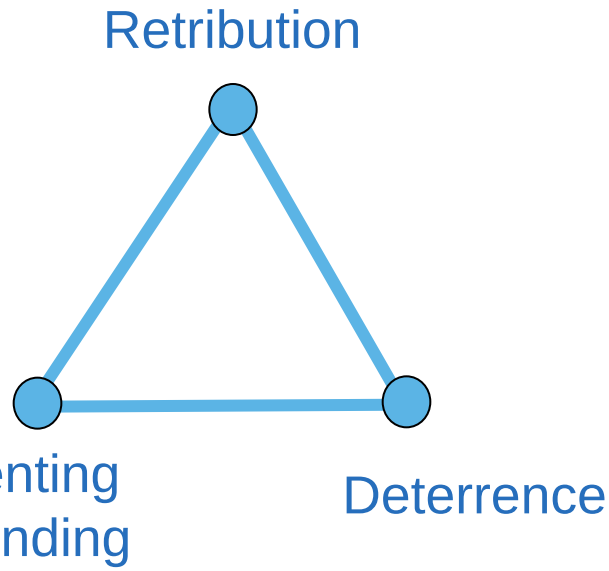
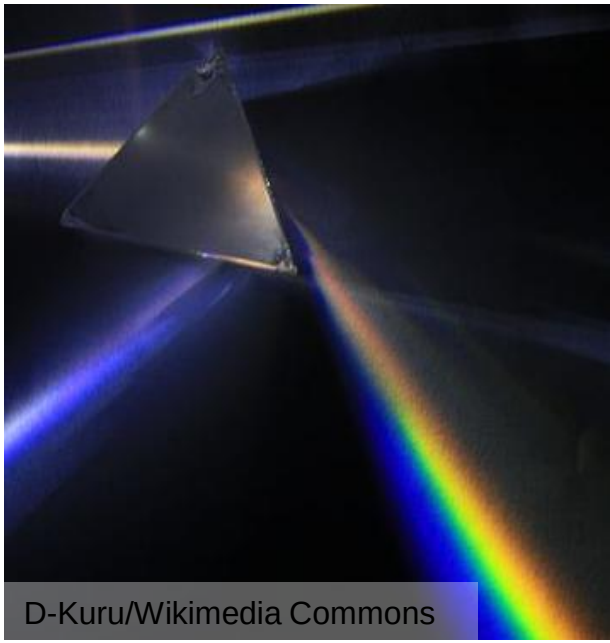
Prisms and lenses – optical metaphors

- Difficult issues need to be viewed through prisms and lenses
- e.g. sentencing policy:



Policy often based on evidence and judgement



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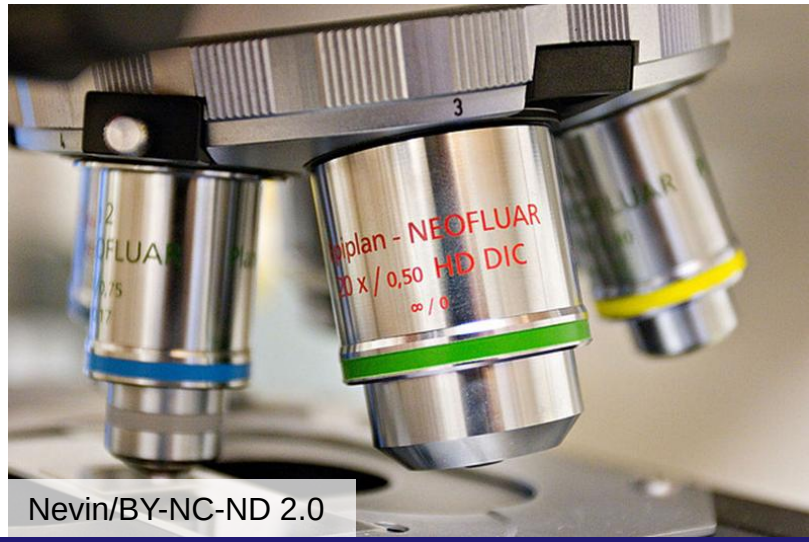

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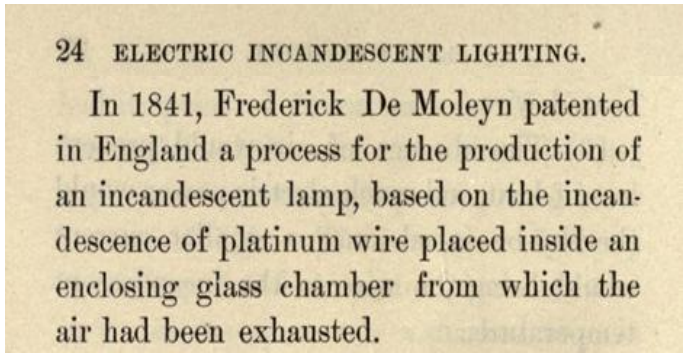
Knowledge to Growth

- Imagination
- Innovation
- Entrepreneurship
- Business Skills
- Manufacturing, branding, marketing and distribution

Thomas A. Edison
(Image:KMJ/Wikimedia Commons)



24 ELECTRIC INCANDESCENT LIGHTING.

In 1841, Frederick De Moleyn patented in England a process for the production of an incandescent lamp, based on the incandescence of platinum wire placed inside an enclosing glass chamber from which the air had been exhausted.

Electric incandescent lighting
by Edwin J. Houston and A. E. Kennelly 1896
www.openlibrary.org

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Knowledge to Growth

- Imagination
- Innovation
- Entrepreneurship
- Business Skills
- Manufacturing, branding, marketing and distribution

We are good at these…

…what's holding us back?

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Knowledge to Growth

We need to be catalytic and break down barriers:

- Incentives
- Intellectual property and knowhow
- Technology transfer machinery
- Catalytic environment
- Skills and leadership
- Capital markets
- Regulation
- Business absorptive capacity
- Good customer… and more?

PAS 68 compliant barrier. Specification developed by UK Government. Ensures quality but leaves design and innovation to private sector

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Knowledge to Growth

- An outstanding example of success

RealVNC

A Cambridge software company that came from developments at Olivetti lab - closely connected with the University Computing Department.

Created in 2002 it produces software allowing remote control of one 'computer' by another. Applications include in-car connectivity of smartphones.

Its products are now standard across the industry, with hundreds of millions of deployments, including Intel and IBM. The company is now generating significant revenue from 'paid for' variants following the global penetration of its free versions.

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Infrastructure resilience
- Engineered world

Challenges

- Energy
- Communications
  - cyber infrastructure and security
- Transport
- Built environment
- Waste

Complexity (vulnerability) of interdependent infrastructure

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Infrastructure resilience
- Natural world

Challenges

- Environment
  - climate and weather
  - space weather
- Food and Water
- Health

Complexity (vulnerability) of interdependent infrastructure

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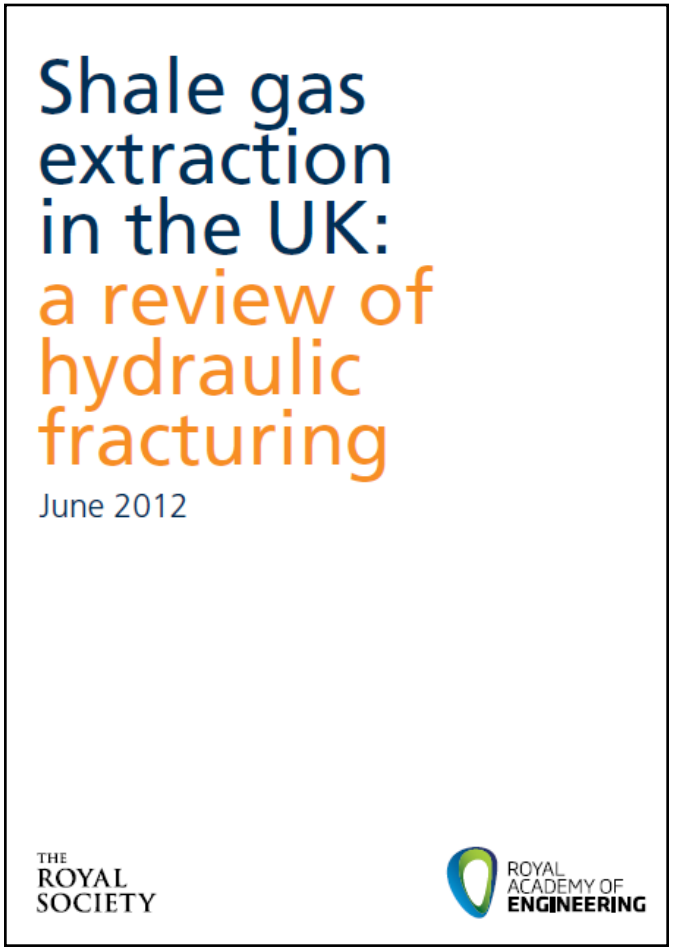
Infrastructure Resilience: – Energy

Need to look through (at least) three lenses:

- Security
- Cost
- Environmental sustainability

But some things are clear:

- Need a diversity of sources
- Need specific advice
  - e.g. shale gas extraction
- Need long term planning
- There is complex interplay between engineering, economics and politics



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Underpinning policy with Evidence – Food security

Neonicotinoid Insecticides and an EU moratorium?

Need to view issue through four lenses

- bee population (an environmental good and as pollinators)
- insect and plant diversity
- loss of crop yield
- Insecticides and vectors of disease

- Available evidence for harm to pollinators in the field is equivocal
- Economic impact of withdrawing another class of insecticides, in contrast, is quite strong
- Neonicotinoids have been in use ~ 20 years

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Tpmartins/CC BY-NC-SA 2.0

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Underpinning policy with Evidence

Corollary of looking at a problem through different lenses:

A multifaceted approach to tackling problems of pollinating insects

- Evaluate effect of increasing diversity of flowering plants in margins of fields
- Increase the diversity of flowering plants
- Make most use of novel cultural practices, natural plant defence mechanisms, and bio-control measures.
- Reduce the uncertainty about the toxicity of pesticides by further field work,
- Ensure effective oversight of pesticide compliance with guidelines
- Use new technology to reduce dependence on pesticides and herbicides

Thomas Shahan/CC BY-NC-ND 2.0

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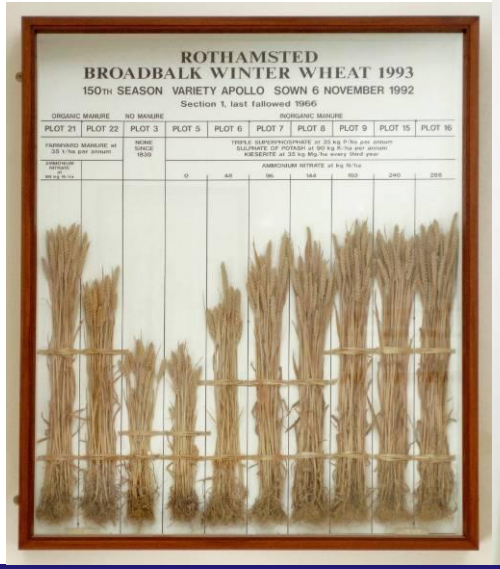
Underpinning policy with Evidence
- from pesticides to crops developed using best technologies

- Conventional crop breeding has changed plants dramatically already but has limitations
- Use genome science for directed breeding programmes
- Significant potential for GM technology
- UK good at basic GM science but restricted in application

1990s wheat



1940s wheat

CELEBRATE 350 YEARS

Reaping benefits (October 2009)
Science and the sustainable intensification of global agriculture

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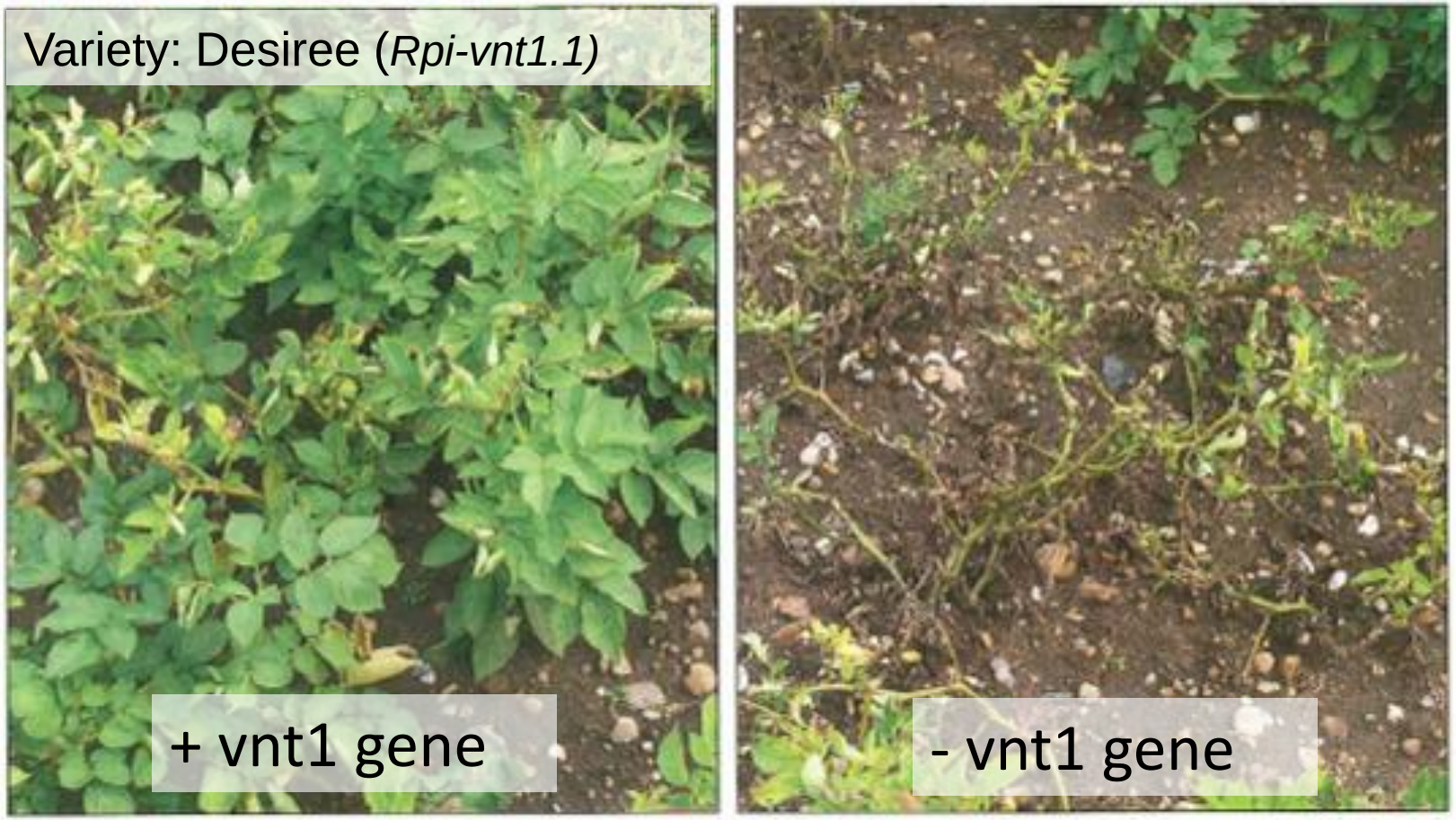
Underpinning policy with Evidence

Blight resistance gene taken from another variety of a less commercially viable potato



Potato plants carrying the vnt1 (Solanum venturii) gene performed well. Those with the gene from S. mochiquense (right) were all but wiped out by Blue 13, even though leaf testing had shown them to be resistant to the older A1 blight strains. Below: non-transgenic Desirée control plants.

Source: The Sainsbury Laboratory

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Science for emergencies
- all the sciences

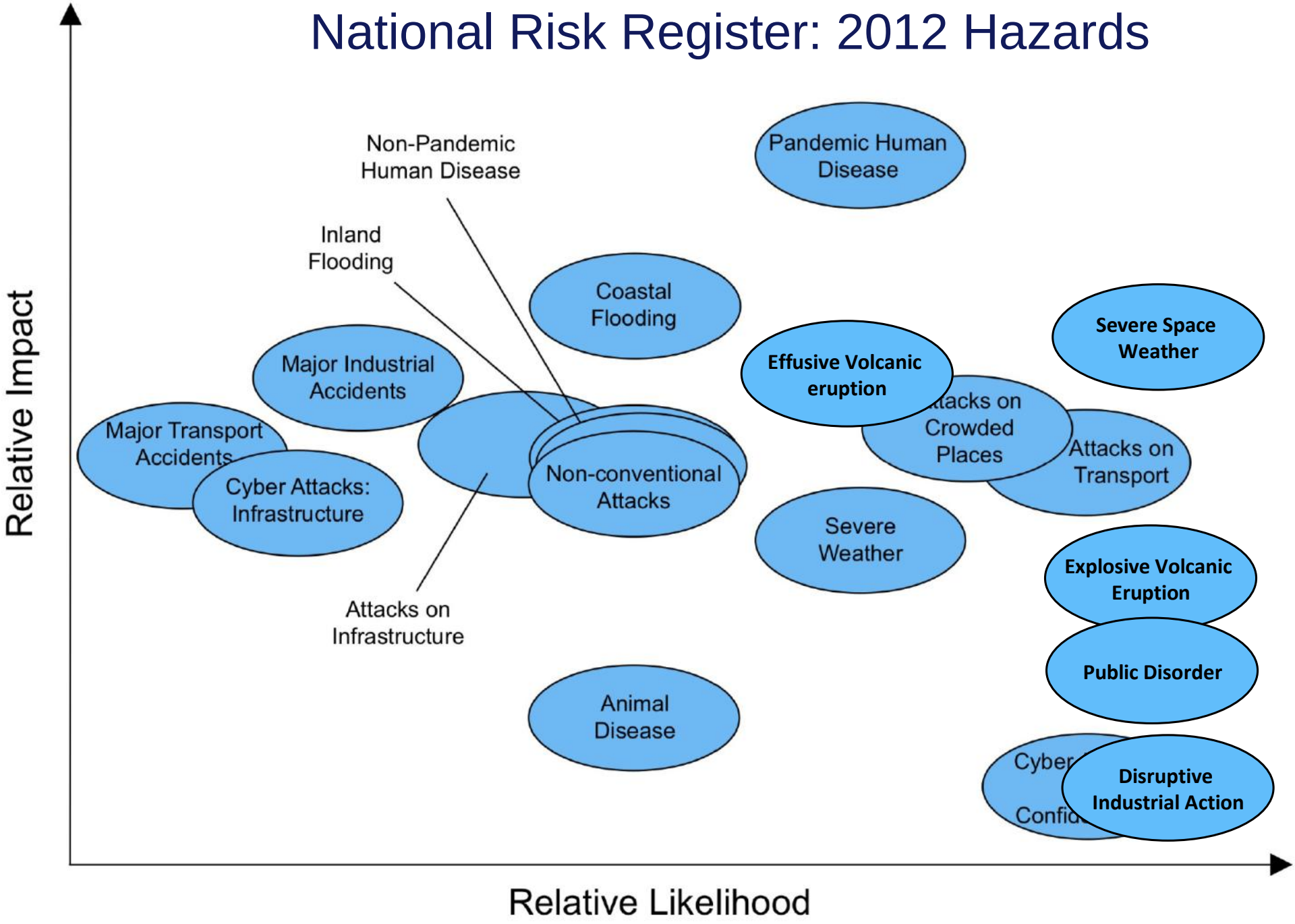
Science essential to predict, monitor mitigate, respond and clear up

- National Risk Register
- Contingency planning
- Science input in emergencies

Civil Contingencies Act 2004

Cabinet Office **Civil Contingencies Secretariat**: coordinates government wide planning, response and recovery from civil emergencies

National Risk Register: 2012 Hazards



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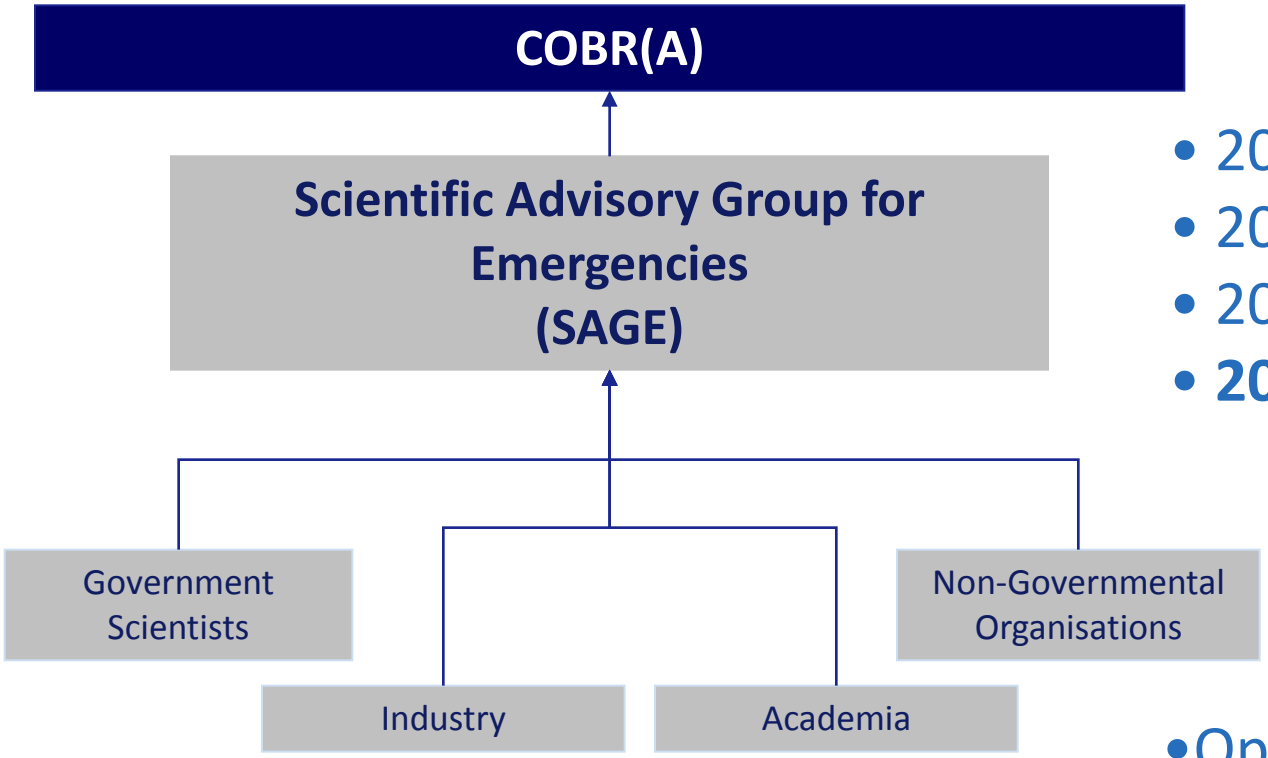
Science for emergencies



- 2009 – Pandemic Flu
- 2010 – Volcanic Ash
- 2011 – Fukushima
- **2013 - ?**

- Operational response
- Impact management
- Recovery
- Public Information

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Science for emergencies

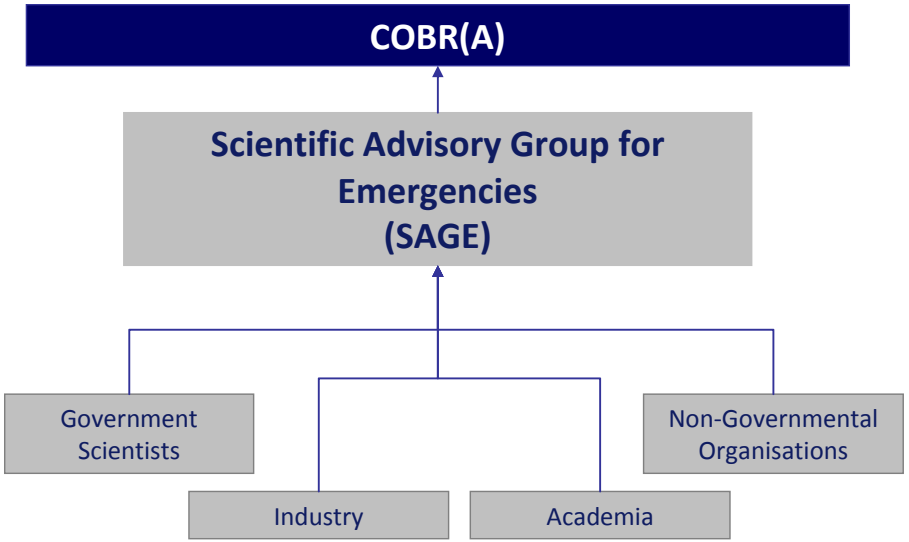
Fukushima Disaster

- On 11 March 2011 an earthquake of magnitude 9.0 hit approximately 100km from Japan's east coast
- Sixth largest earthquake on record, followed by a devastating tsunami
- Widespread infrastructure damage, including to the Fukushima Daiichi nuclear plant
- Science advice was needed as to the effect on the nuclear plant and what that would mean for UK nationals living in Japan

Science for emergencies

The Government process

- COBR requests that SAGE meets to consider reasonable worst case scenario;
- SAGE advises that even in the reasonable worst case, the danger to UK nationals in Tokyo was negligible;
- All minutes published shortly afterwards on web



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Science for emergencies

- SAGE advice is accepted; British nationals remain. Other countries such as France evacuate;
- Sir John Beddington had lead role in communicating advice: teleconference with the British Embassy
- Advice made publically available

Science as diplomacy

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Science for emergencies

Natural Hazards Partnership: bringing together critical national and global scientific infrastructure

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Met Office

RIMNET

Public Health England

UK SPACE AGENCY

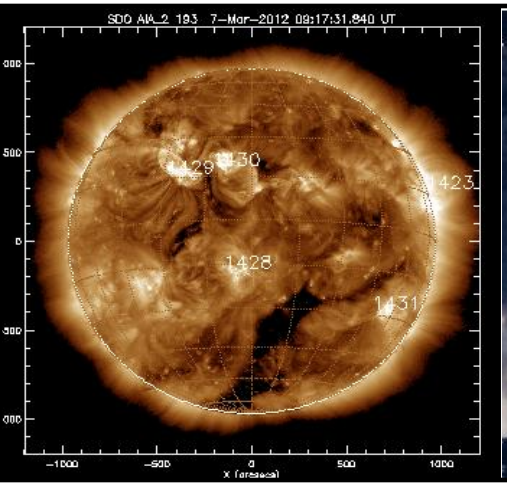
FLOODFORECASTINGCENTRE
a working partnership between Environment Agency | Met Office

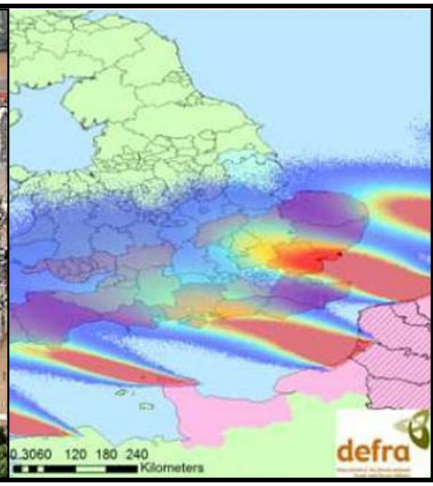
Environment Agency

defra
Department for Environment Food and Rural Affairs

Ordnance Survey

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL





Space weather | Atmospheric pollution | Flooding | Vector/disease incursion

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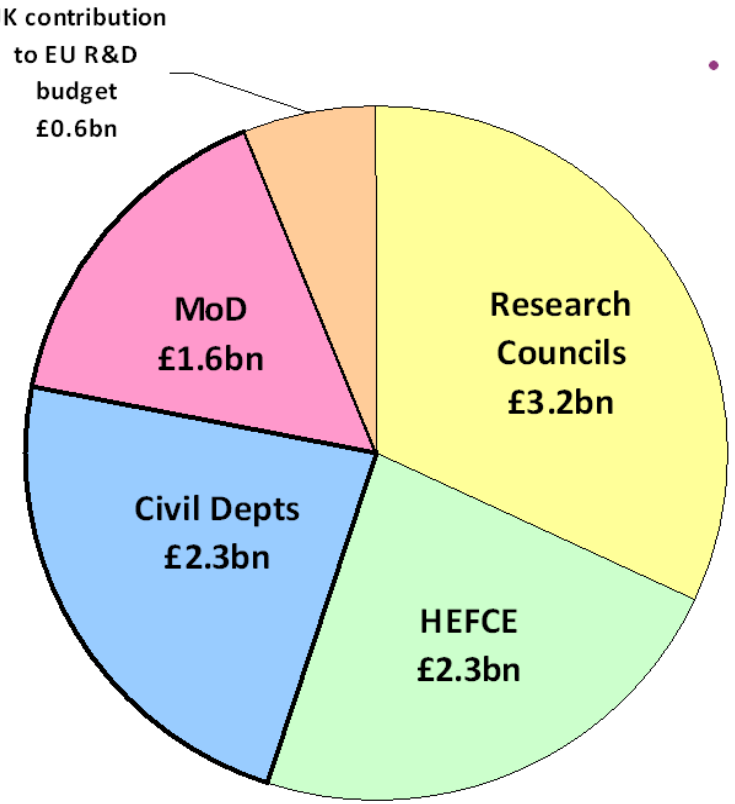
Leadership for science
- helping to make the case

Science budget

Split between:

Research Councils and Departmental budgets



- Total Government Spend on R&D in 2010-11 was £10bn. This consisted of:
  - £3.9bn spend by Govt. Dept.
  - £5.5bn on Research Base (RC's & HEFCE)
  - £0.6bn on EU R&D budget

Source: Science, Engineering and Technology Statistics (September 2012 update). **Figures are for 2010-11 – the latest available published figures.** R&D is measured under the guidance of the OECD Frascati Manual

We must collectively make the case for funding…

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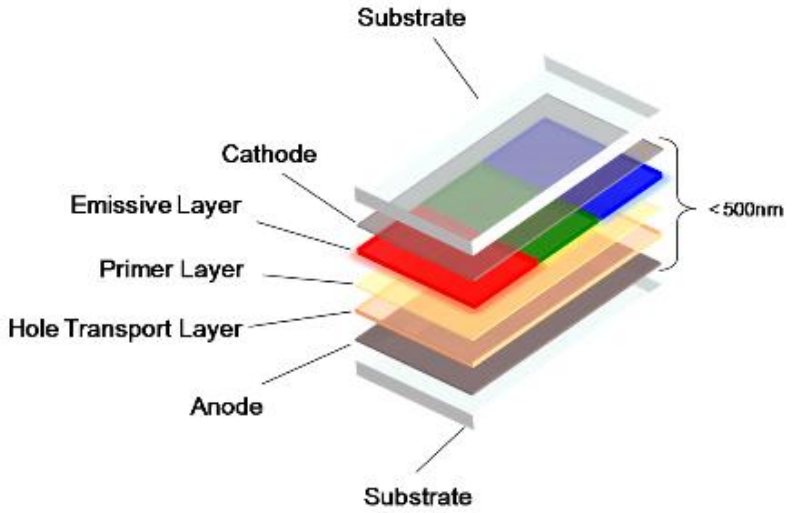
Leadership for science
- showing the benefits

It takes time to see a benefit,

We must be prepared to answer the question: what has come of research funding of two or more decades ago?

e.g. flat screen technology:

- **LCD displays** – pioneering work done in UK 1960s/70s
- **Cambridge Display Technology**: spun out of the Cavendish Laboratory in 1992 to develop polymer organic light emitting diodes (OLEDs) – Panasonic use their technology in their latest products. The industry projections are for OLED displays to displace LCDs.



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Leadership for science
- engaging the public

- No single public – lots of different constituencies
- Not about correcting the deficit in knowledge
- Too easy to be at cross-purposes
- Not about trust generically - trust is specific
- Rational arguments will not always (or fully) work

  – though we mustn't be irrational in response

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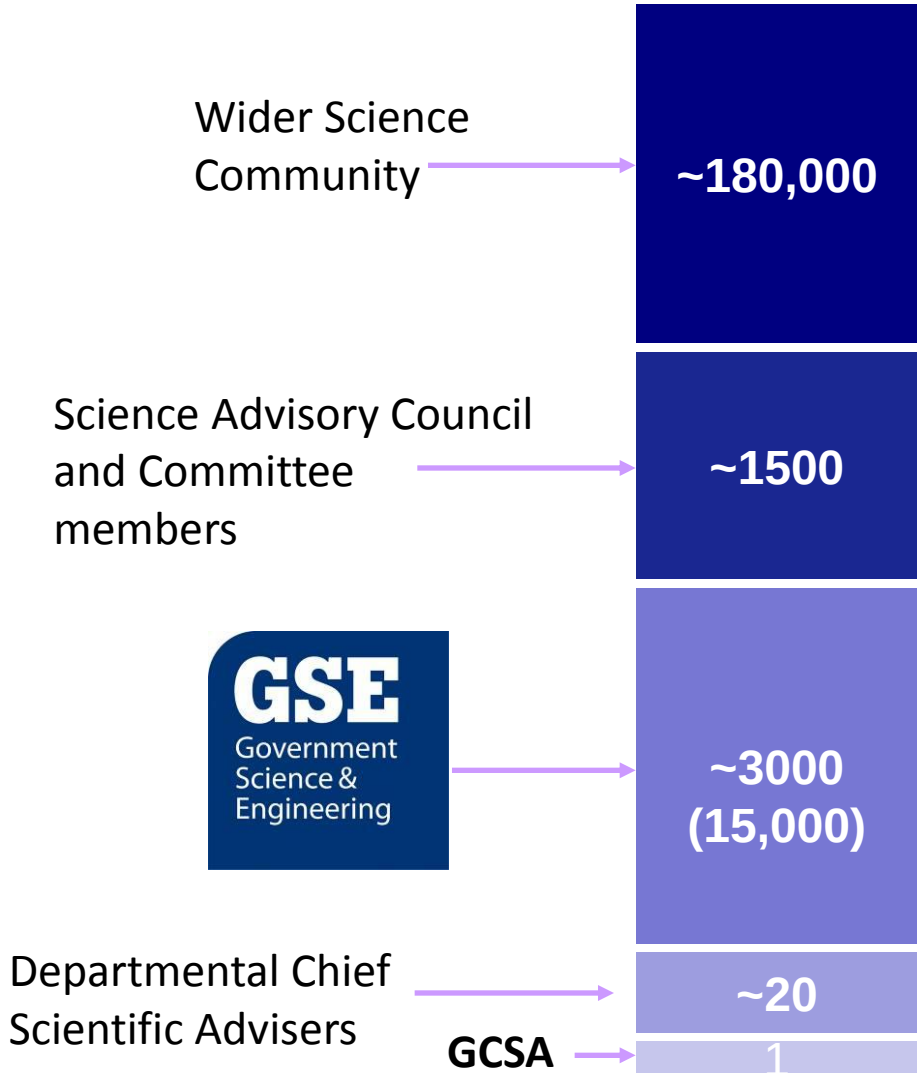
I need your advice…

- Need to be proactive
- GO-Science only as good as advice we receive – we need your help
- Role for us, to engage with scientist/engineers in academia and industry, in your environments. Identify areas that can translate to growth.
- Important role for learned academies and other rigorous independent advice
- Greater role for Government Science and Engineering network
- Horizon scanning



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Foresight

Hindsight

- Need to look both forwards and backwards
- More historical analysis in government useful but we must integrate and avoid silos


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"Those who cannot remember the past are condemned to repeat it"

George Santayana


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