The Role of Science & Scientists in UK's Emergency Response Policy

Robin Grimes
29th June 2017

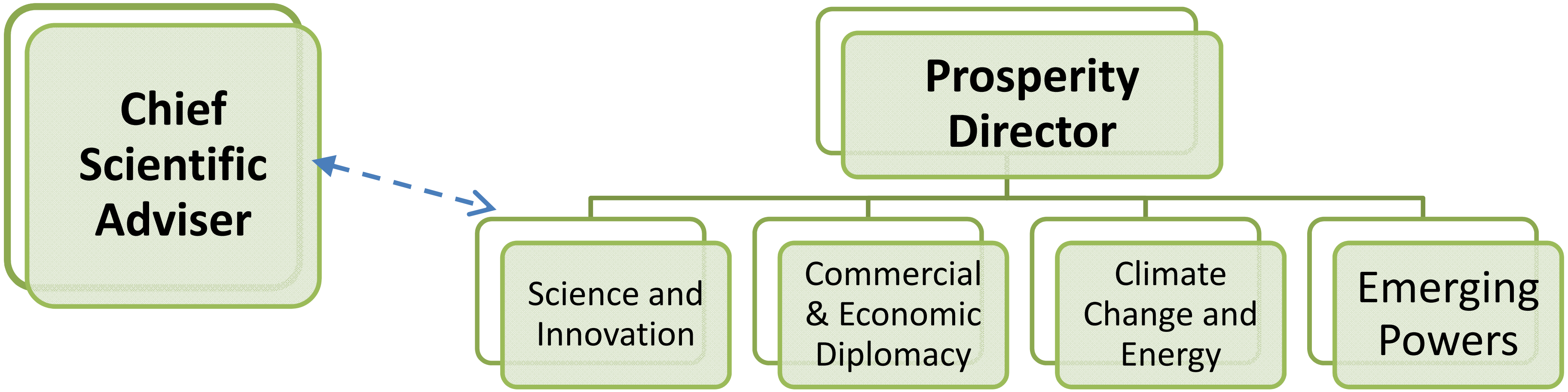
Foreign & Commonwealth Office

Foreign & Commonwealth Office

Within the FCO, the Chief Scientific Adviser & Prosperity Directorate are the S&I focal points

Foreign & Commonwealth Office

- The CSA looks across the full range of FCO policy.
- Ensures that foreign policy is informed by the best available science & has access to appropriate science networks.
- Provides advice to the Foreign Secretary and Ministers.



A network of Chief Scientific Advisers

Prof Sir Mark Walport GCSA

Prof Dame Sally Davies CMO

Prof Vernon Gibson MOD

Prof Ian Boyd Defra

Prof Chris Whitty DH

Prof Tim Dafforn BIS

Prof Robin Grimes FCO

Prof Phil Blythe DfT

Prof Charlotte Watts DFID

Prof Bernard Silverman Home Office

Dr Tim Leung DfE

Osama Rahman MoJ

Prof Anthony Finkelstein National Security

Prof John Loughead DECC

Prof Stephen Belcher Met Office

Prof Andrew Curran HSE

Prof Peter Freer Smith Forestry C.

Stephen Aldridge (interim) CLG

Prof Sheila Rowan Scotland

Prof Julie Williams Wales

Prof Bernadette Hannigan (interim) Northern Ireland

Government Office for Science

Problems 1990-2010

HEALTH & SAFETY LABORATORY

- Kings Cross Fire
- Hillsborough Stadium
- Potters Bar
- Port Talbot Blast Furnace
- Buncefield Oil Storage Depot
- Liverpool Crane Incident
- Grayrigg Rail Incident

Some principals of Engineering Design Safety

- Failures in engineering systems can occur as a consequence of: i) component failure, ii) human error & iii) external events.
- Defence in depth: consists of multiple independent protections against the occurrence and propagation of accidents.
    - If one component fails, another component is present whose failure is independent of the operation of the first.
    - No single point failure mechanisms.
- DID should prevent accident scenarios but also provide sufficient protection that should the initial system fail it would prevent the escalation of failures and mitigate the risks from accidents.

Some principals of Engineering Design Safety

- DID compensates for weaknesses in the ability to evaluate the risks and protects against common cause failures (CCFs).
- DID is implemented through the engineered mechanisms of:

  i) Redundancy,

  ii) Diversity,

  iii) Segregation

- The DID design must withstand the consequences of postulated (most severe) accidents, including the loss of systems, structures and components that assure health and safety. These are known as **design basis accidents** (DBA).
- Accidents due to human error can be DBA but can lead to circumstances which are **beyond design basis accidents.**

Definitions

Hazard: something that poses a threat to life, health, property, or the environment.

A **hazard** is any biological, chemical, mechanical, environmental or physical agent that is *reasonably* likely to cause harm or damage to humans, other organisms, or the environment in the absence of its control.

Identification of hazards is the first step in performing a risk assessment.

Risk: the probability that exposure to a hazard will lead to a negative consequence

Risk = Hazard x Dose (Exposure)

So, a hazard poses no risk if there is not exposure to that hazard

Perception of risk varies depending on circumstances

- Risk
- Hazard
- Uncertainty
- Vulnerability
- Randomness

There are different facets to disaster risk response

Prevent

Mitigate

Manage

Clear-Up

Many risks have common consequences:

This determines the National Planning Assumptions

Different departments are involved in both mitigation & response


Terrorist attack

Mass Fatalities

Mass Casualties

Biological Release

Radiological Release

Chemical Release

Debris / Rubble

People requiring evacuation & shelter

Influx of British Nationals

Disrupt. to Water Supply

Disrupt. to Transport

Disrupt. to Oil & Fuel

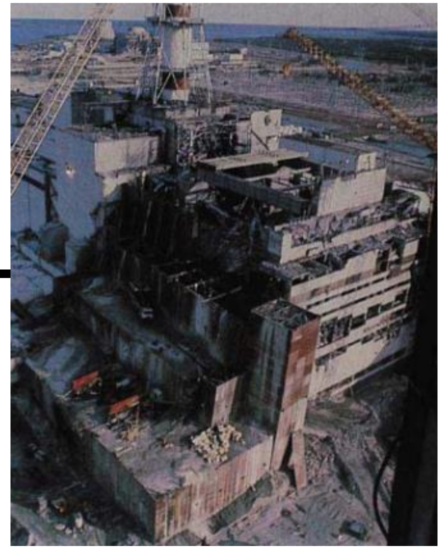
Disrupt. to Gas

Disrupt. to Electricity

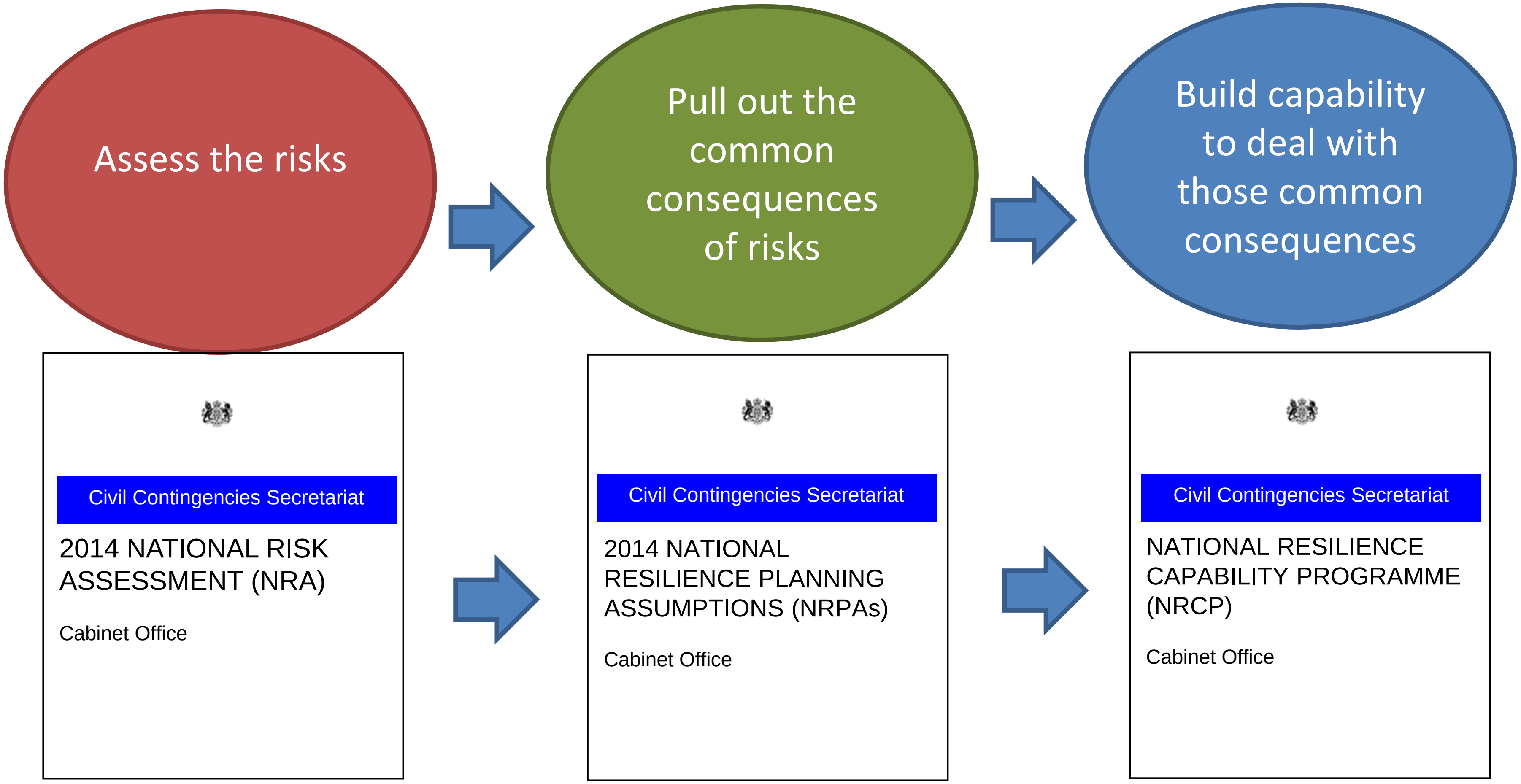
Disrupt. to Telecoms

Disrupt. to Health

Disrupt. to Financial Services

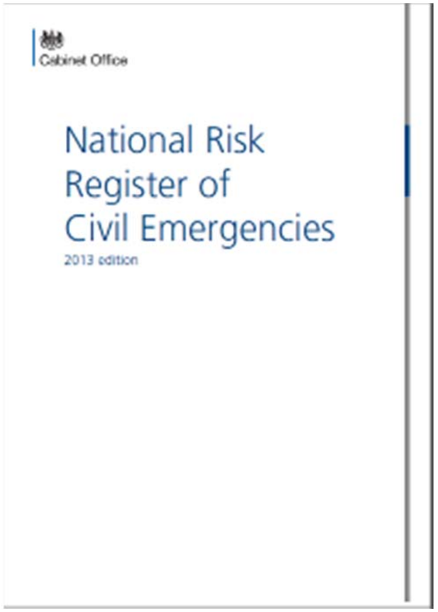

Major industrial accident

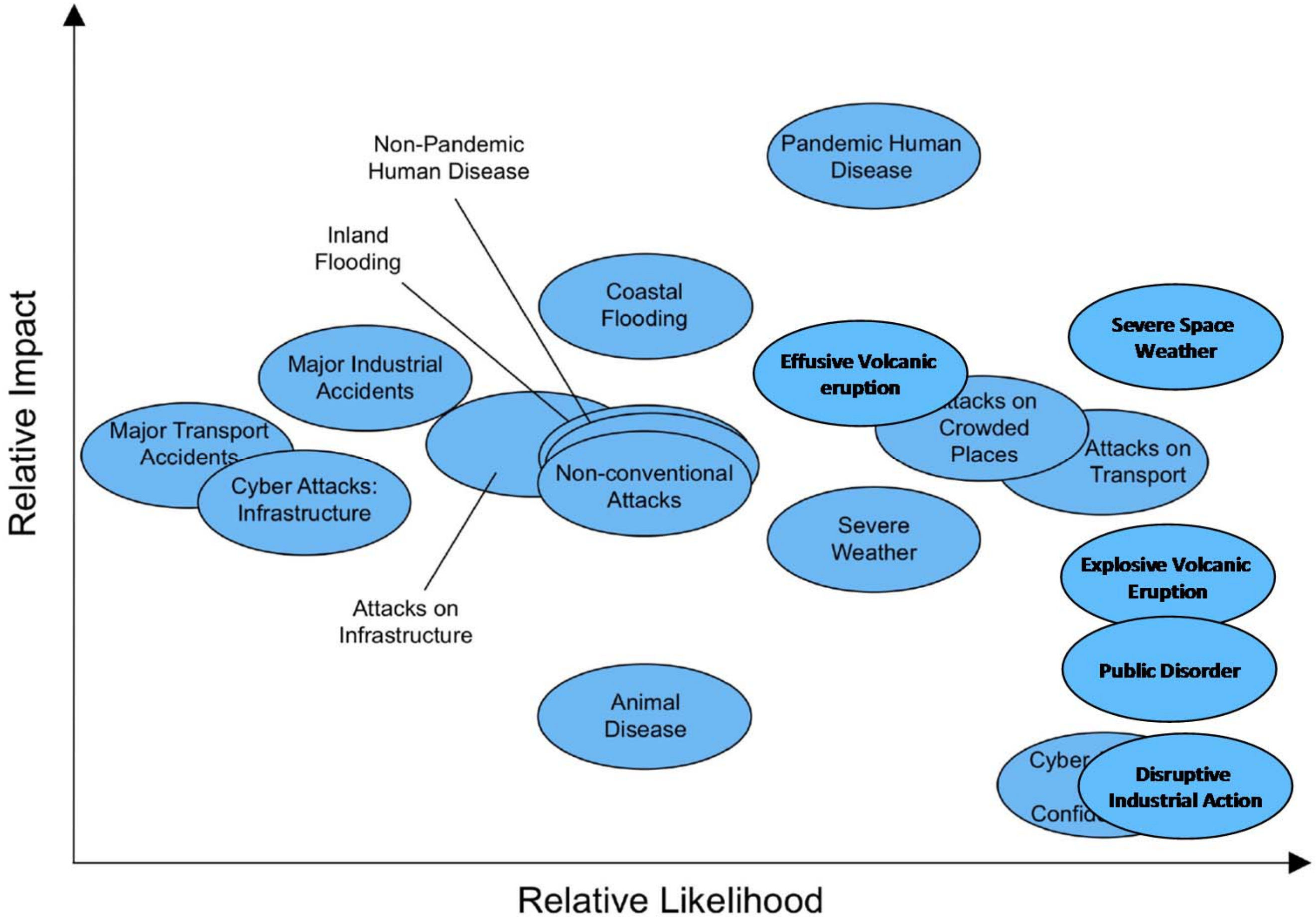
How the UK prepares for the common consequences of risks



6 month Forward Look: Provides departments with an indication of the relative likelihood and impact of **unfolding or emerging** civil domestic risks. It is produced every quarter.

The National Risk Register





In the UK the Natural Hazards Partnership brings together expertise from across the UK's leading public sector agencies with the aim of drawing upon scientific advice in the preparation, response and review of natural hazards.

Working together

Daily Hazard Assessment

Issued 14:09 on Monday, 03 February 2014

The Daily Hazard Assessment is intended to provide an 'at a glance' top level overview only. The links provided to the relevant Partner Organisations should then be used to obtain further and more detailed information as required.

Hazards Five Day Summary – FLOOD: AMBER, LANDSLIDES: YELLOW, WIND: YELLOW.

FLOOD:
For England and Wales:- Prolonged period of heightened flood risk: MEDIUM coastal flood risk for the lower River Severn in Gloucestershire today and parts of the Dorset coastline on Tuesday and Wednesday. Ongoing MEDIUM river flood risk in the Somerset Levels and groundwater flood risk in Hampshire throughout the period. LOW flood risk for large parts of the south and the southwest of both England and Wales from Tuesday onwards.
For Scotland: "There is a low risk of coastal flooding with some minor flooding impacts and disruption expected especially during Monday. There is also a low coastal flood risk for areas around the Firth of Clyde on Wednesday. The low risk in north east areas in Wednesday and Thursday is for river flooding."

LANDSLIDE:- Heavy rain spreading north across the country accompanied by strong winds could result in an increased likelihood of coastal and inland landslides and slope failures, this will mainly affect Southern and South West England and South Wales.

WIND:- LOW likelihood of MEDIUM impacts in Northern Ireland and parts of western Scotland until 1800 today and tomorrow and Wednesday for parts of Northern Ireland, South Wales and southern England.

Hazards Five Day Summary Detail

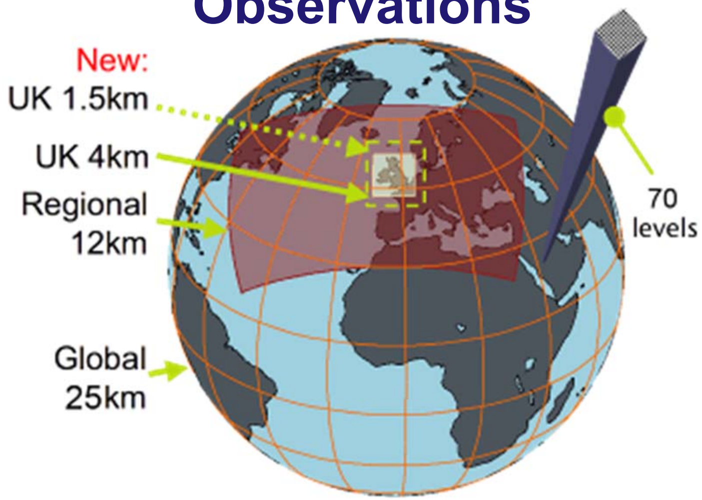
FLOOD:- With deep Atlantic low pressure areas expected to move in to affect the UK during the next few days, the Met Office has issued yellow warnings for a very unsettled period, with rain and wind for each of the first three days of this week. Southern and western UK will be most affected initially, with the main risk also spreading to include northeastern Scotland by Wednesday. Please see the Met Office's website for the latest warnings or view them on Hazard manager using the links overleaf.

For England and Wales, the Flood Guidance statement (FGS) from the Flood

The Natural Hazards Partnership

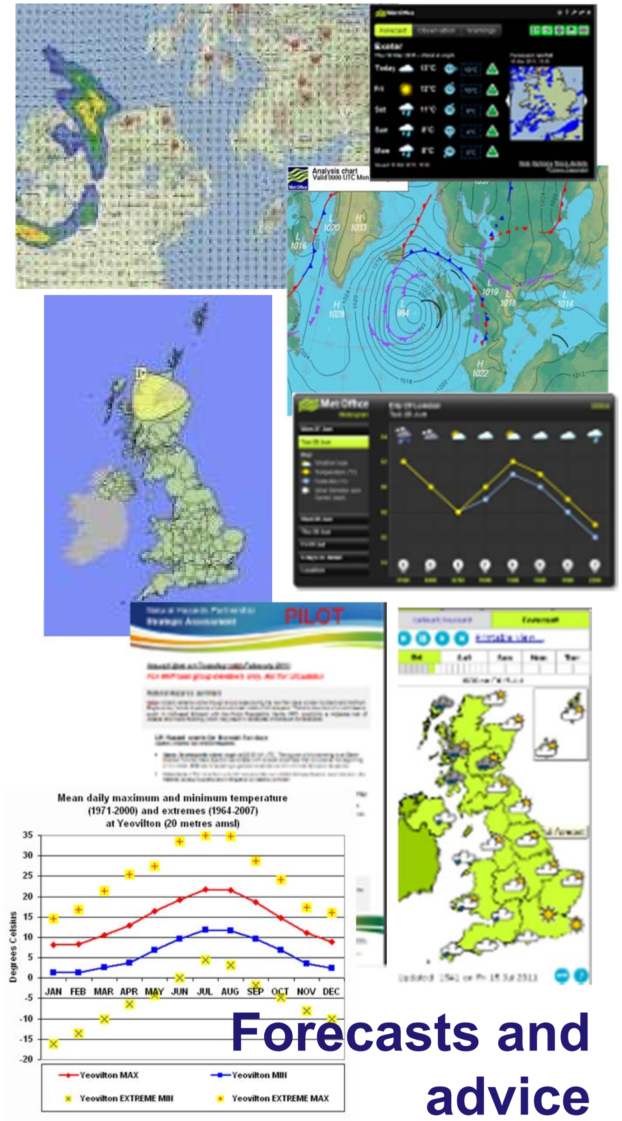
Our ability to respond to disaster risk relies on a scientific value chain

Observations



Forecast model output

Interpretation, Risk Analysis & Communication



Forecasts and advice

Scientific Advisory Group for Emergencies (SAGE)

How science supports the UK's emergency response

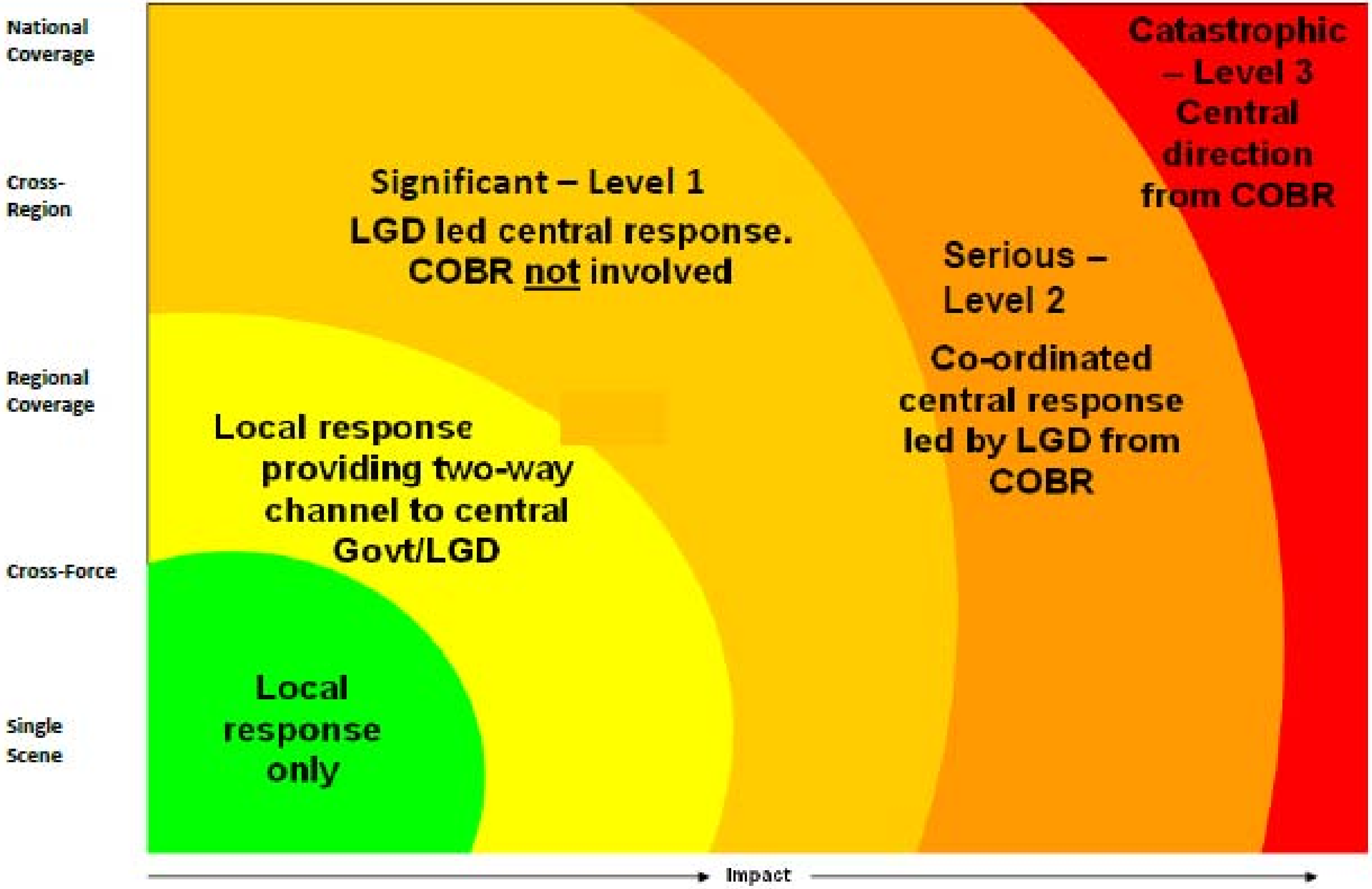
COBR - The decision making process

COBR

- Facilitates rapid co-ordination of the central government response and effective decision-making.

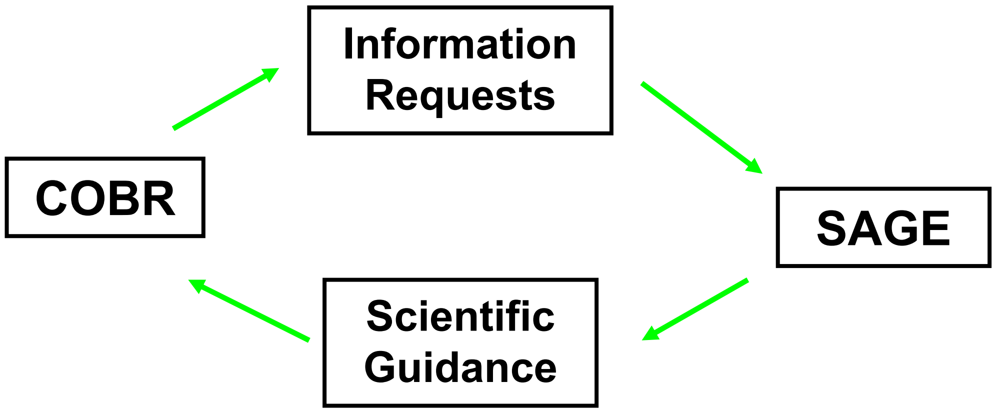
Calling COBR

Escalation of the Central Response



SAGE’s purpose

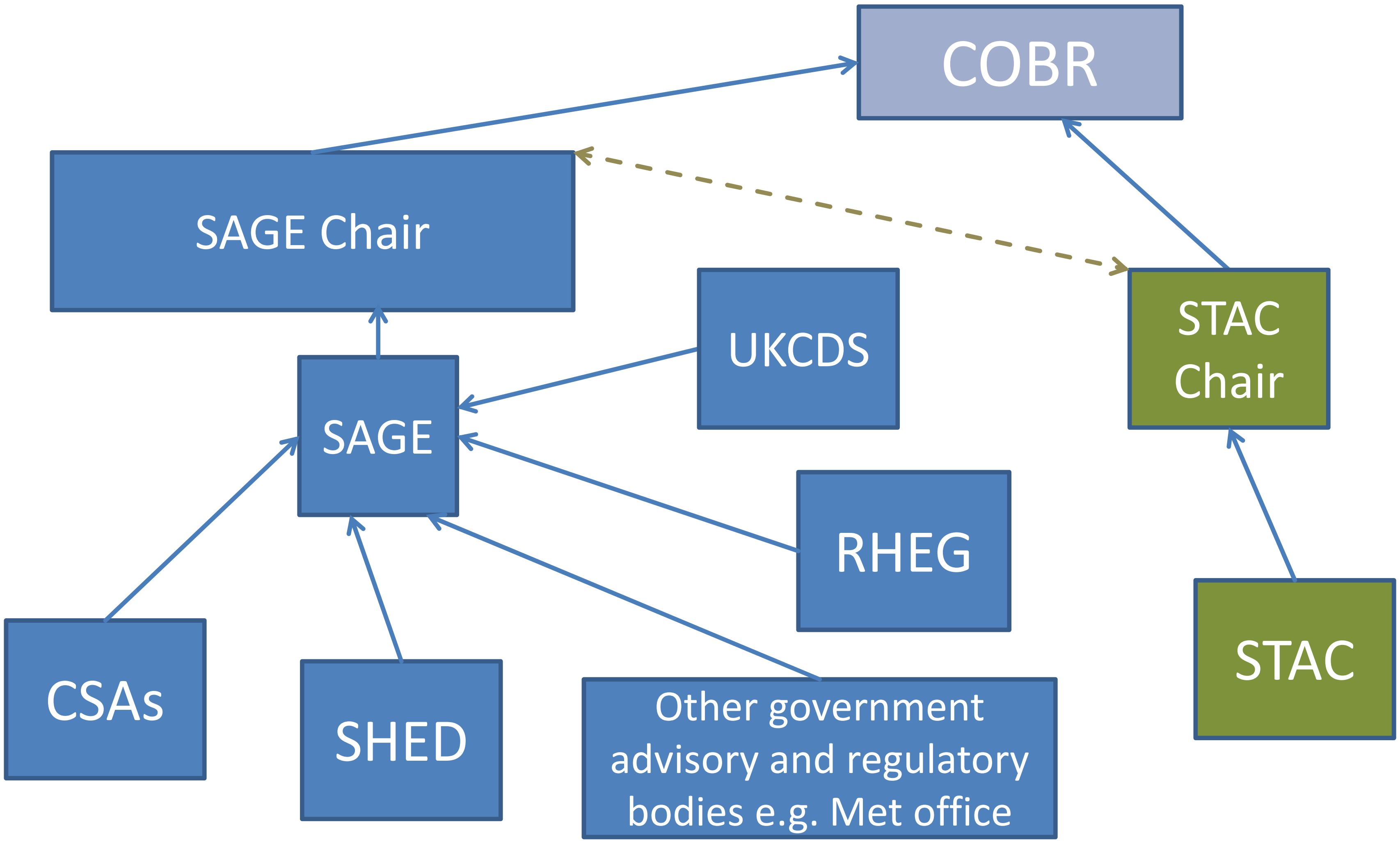
- COBR must decide whether it is necessary to call SAGE
- The aim of SAGE is to “ensure that coordinated, timely scientific and/or technical advice is made available to decision makers to support UK cross-government decisions in COBR”



- Practice, practice, practice…what’s missing?

http://www.publications.parliament.uk/pa/cm201011/cmselect/cmsctech/498/49809.htm

Where does CSAs advice fit during a crisis?



STACs and SAGE:
1. Local v Cross-government

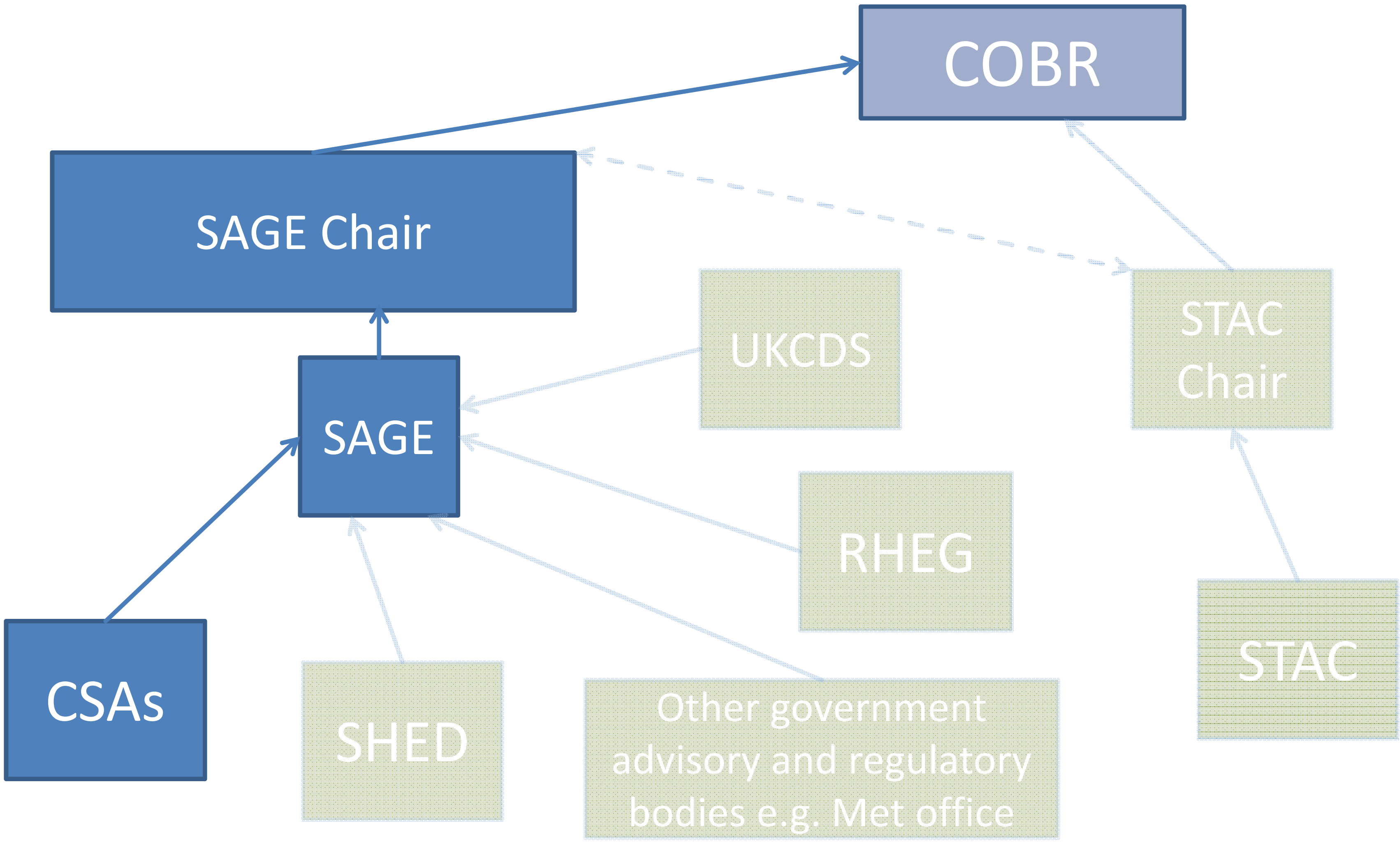
*STACs should support **local** decision making, whilst the focus of SAGE should be to support UK **cross-government** strategic decision making."*

STAC - Science and Technical Advice Cell within the multi-agency Strategic Co-ordination Centre (SCC)

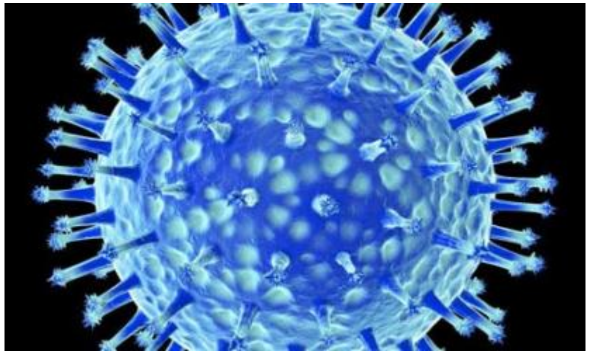
STACs and SAGE:
2. Known v Uncertain

*STACs will focus on **"pre-prepared known"** whilst SAGE will focus on more **uncertain advice** where there are knowledge gaps.*

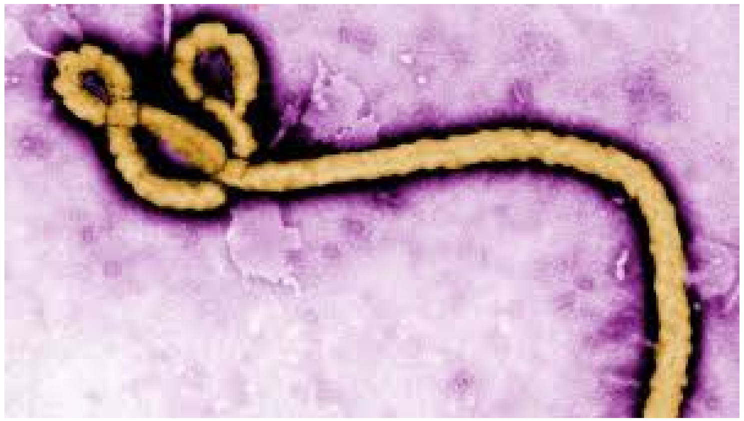
Where does CSAs advice fit during a crisis?



SAGE in action: Recent challenges that led to international collaboration action



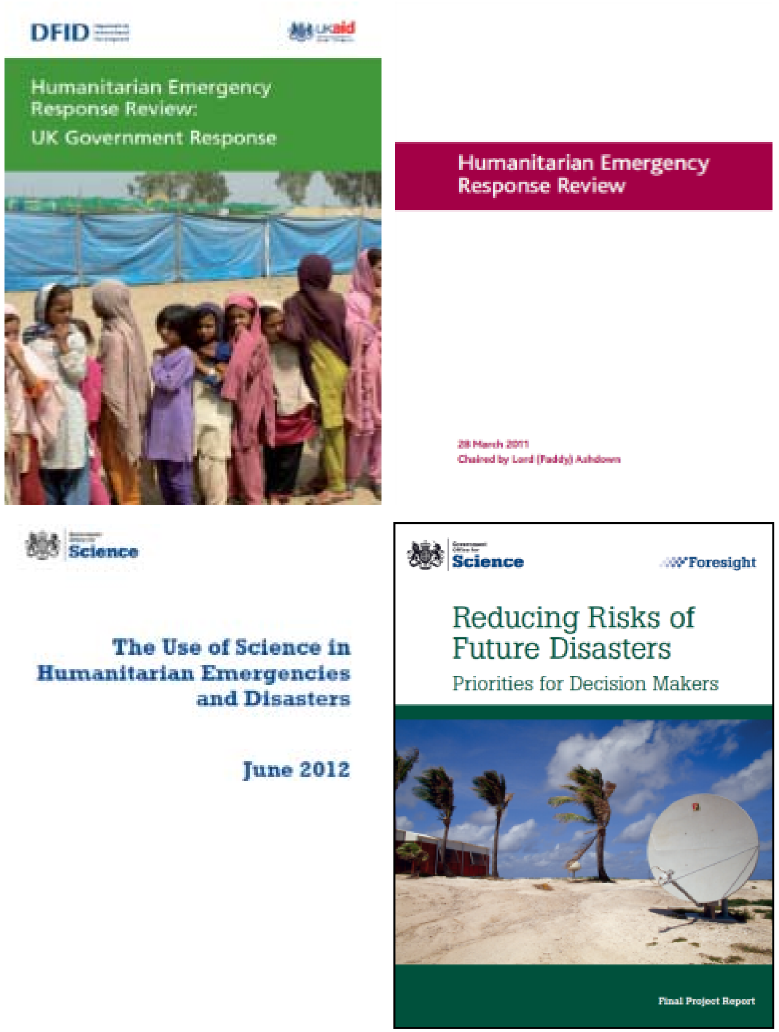
2009 – Pandemic Flu
2010 – Volcanic Ash
2011 – Fukushima
2014 – UK Floods
2014 – Ebola
2015 - Zika



Science in Humanitarian Emergencies and Disasters

How science supports the UK’s emergency preparedness and response overseas

A similar approach is being taken for international natural hazards



Humanitarian Emergency Response Review:

"If we are to meet the challenges ahead, we have to be 'ahead of the curve'…preparing for disasters, as well as reacting to them"

"improve our use of science in both predicting and preparing for disasters, drawing on the Chief Scientific Advisors network across government."

Science in Humanitarian Emergencies and Disasters Project

Government Office for **Science**

The Use of Science in Humanitarian Emergencies and Disasters

June 2012

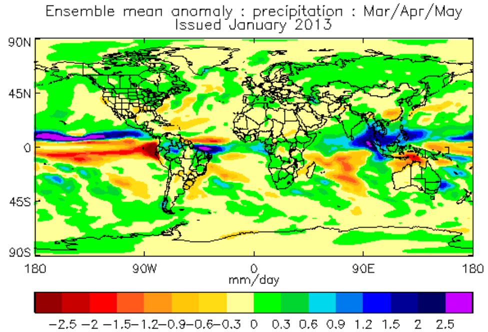
Anticipating natural hazards

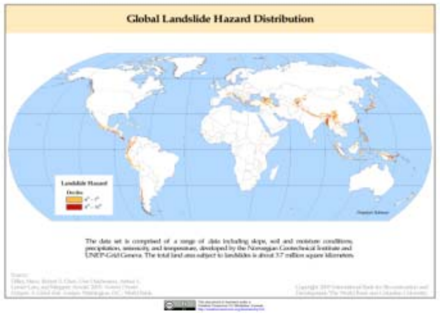
Established a Risk and Horizon Scanning Expert Group (RHEG) to provide advice to DFID, FCO and MOD on what natural hazard events may occur over the next 6 months that have the potential to cause disasters.

Responding to disasters

Provision of rapid scientific and technical advice in response to natural disasters. Option to established a Humanitarian Emergency Expert Group (HEEG), which is similar to SAGE

Risk and Horizon Scanning Expert Group





Public Health England

AHVLA Animal Health and Veterinary Laboratories Agency

defra

Infectious Disease Surveillance and Monitoring System for Animal and Human Health:
Summary of notable events/incidents of public health significance for the period
1 – 30th April 2013

Incident & country	Details/Summary
Avian Influenza A(H5N1), Worldwide [update]	In 2012, the number of laboratory confirmed human cases of avian influenza A(H5N1) virus infection declined. Thirty-two human cases were reported to WHO, down from 62 in 2011, 48 in 2010 and 73 in 2009. The overall proportion of fatal cases among those reported was 62.5% (20/32), slightly higher than in the previous 3 years (44-55%) but similar to the average of all cases reported to WHO since 2003 (59% [360/610]) [WHOa]. So far in 2013, sporadic human cases have been reported from Bangladesh (1), Cambodia (10), China (2), Egypt (3) and Vietnam (2) [WHOb]. The majority had exposure to poultry.
Avian Influenza A(H7N9), China [update]	As of 2 May, 128 human cases of influenza A(H7N9) including 26 deaths have been reported from ten provinces and cities in eastern China: Anhui (4 cases, 1 death); Beijing (1 case); Fujian (3 cases, no deaths); Henan (4 cases, no deaths); Hunan (3 cases, no deaths); Jiangsu (27 cases, 6 deaths); Jiangxi (5 cases, no deaths); Shandong (2 cases, no deaths); Shanghai (33 cases, 13 deaths) and

Department for International Development

Department for Environment Food & Rural Affairs

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Foreign & Commonwealth Office

Public Health England

Department of Energy & Climate Change

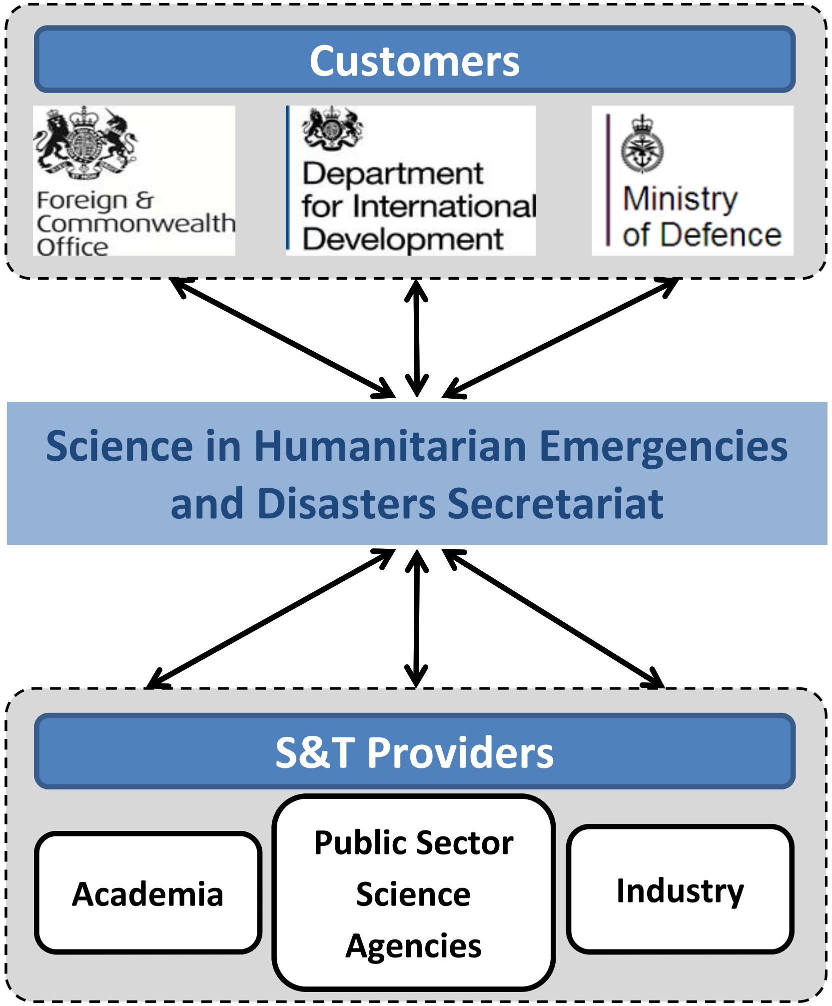
Ministry of Defence

Department of Health

Government Office for Science

Met Office

Responding to international emergencies



- Acts as a **coordinating body** and a **"one-stop-shop" for S&T advice** in emergencies when COBR not called.

- Coordinates the provision of **timely S&T advice to support the UK Government response to overseas emergencies**.

- **Facilitate interaction** between policy makers / crisis management teams and scientists.

- **Multi-disciplinary and multi-hazard approach.**

Typhoon Haiyan

Typhoon Haiyan – the SHED response

8 November

10:00GMT – request from DFID for S&T advice to support the UK's response.

10:15 – SHED Secretariat contacts the International Landslide Centre and UK Met Office.

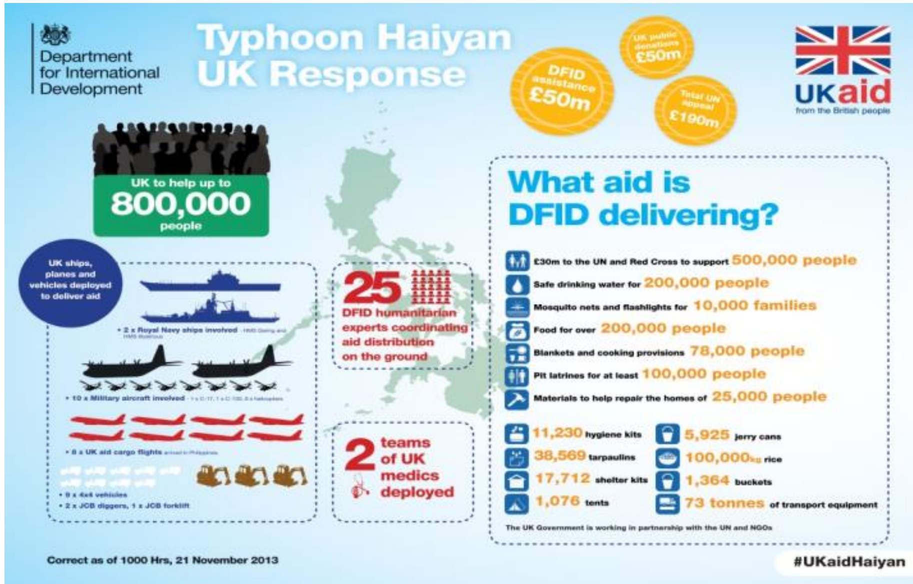
10:32 – Initial advice on landslide risk provided.

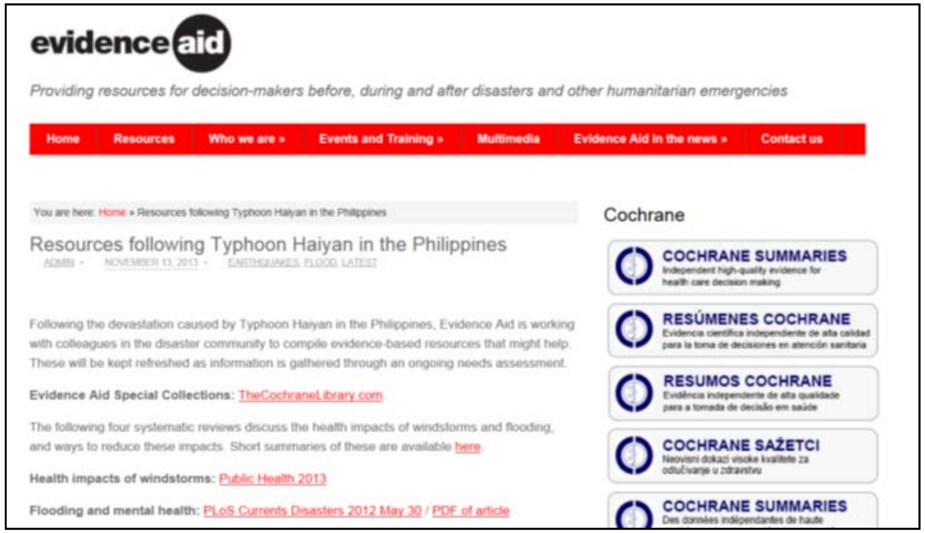
13:39 – Detailed weather forecast provided by UK Met Office.

9-18 November

- Brought together a wide range of experts from Met Office, BGS, PHE & the International Landslide Centre
- Coordinated the provision of rapid coherent advice data & information on:
  - Daily forecast information including risk of low cloud and the expected sea state, which could hamper aid operations.
  - Expected frequency of further rainfall and thunderstorms.
  - Risk of flash floods.
  - Areas most at risk of landslides.
  - Health impacts.

Haiyan - What impact did SHED have?





- Advice assisted DFID and their partners in-country with the response.
- Helped inform where to send two British Royal Navy ships
- Advice on health impacts made available open access to everyone the Philippines through Evidence Aid
- Review found that the *"SHED process did achieve its aim in streamlining and synergising the UK's scientific capacity to advise key actors in disaster anticipation and mitigation."*

Case Study: Nuclear response

UK Approach to Safety Regulation

All regulators aim to ensure operators properly control nuclear hazards and manage risk.

Many regulators set out rules telling operators how to do this – a ‘prescriptive’ approach.

UK instead has a ‘goal-setting’ approach, which makes it a legal duty to meet the safety goals, but does not set out in detail how operators should meet this duty, e.g. “reduce the risk to workers and the public so far as is reasonably practicable.”

UK Nuclear Emergency Preparedness & Response

- UK Legislation
- Emergency Planning Requirements
- ONRs Role:
  - Regulator
  - Independent Source of Advice

The national radiation monitoring network and emergency response system (RIMNET)

- Following Chernobyl, the UK Government developed a **National Response Plan** to ensure that any future similar emergency could be effectively managed. It is a multi departmental and agency plan, DECC led.
- RIMNET is both a multi-purpose response tool and a platform for the effective coordination of emergency response. It supports the UK response to any radiological event and has the potential to be used in non-radiological events. It is managed by the Met Office.
- RIMNET has a network of 94 fixed gamma dose rate monitoring sites across the UK, automatically measuring, analysing and informing on background radiation levels 24/7. All measurement and reference data is stored in the UK National Nuclear Database.

Met Office

Public Health England

RIMNET

JAM

ONR Office for Nuclear Regulation

Environment Agency

FOOD STANDARDS AGENCY

Aim: Delivery & ongoing development of inter-agency collaboration and capability to provide timely expert data and advice to the UK Government through SAGE to support the response to a radiological emergency

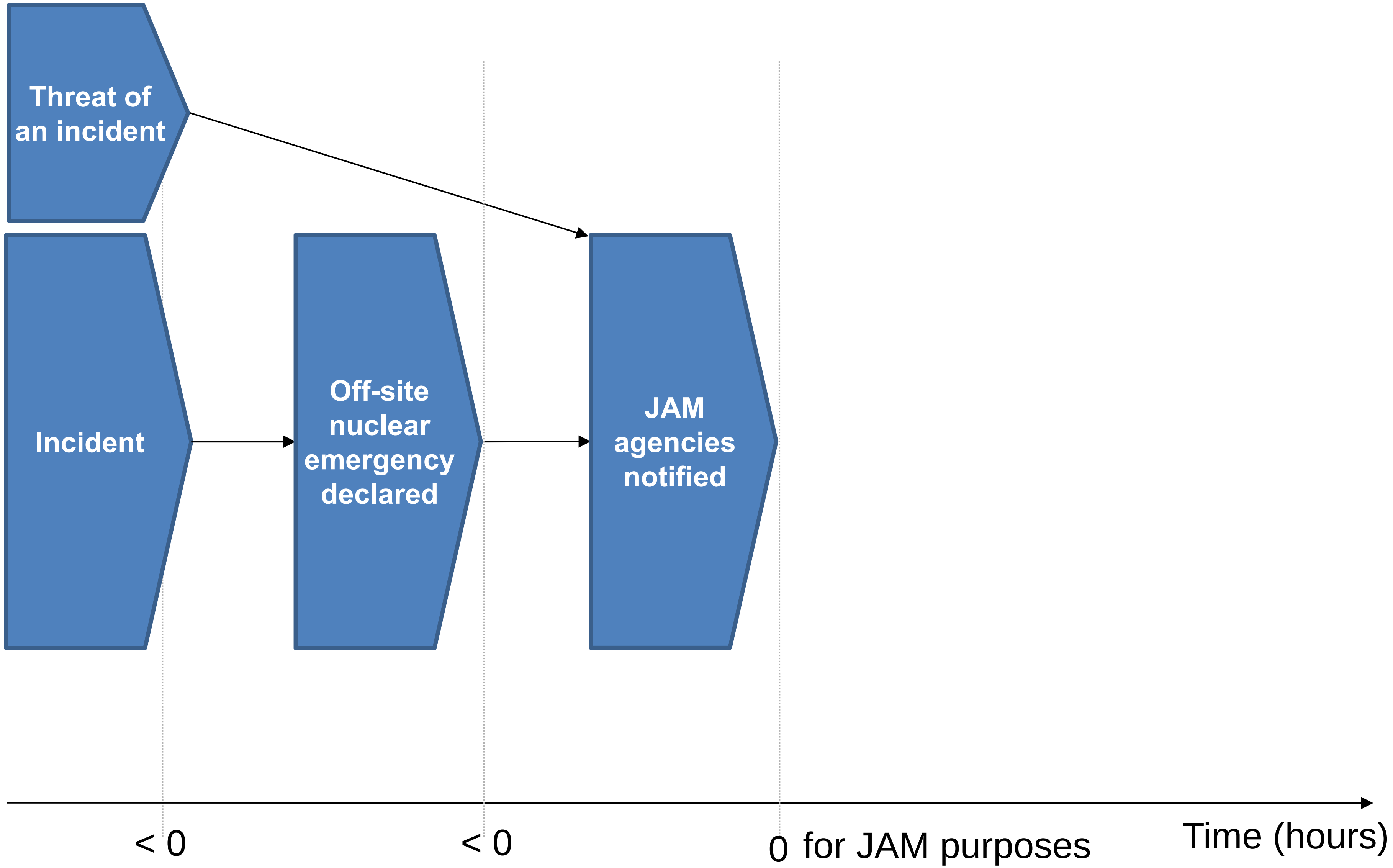
Joint
Agency
Modelling

Existing operational framework

- Current UK operational response includes:
  - Operators emergency response plans
  - Local and national emergency response plans
  - Local & regional model predictions based on unit source term
  - Local and national monitoring
  - Local ‘most likely scenario’ impact assessment
- All JAM partners are represented within current local and national response
- JAM builds on this with a focus on:
  - Better integration across agencies, contingency planning through ‘what if’ scenarios, greater exploitation of science

Joint
Agency
Modelling

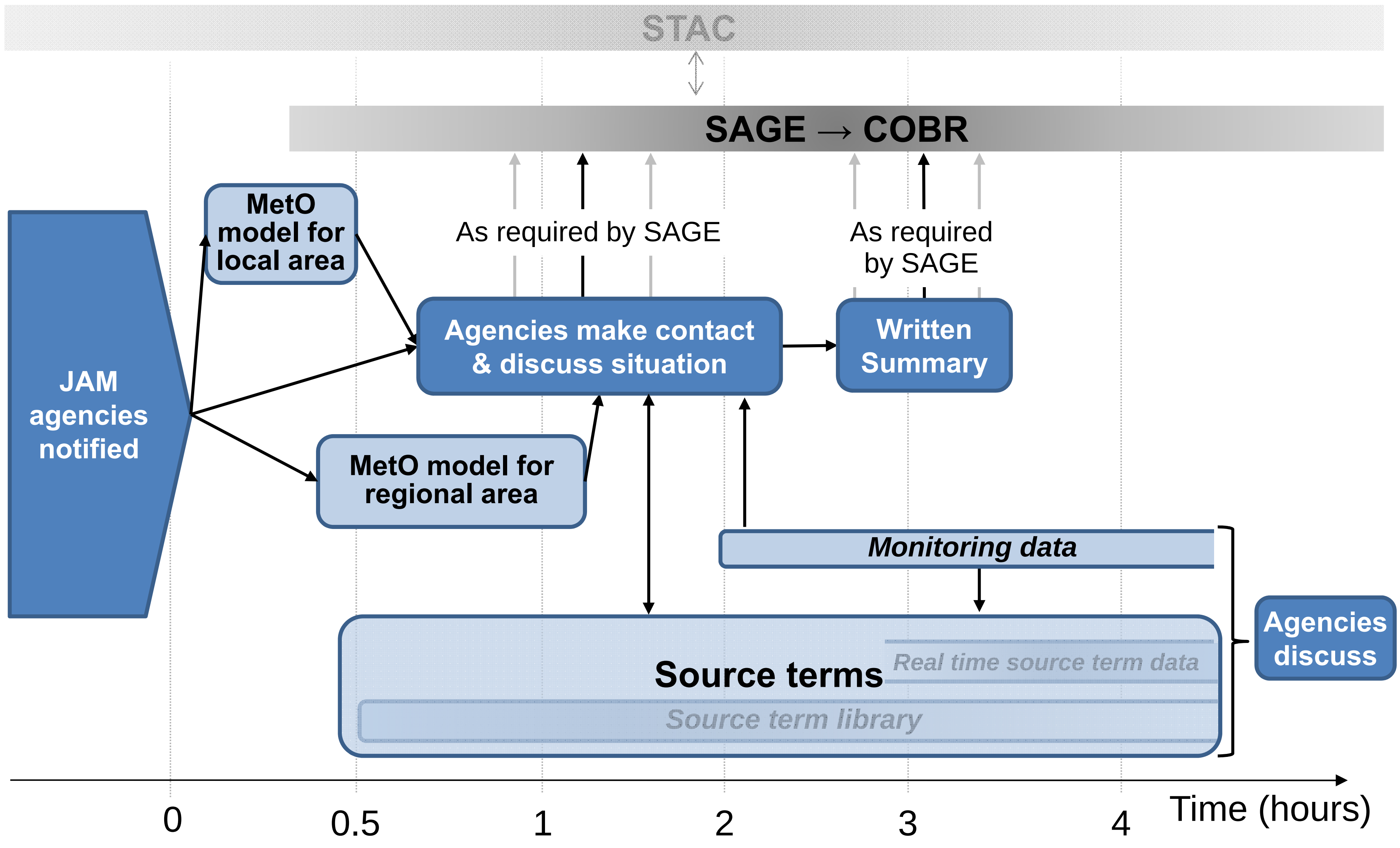
Timeline



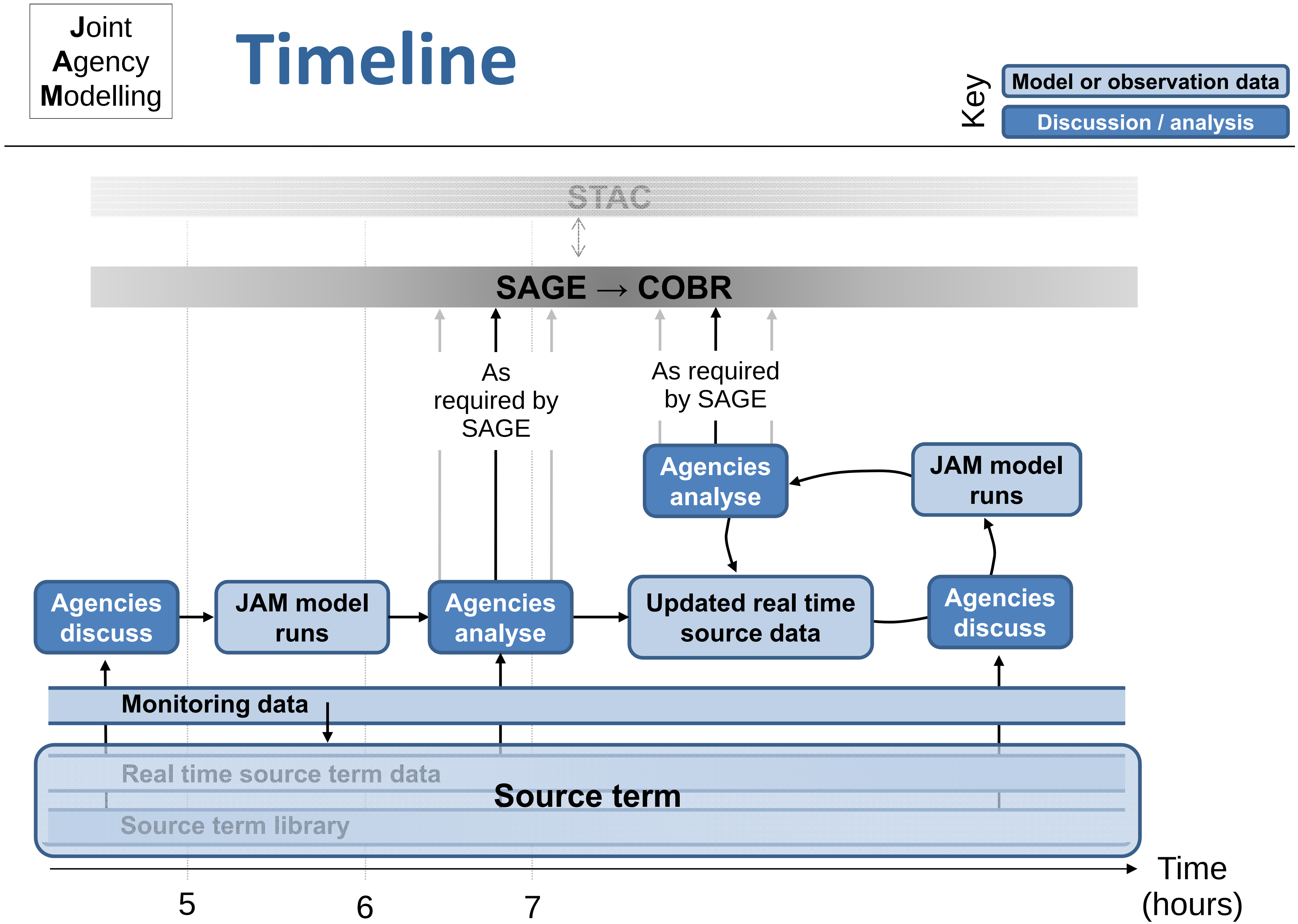
Joint
Agency
Modelling

Timeline

Key
Model or observation data
Discussion / analysis



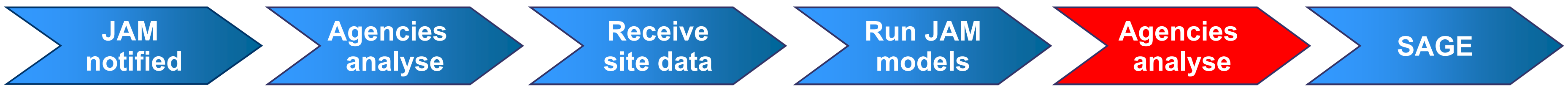
Timeline


Joint Agency Modelling
Key
Model or observation data
Discussion / analysis
STAC
SAGE → COBR
As required by SAGE
As required by SAGE
Agencies analyse
JAM model runs
Agencies discuss
JAM model runs
Agencies analyse
Updated real time source data
Agencies discuss
Monitoring data
Real time source term data
Source term
Source term library
5
6
7
Time (hours)

Joint
Agency
Modelling

JAM inputs to SAGE

- Briefing documents (most likely and reasonable worst case scenarios)
- Extra data (images / maps / figures) from models (e.g. sensitivity analysis) and measurements as available
- Consensual expert interpretation of data
- Quality assured science and data
- Integrated expertise
- All the agencies believe JAM contributes significantly to the UK capability and will improve the information available to SAGE/STAC for the response

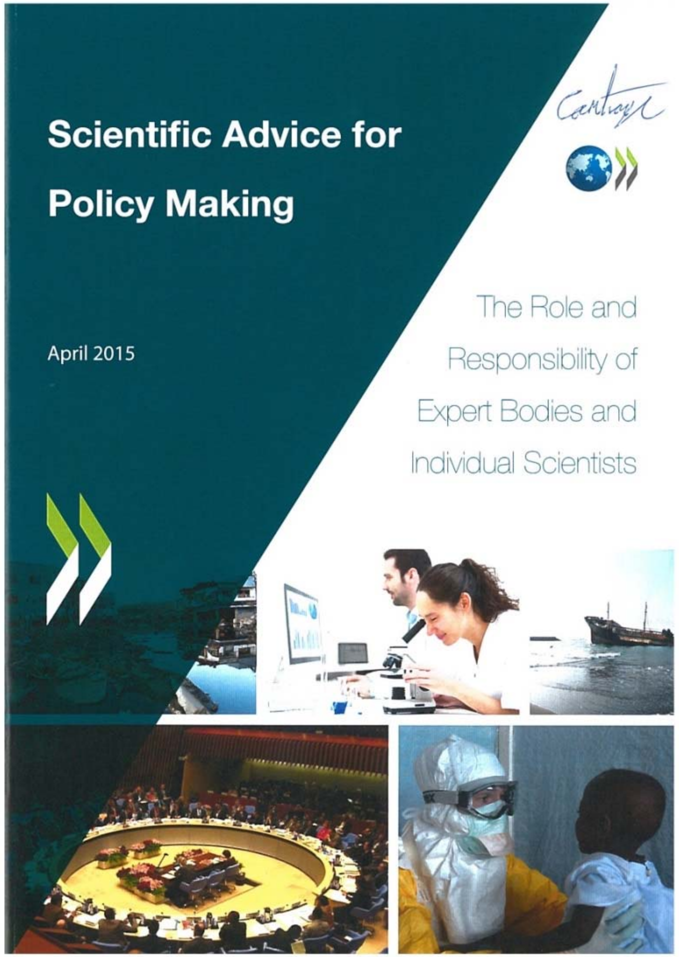


OECD GSF report 2015

- Motivated by Fukushima and L'Aquila
- Focuses mainly on deliberative processes

Includes:

- ✓ A review of national science advisory (eco-) systems
- ✓ An analysis of the different steps in an advisory process
- ✓ An analysis of legal responsibilities
- ✓ Special challenges in crisis situations
- ✓ Perspectives on public interest/engagement



Terms of Reference

Two main aims:

- To analyse national mechanisms for obtaining science advice in ‘international’ crisis situations.
- To explore the challenges and barriers to information and data sharing during ‘international’crises.

Specific activities :

- A survey of (OECD member) countries to capture information on national responsibilities and processes for providing scientific and technical advice during crises.
- Building on the results of the survey, a workshop on information and data sharing during transnational crises.
- **April, 2018**: Final report to GSF

International collaboration is the way to solve international problems

Many 21st century challenges require scientific collaboration

- Climate change
- Poverty reduction
- Food security
- Nuclear disarmament

Collaboration is essential for our domestic science

- Strength of research base
- Creativity of innovation ecosystem
- Knowledge economy
- More export potential!

Foreign & Commonwealth Office

Fin

Muchas gracias