House of Commons

Science and Technology Committee

Science in emergencies: chemical, biological, radiological or nuclear incidents

Twelfth Report of Session 2016–17

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Science and Technology Committee

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Summary

Our inquiry into science advice in chemical, biological, radiological and nuclear (CBRN) emergencies discovered a confusing landscape of organisations and acronyms which has been difficult to navigate. In particular a distinction between deliberate 'CBRN' incidents and accidental 'Hazmat' releases of the same materials may be creating confusion or limiting the mechanisms which local planning bodies can access in order to obtain scientific expertise. It is important that definitions do not stand in the way of organisations receiving science advice.

Science advice for CBRN incidents is provided through the "Emergency Coordination of Scientific Advice" (ECOSA) mechanism. ECOSA is a relatively new mechanism that has not yet had to react to a national emergency. We recommend that dry-runs and practice scenarios for CBRN include 'live' unscheduled drills which test the speed and effectiveness of the provision of science advice. The remit of ECOSA also needs to be clarified with respect to Hazmat incidents.

The Government is making use of scientific evidence to refine its CBRN Response Framework and it appears that in introducing changes the Government is making use of the evolving scientific evidence in a pragmatic way. Science also contributes to the detection and modelling of CBRN and Hazmat incidents, via the Met Office and the National Physical Laboratory.

However, coordinating effective advice in relation to the Fukushima Hazmat incident was possible only as a result of domestic expertise being available in the relevant areas of science. Effective science advice relies on the ongoing availability of such expertise, and the Government should review its lists of experts to identify where gaps may emerge in the future as individuals retire.

Communicating accurate science advice to the public in the event of a CBRN or Hazmat incident is an essential part of the response. We heard concerns that access to informed government scientists is not always possible, and it is understandable that meeting the media's demand for expert spokespeople may not naturally be the first priority for the Scientific Advisory Group for Emergencies (SAGE). We endorse the recommendation made by the Science Media Centre that future SAGEs should include a dedicated independent scientific press officer to ensure that the communication of science to the public is as good as it can be during an emergency.

For the advice received during a CBRN or Hazmat incident to be understood and interpreted by the public it needs to build on a basic level of understanding of science topics such as radiation. The Government should commission GO-Science to produce clear and simple guidance for the public for dealing with different types of CBRN or Hazmat emergency, not just in terms of the actions they need to take but also the science that underpins them.

1 Introduction and definitions

Our inquiry

1. In January 2016 we published our report on *Science in Emergencies: UK lessons from Ebola*.[1] This report explored the UK's use of science advice to inform the response to the overseas 'disease emergency' of Ebola, and built on the earlier work on science in emergencies of our predecessor committee in 2011.[2] Having considered mechanisms for science advice in the context of the natural hazard of human disease, we decided to continue our science in emergencies work by turning to another category of risk referred to in the Government's National Risk Register, known as Chemical, Biological, Radiological or Nuclear (CBRN) incidents.[3]

2. We launched our inquiry in April 2016. We took oral evidence from a range of witnesses including Ben Wallace MP, Minister for Security, and visited Glasgow to discuss cross-border co-operation during CBRN incidents with representatives of the Scottish Government and Health Protection Scotland (see Annex).

Definitions: what is a 'CBRN' incident?

3. We invited written submissions on 'CBRN' emergencies in the following terms:

- How prepared the Government is for a CBRN emergency;
- The extent to which the Government currently works with scientists and others to identify and assess CBRN risks, and to communicate public advice;
- The use of scientific evidence in informing current CBRN emergency response plans; and,
- The mechanisms that are in place to allow scientific advice to be provided to Government in the event of a CBRN emergency, and to share information and response strategies across Government and with local government.

However, we discovered during our inquiry that the 'CBRN' label was used by groups to refer specifically to *malicious* releases, and that *accidental* releases of the same substances were referred to as Hazardous Material (or 'Hazmat') incidents. For instance, the Fukushima Daiichi disaster in Japan (which saw a release of radioactive material from a nuclear power plant) is not considered to be a Chemical, Biological, Radiological or Nuclear incident as the initial cause was a tsunami rather than malicious intent.[4]

4. The Home Office told us that this distinction was reflected in the definitions provided by the Civil Protection Interoperability Lexicon,[5] administered by the Cabinet Office

1 Science and Technology Committee, Second Report of Session 2015–16, *Science in emergencies: UK lessons from Ebola*, HC 469
2 Science and Technology Committee, Third Report of Session 2010–11, *Scientific advice and evidence in emergencies*, HC 498
3 Cabinet Office, *National Risk Register of Civil Emergencies 2015 edition* (March 2015)
4 See case study.
5 Gov.uk, 'Emergency responder interoperability: lexicon', accessed 17 January 2017

and last reviewed in 2013.[6] However, the lexicon states that CBRN is "a term used to describe Chemical, Biological, Radiological or Nuclear *materials*" and that "CBRN is often associated with terrorism".[7] This is not perhaps as clear as the Home Office suggested.

5. Witnesses to the inquiry explained that in part the distinction reflected the fact that the police would lead the response for malicious (and therefore criminal) CBRN emergencies, whereas the fire service would lead the response to Hazmat accidents.[8] Andy Bell of the Chief Fire Officers' Association explained that the dangers of the situation differed according to the intent behind the incident:

> While the hazards within the area may well be the same, for CBRN there are additional hazards around the perpetrator, and information on what that hazard is may not be as clear as it would be with an accidental release […] An accidental release […] would generally take place where the material was stored or worked with, and that would be known to us […] That is the complete opposite of a CBRN incident […] The response to a deliberate CBRN-type release is much more difficult and high risk.[9]

Similarly, the Home Office told us that there was a difference in the scientific expertise required to deal with CBRN and Hazmat incidents, with a corresponding difference in where this expertise was held:

> In Hazmat, the required advice is "how do we deal with…?" while in a CBRN event the question is more likely to be "what is…?" The scientific background and expertise required to address these two questions is very different. Whilst all [Fire and Rescue Services (FRS)] in the UK have a level of Hazmat knowledge and skills, the CBRN-specific detection and identification capability is much scarcer and it would not be proportionate for all FRS to have this skill set. […] The extra requirements to work in a crime scene are a complicating factor for CBRN events.[10]

Issues arising from current definitions

6. Some of our witnesses were relaxed about the distinction between CBRN and Hazmat. For instance, Phil Evans, representing the Met Office, said "we do not particularly care about the nuances of that because we provide the advice and services we do whether or not it is the consequence of malicious intent. The definition does not matter to us".[11] Others were more concerned about the distinction. The Staffordshire Civil Contingencies Unit (CCU)[12] warned us that there was "confusion over what constitutes a CBRN incident", and that this "makes it difficult for local responders to access the full range of scientific support and advice that would be available in the event of a traditional CBRN incident".[13] In particular, as we discuss in Chapter 2, we were told that the key source of science advice known as 'ECOSA' may have a particular focus on CBRN incidents.

6 Home Office (CBR 28) para 5
7 Cabinet Office, *Lexicon of UK civil protection terminology—version 2.1.1* (19 February 2013)
8 Q9 [Christopher Abbott]
9 Q14
10 Home Office (CBR 28) para 8
11 Q79
12 A local unit focused on meeting the requirements of the Civil Contingencies Act 2014, funded by Staffordshire emergency services, local authorities, health organisations, and the Environment Agency.
13 Staffordshire Civil Contingencies Unit (CBR 10) para 5

7. James Webster, representing the Staffordshire CCU, argued that from the perspective of a local authority it was better to categorise incidents by their effects rather than their causes:

> Obviously, the first response differs according to whether it is deliberate or accidental, but after that, particularly for local authorities dealing with clean-up and long-term health effects, the majority of that does not change whether it is CBRN, Hazmat or the grey area in between.[14]

The Staffordshire CCU provided two examples of categories of incidents involving unidentified materials which did not fall within the definition of CBRN as a malicious act and therefore might not qualify for the same level of scientific support:

- Fires involving illegally stored waste (an example of which had occurred in Staffordshire). The CCU told us that "as this was not declared a major incident, air quality monitoring by Public Health England and the Environment Agency was not provided".
- Cases of "deliberate individual chemical exposure"—where an individual has been exposed to a chemical substance which is potentially unknown.

We were told that "there is no guidance targeted to the complex multi-agency responder community to support them in either of the above scenarios as there is for traditional CBRN scenarios".[15]

8. Paul McCloghrie from the Civil Contingencies Secretariat (CCS, embedded in the Cabinet Office and responsible for coordinating the production of the National Risk Register)[16] told us that the CCS had held some discussions with Local Resilience Forums (LRFs)[17] on whether there was a widespread source of concern about the definition, and had received "mixed responses".[18] Mr McCloghrie told us that the CCS was "taking steps to update" its guidance to make sure that it was "not creating any uncertainty".[19]

9. We also heard that as part of the Government's 2013 review of the Lexicon "a small group representative of the national spread of LRFs" were consulted on the definitions, and that the use of the 'CBRN' and 'Hazmat' categories was considered as part of a National Risk Assessment chemical review conducted in 2015. The Government explained that:

> As part of this review, the Cabinet Office considered whether to use the CBRN label for non-malicious, as well as malicious, risks. Whilst Local Resilience Forums were not directly consulted during this review, stakeholder feedback from lead agencies, Government departments and other Chemical Biological Radiological and Nuclear specialists including the NRA's CBRN Scientific Expert Group indicated that 'CBRN' is conceptually well established and recognised as a descriptor for malicious

14 Q19
15 Staffordshire Civil Contingencies Unit (CBR 30)
16 Q201
17 Local Resilience Forums are the means by which 'Category 1 responders' (police forces, fire services, local authorities and others) co-ordinate their resilience work in a local area, as required by the Civil Contingencies Act 2004 (Contingency Planning) Regulations 2005 (SI 2005/2042) regulation 4
18 Qq211–2
19 Q212

> attacks, including within the CONTEST [counter-terrorism] strategy. Similarly, the abbreviation 'Hazmat' is well established for chemical, biological, radiological and nuclear non-malicious risks. For example, this distinction is made in NHS advice to practitioners for Chemical, Biological and Radiological events, and is also made by the National College of Policing.[20]

The Cabinet Office subsequently concluded that continuing to use Hazmat for non-malicious risks and CBRN for malicious risks was "the most sensible and least confusing option for the time being", but committed to paying "close attention" to this when updating the Lexicon in 2017.[21]

10. **A distinction between deliberate 'CBRN' incidents and accidental 'Hazmat' releases of the same materials may leave grey areas in between, which could lead to confusion or affect the mechanisms which planners can access. It is important that definitions do not stand in the way of organisations receiving science advice that is relevant to the emergency in question, however it is described.** ***We recommend that the Government consult further with Local Resilience Forums regarding these definitions and explore how any ambiguities could be resolved—such as by referring simply to 'malicious CBRN' incidents and 'non-malicious CBRN' incidents where the distinction is of any significance.***

11. For clarity, we retain the terms 'CBRN' and 'Hazmat' for this report, reflecting the current lexicon.

20 Home Office (CBR 28) para 7
21 Home Office (CBR 28) para 9

2 National mechanisms for science advice during CBRN and Hazmat incidents

Emergency Coordination of Scientific Advice (ECOSA)

12. Our attention was drawn to three main agencies providing science advice:

- The Defence Science and Technology Laboratories (DSTL) for chemical and biological events;
- The Atomic Weapons Establishment (AWE) for radiological and nuclear events; and
- Public Health England (PHE) for more general health issues.[22]

The Home Office told us that together these three agencies form 'ECOSA'—the Emergency Coordination of Scientific Advice[23]—a mechanism that can be triggered through a telephone call to the National CBRN Centre.[24] ECOSA takes the form of a teleconference between DSTL, AWE and PHE personnel with relevant expertise,[25] and aims to provide the necessary scientific advice during the earliest stages of the response to an incident.

13. Dr Nick Gent from PHE told us that the ECOSA mechanism had been developed following recognition that there was a need to fill a "gap in providing science services to firstline responders" which previously existed between an incident taking place and other more formal scientific advisory systems being set up.[26] In 2016 a Public Health England review of processes for scientific advice delivery to first responders had led to a "relaunch" of ECOSA,[27] although we heard that in practice this was more of a formalisation of the existing process.[28]

14. The ECOSA mechanism also exists to ensure that responders do not receive conflicting advice from different sources. Dr Cerys Rees from DSTL explained that, without ECOSA, "the danger is that [PHE] may give different answers from a health perspective from the ones that perhaps [AWE] and DSTL would give from a scientific perspective. It is about making sure that we do not give slightly different advice for different reasons and making sure that we have coordinated and given the correct information, as one".[29] Dr Gent described the work of ECOSA as a "bridging first response, augmenting first response and making sure that the national and local definitive services start with good briefings and clean handovers".[30]

22 Home Office (CBR 17) para 50
23 Home Office (CBR 17) para 46
24 Q219
25 Q132 [Dr Rees]
26 Q105 [Dr Gent]
27 Home Office (CBR 17) table
28 Q113 [Gary Butler]
29 Q114
30 Q107

15. We learned that ECOSA exists only until a Scientific and Technical Advice Cell (STAC) can be established for the incident,[31] which comprises local bodies involved in responding to the incident and national experts who can continue to provide advice. At this point, ECOSA is stood down, and a handover procedure is followed to brief the STAC.[32] Dr Gent described how science advice is provided by different groups during the early stages of a response to a CBRN incident and the timescales involved:

> If we imagine a timeline from an incident occurring, we have the first responders being deployed to an incident, and they then use the training they are given in the response. There is a lot of operational response guidance and training given to them, but it is an automatic response. If they recognise that there is something outwith their training and understanding, they can then call off, using conventional telephone systems or any other communication systems, science advice […] The first scientific adviser and senior medical adviser would be online to those first responders within minutes. The whole coordinated group of science adviser services that cover all three agencies [i.e. ECOSA] comes together in the next 10 to 20 minutes, and that bridges the gap until the formal advisory structures that sit in rooms and provide facetoface advice come together in the one, two or three hours after that.[33]

16. We asked representatives of the constituent parts of ECOSA how this mechanism compared to those in other countries. Dr Gent (PHE) told us that the degree of integration between the ECOSA bodies and with law enforcement services was "quite remarkable and unusual".[34] Similarly, Dr Rees (DSTL) told us that:

> The thing that works well in the UK is that all the organisations involved are relatively small and are able to communicate with each other on a regular enough basis that the advice is coherent. There are also only three agencies involved. The complication in some other countries may be that there is such a vast number of agencies involved in responding to different types of incidents that it can be very difficult to ensure coherence. Certainly, from the US perspective, the US looks at the UK as a really joinedup response, mainly because we are so small and there is one agency for each type of response.[35]

The need to work across national borders

17. Our attention was also drawn to the importance of ensuring that national borders within the UK do not impede the provision of science advice in emergencies. The ECOSA mechanism includes Public Health England (PHE) but not its equivalents in other nations. This means it is incumbent on PHE to ensure that suitable connections are made with other health bodies in Scotland, Wales and Northern Ireland.

18. Dr Gent confirmed that ECOSA would still be triggered if the incident was located in Scotland, for example,[36] and explained that:

31 Q111
32 Q107 [Dr Gent]
33 Qq106–7
34 Q186
35 Q186
36 Q138

> We promise to provide the same service that we provide anywhere in the UK if an emergency service in Scotland asks for it, but we would also make sure that we called our equivalent colleagues in Scotland to make sure that, where they wished to take the lead and where they wanted support from us, it was given. They take the responsibility for saying what they want from what we can offer, but we make that available and there are no issues, boundaries or borders around that. We just say we are there and available: "How can we help?"[37]

We probed this further with representatives of Health Protection Scotland during our visit to Glasgow, where we heard that coordination with PHE was working well, and that the creation of a Scotland-specific form of ECOSA would risk disrupting coordination of advice (see Annex).

Testing

19. Thankfully, the UK has not yet experienced an event of the nature that would require an ECOSA response.[38] However, Dr Gent explained that "probably two or three times every quarter" the three ECOSA agencies will undertake some coordination of activity in order to respond to a request for advice,[39] and individual agencies provided advice frequently. Dr Rees told us that DSTL was called upon for advice "on a weekly basis".[40]

20. The ECOSA bodies participate in exercises organised by the Home Office and the police.[41] However, Andy Bell from the Chief Fire Officers' Association told us that the process for accessing science advice was "not as well tested as it should be", and that "we should focus a little bit more, when we are doing these types of exercises, on testing the scientific advice".[42]

21. **ECOSA is a relatively new mechanism that has not yet had to react to an emergency. *We recommend that future exercises and practice scenarios for CBRN and Hazmat incidents include 'live' unscheduled drills which test the speed and effectiveness of the provision of science advice at all levels and stages of the response, including ECOSA. Scenarios should also test how these mechanisms would function during emergencies that cross national borders within the UK.***

STACs and SAGEs

22. The Home Office explained that, according to the nature of the situation, ECOSA may "morph" into Scientific and Technical Advice Cells (STACs), and that these can subsequently provide expertise for the Scientific Advisory Group for Emergencies (SAGE), if it has also been activated.[43] The distinction between these groups, drawn by the Home Office, was that ECOSA provides immediate advice to responders, while STAC provides

37 Q137
38 Q158 [Dr Rees]
39 Q154
40 Q157
41 Q120 [Simon Earwicker], Q155 [Dr Gent]
42 Q35
43 Home Office (CBR 17) para 46

"wider advice on consequence management" and SAGE provides national level advice to the Cabinet Office emergency committee (known as 'COBR' or 'Cobra', with the Scottish Government Resilience Room (SGoRR) as the equivalent in Scotland).[44]

23. Dr Gent from Public Health England described how ECOSA, STACs and SAGE would interact in an emergency and their different areas of focus:

> The SAGE group is the principal group, usually chaired by the Government Chief Scientist or the Chief Medical Officer, that advises the ministerial meetings or senior officials meetings sitting in the Cabinet Office briefing rooms—the Cobra mechanism—about the science picture. They do a certain degree of peer review of the science technology adviser system that operates at local level, and they also have a role in dealing with areas of science where there may be a degree of uncertainty. The local systems will deal with the knowledge, the bestknown science and the best already promulgated advice about how to manage things, but when things start to be unusual, the SAGE group is a higher level in terms of strategic management but they can also call on science resources that are unique and unusual, and coordinate those nationally. […] A good example of where SAGE would have come in would have been, for instance, around the time of Fukushima where we were dealing with complex questions about exposure, pathways of exposure, risks in the food chain, what is a tolerable degree of risk and that kind of thing, whereas a STAC group might meet around, for instance, a fire at a local chemical factory where the chemicals are very well defined.[45]

Ensuring clarity for local resilience forums

24. Reflecting the distinction between CBRN and Hazmat, which we discussed in Chapter 1, we encountered some confusion about whether ECOSA was activated only as a response to malicious CBRN incidents or whether it could be called upon during a Hazmat emergency (or, indeed, if an equivalent mechanism existed for non-terrorist scenarios). A Home Office leaflet from September 2013 describes the role of ECOSA in terms of "malicious" CBRN incidents and "CBRN terrorist incidents".[46] Christopher Abbott from the Emergency Planning Society said that "DSTL and AWE very much focus on scientific advice around CBRN terrorism and the use of CBRN materials in that sort of way, because that is what their business is about".[47] This was confirmed by Simon Earwicker from DSTL.[48] However DSTL later added that in practice it was "unlikely that ECOSA would refuse to respond" to a Hazmat incident if the ECOSA organisations "had the necessary expertise to assist".[49]

25. We were also told that the ECOSA service was "not well advertised" and is not referred to in the Government's guidance on emergency preparedness,[50] the Cabinet

44 Home Office (CBR 17) para 45
45 Qq108–9
46 Home Office, *Malicious Chemical, Biological, Radiological or Nuclear (CBRN) incidents: Emergency Coordination of Scientific Advice (ECOSA)* (September 2013)
47 Q9
48 Q146
49 DSTL (CBR 26)
50 Cabinet Office, 'Emergency Preparedness', accessed 7 March 2017

Office's Emergency Response and Recovery guidance,[51] or the Lexicon in which CBRN is defined[52]—presumably as a result of these documents not having been updated since the relaunch of ECOSA (paragraph 13). A basic search of the gov.uk website for 'ECOSA' currently produces no results.

26. James Webster from the Staffordshire Civil Contingencies Unit suggested that, from the perspective of a local resilience forum, "It would be helpful to have a road map that sets out what information is available on a national level, how we go about accessing it and where we get it in an emergency".[53] He suggested that

> It would make our life easier if it was effectively a one-stop shop. If, as a local planner doing our CBRN and Hazmat plan, we can go to a single agency that has all the suites of guidance documents, sits across government and has all the specialists and everything in one place, we can say, "We have this particular chemical. What do we do?" If we are planning for a chemical site that has just come online, we can say, "What do we do with this?" or "We have a biological risk. Where do we go?" If it is one place, it makes our life much easier and more efficient.[54]

The Staffordshire Civil Contingencies Unit suggested that "the use of a single repository for advice and guidance would allow responders to access this information in one place, wherever it was produced".[55] They pointed us towards Resilience Direct[56]—a secure Cabinet Office website that provides document storage and information for the resilience community—as a possible home for this.[57]

27. **It is important that local resilience forums are clear about what scientific support is available to them to support planning and response to CBRN and Hazmat incidents, including how that might be different for each type of emergency. *The Government should investigate whether there is sufficient clarity amongst all LRFs and how this could be improved—such as by assembling all of the relevant information in the Resilience Direct secure website. In particular, the Government should clarify whether the ECOSA mechanism should only be used for scenarios with suspected malicious intent (and consequently what routes are available for securing advice in relation to Hazmat incidents), or whether the service can be used more generally.***

51 Cabinet Office, *Emergency Response and Recovery* (29 October 2013)
52 Gov.uk, 'Emergency responder interoperability: lexicon', accessed 17 January 2017
53 Q7
54 Q20
55 Staffordshire Civil Contingencies Unit (CBR 21)
56 'Guidance: Resilient communications', Cabinet Office, accessed 13 March 2017
57 Staffordshire Civil Contingencies Unit (CBR 30)

Box 1: Case study: the Fukushima SAGE

Several witnesses drew on the example of the UK's response to the Fukushima incident in 2011 to illustrate the strengths and weaknesses of the SAGE mechanism in the context of the release of CBRN materials (although under the current definitions the Fukushima disaster is not considered to be a CBRN incident).

On 11 March 2011 an earthquake struck the east coast of Japan. The earthquake, and the associated tsunami, resulted in a loss of electrical power and cooling function at the three operating reactor units at the Fukushima Daiichi nuclear power station. Despite the efforts of operators at the plant to maintain control, three reactor cores overheated, and radionuclides were released from the plant to the atmosphere and the sea.[58] In the UK, a SAGE was established to provide advice to the Government on the safety of British nationals in the area and how the radioactive material was expected to spread. A summary of the incident on the Government's website explains that:

> SAGE came to a unanimous view that, given the fuel held at Fukushima, there was no need for UK nationals to evacuate areas outside the exclusion zone recommended by the Japanese Government. This advice was felt to be appropriate even in a reasonable worst case scenario. Modelling results indicated that outside the exclusion zone, even in this worst case, the risk to human health could be managed by precautionary measures, such as staying indoors to avoid exposure, iodine tablets would also be helpful, notably for infants and pregnant women. The Government put in place precautionary advice to leave an area within 80 km of the plant on 17 March and SAGE were content at this additional level of precaution.[59]

Dr Gent of Public Health England explained how a range of bodies provided scientific input to the Fukushima SAGE, covering contamination, dispersal and health risk:

> The principal scientific advice about the risk to British nationals in Japan, and more widely through foodstuffs and transmission through transport systems, was given by the Atomic Weapons Establishment and Public Health England. The Atomic Weapons Establishment and the Office for Nuclear Regulation could obtain information about the materials that had been released. Using the Met Office and others we could get dispersal patterns, so I was getting predictions about what materials would be deposited that people would be exposed to. My scientists in Public Health England were turning that into exposure information as to what degree of radiation exposure British nationals were getting in, say, Tokyo, or whatever, and what the contamination routes were into food and foodstuffs. We were turning that into human risk, and also into human messaging so that we could advise people in Japan and people who had an interest or were travelling to and from Japan what that meant to them in terms of hazards to their health.[60]

58 International Atomic Energy Agency, *The Fukushima Daiichi Accident: Report by the Director General* (August 2015)

59 '*The role of science advice in planning and responding to a major emergency*', Government Office for Science website archived at 5 July 2013

60 Q151

He told us that the same processes would operate if a similar incident were to take place in this country, and that exercises are undertaken to test this at a range of levels.[61]Dr Dame Sue Ion, Chair of the Nuclear Innovation Research Advisory Board and a member of the SAGE set up for the disaster, recalled that:

> At that time all the right people were drawn in very quickly from our National Nuclear Lab, our regulator, the ONR, the Health Protection Agency, as it was then, the Met Office and known key individual experts and UK academics like Robin Grimes, who subsequently became [Chief Scientific Adviser to the] Foreign Office, and Professor Andrew Sherry. The right experts were all drawn together to enable the advice to be discussed with the [Government] Chief Scientific adviser—at the time Sir John Beddington—and passed onward to COBRA.[62]

Dame Sue summarised the impact of SAGE's work for the Fukushima disaster:

> Our Prime Minister was able to give advice to the embassy in Japan not to evacuate anybody from Japan who was a UK national. Our ambassador stood in front of Japanese television and said he was staying put and so was his family, because it was safe to do so. That was a huge thing. Some other nations did not take the scientific advice they were given, and evacuated, although the scientific advice, whether it was in France, the United States or here, was common; it was that there was no need to evacuate.[63]

Dr Edward Sykes of the Science Media Centre highlighted the "Fukushima bounce" observed in the UK after the incident—an increase in support for nuclear power in this country, in contrast to other countries where support was diminishing "because the media were getting even less evidence into their stories and the public were being misinformed".[64] However, Dr Sykes also complained that "there was not as much information coming out from Government Departments as we would have hoped, and hopefully that is something we can learn from".[65] This issue is explored further in Chapter 4.

Dame Sue Ion argued that the work of the Fukushima SAGE showed the importance of long-term investment in "national capability":

> In the nuclear world, many of the subject-matter experts available for Fukushima had their genesis in research 20 or 30 years ago when we had much bigger national labs in that area, so one of the things we need to be careful about going forward is not to diminish that national capability so that you actually can have subject-matter experts.[66]

61 Q152
62 Q74
63 Q97
64 Q93. See also Nuclear Industry Association (CBR 7) paras 8–10.
65 Q93
66 Q88

3 Use of science in planning and responding

The National Risk Assessment

28. Under the Civil Contingencies Act 2004, the Government has a duty "to assess, plan and advise" for emergencies. One way in which the Government exercises this duty is through its National Risk Assessment (NRA) process; a classified appraisal of the most significant emergencies (malicious and non-malicious) that people in the United Kingdom could face over the next five years. The public version of this is the National Risk Register,[67] an unclassified version of the National Risk Assessment, which is published every two years[68] to assist individuals, communities and local commercial organisations in their planning.

29. During our inquiry we learned that there is an even higher level of planning above the classified National Risk Assessment, which was also constructed with scientific advice. The Home Office told us that:

> In addition to the NRA, the Home Office owns a document (marked at a higher classification) that contains a wider range of CBRN scenarios than depicted in the NRA. It draws upon scientific expertise across the CBRN community to generate a more comprehensive (covering more scenarios) source of scientifically evidenced data to support planning and exercising across the CBRN community.[69]

30. We were pleased to learn that a CBRN expert group exists to provide advice for the National Risk Assessment, including in relation to behavioural science.[70] The group comprises named individuals from the ECOSA organisations (Public Health England, the Defence Science & Technology Laboratory, and the Atomic Weapons Establishment), alongside academics with relevant expertise.[71] Understandably, the Government cannot publish details of the membership for security reasons.[72]

The use of science in the Government's response framework

31. The Home Office told us that a new CBRN Response Framework had been produced in 2014, which was "firmly based on the scientific evidence available and the principle of value for money".[73] The Home Office explained that "updated scientific evidence" had led to a number of significant evidence-based changes to the approach, including:[74]

- Development of "evacuation and disrobe" as a response (i.e. removing outer layers of clothing) on the basis of evidence emphasising the importance of speed of decontamination;

67 Cabinet Office, *National Risk Register of Civil Emergencies 2015 edition* (March 2015)
68 Q201
69 Home Office (CBR 17) para 14
70 Q206 [Paul McCloghrie]
71 Qq 207–8
72 Home Office (CBR 28) para 4
73 Home Office (CBR 17) para 30
74 Home Office (CBR 17) para 31

- A move away from 'wet decontamination' (i.e. using water to wash away decontaminants), on the basis that "research has indicated that dry decontamination performed immediately (using any available absorbent material to wipe away the decontaminant) may be beneficial where the chemical is non-caustic".[75]

- Changes in police use of personal protective equipment and the position of cordons—since "new modelling on expected contamination levels shows that in most circumstances by the time fully protected police in CBRN personal protective equipment could set up a cordon most contaminant would have dispersed or settled".[76]

32. We were told that these changes were informed by research commissioned by the Department of Health and Public Health England, including the ORCHIDS project (Optimisation, through Research, of Chemical Incident Decontamination Systems) and EDICTAS (Emergency Decontamination In Clinical Treatment At Scene),[77] as we discuss below.

Moving away from 'wet decontamination'

33. The Institute of Physics and Engineering in Medicine told us that the new advice to use dry decontamination was "mainly based on chemical events and not radiological or biological. Common consensus would be that damp (wet wipes or wet sponge) or wet decontamination is better for radiological casualties, however this was not reflected in the updated [Initial Operational Response]".[78]

34. Dr Nick Gent from Public Health England explained that "the absolute ideal" approach to decontamination was to "remove all clothing and wash people down using warm water, detergent and a washing aid like a flannel or a sponge". However, he argued that this was "a counsel of perfection" and that waiting for full wet decontamination equipment could result in delays of one or two hours, which was "undesirable, particularly if people were injured".[79] He told us that research had been conducted to identify the relative importance of different contamination strategies:

> For instance, how effective was just removing an outside layer of clothing? To be honest, that is very good and we tested it by putting simulants on to people—simulants they could not see, that only showed up in ultraviolet light—and asking them to do decontamination steps, such as simply removing clothing, then photographing them under ultraviolet light to determine quantitatively how much material had been removed. We looked at that and we looked at simply dry decontamination—removing things, brushing things down—and the use of absorbent materials to remove liquid contamination, how good and effective they were, and at simple showering,

75 Home Office (CBR 17) para 31
76 Home Office (CBR 17) para 31
77 Home Office (CBR 28) paras 17–20. See also Public Health England (CBR 29) for further description of these and other projects.
78 Institute of Physics and Engineering in Medicine (CBR 15) para 16
79 Q165

> such as just hosing down without detergent being used. We quantified all these things. We now have what we call an Initial Operational Response, which is what needs doing quickly at the scene.[80]

35. Dr Gent also indicated that the full picture of what research showed to be the best approach was not necessarily publicly available due to security concerns:

> There is a literature that is in part open, because there is a certain element about national resource and national capability that is of use to our first responders, but also to people who might want to perpetrate attacks. There is a certain amount of the literature and some of the science detail behind it that is not public, but I am privy to all of it and I am confident that we know as much about the methods of decontamination and their effectiveness as we can, but we are continuing to research.[81]

Reducing mass decontamination resources

36. The Home Office told us that "in line with value for money principles" there had been "reductions in Mass Decontamination resources and trained equipped police, without reducing the effectiveness of the response". The Emergency Planning Society argued, however, that "the ORCHIDS Project never examined the decontamination of hair, so it was an insufficient evidence base to make decisions".[82]

37. When we asked Dr Gent whether this was a significant criticism he told us that:

> There is always a level of additional scientific research that you can do. In terms of hair, it is not something that I feel or find is a particular issue, because it is an area of the body that we can manage straightforwardly.[83]

He later added that "UK studies have not as yet looked at additional dry decontamination steps to specifically remove material from hair", but further research is underway to examine "optimal sequencing of decontamination methods and additional dry and/or wet decontamination methods for head hair".[84] Andy Bell of the Chief Fire Officers' Association told us that he was confident that the science behind the reduction in capability was sound, and that from the perspective of the fire service "what we have left is more than adequate to meet the type of incident addressed within the planning assumptions".[85]

38. The Minister for Security, Ben Wallace MP, told us that there was a need to be pragmatic with the distribution of resources in this context:

> We have to be honest with the public that we cannot cover every eventuality in every square centimetre of this United Kingdom. We are informed by intelligence and we are informed by risk, not just in the kind of chemical or

80 Q166. Quantification is provided in Public Health England (CBR 29): "the effectiveness of disrobing alone has been estimated to remove 90% of contamination".
81 Q171
82 Emergency Planning Society (CBR 8) para 24
83 Q175
84 Public Health England (CBR 29)
85 Q12

> biological scenario but in all other terror scenarios. It is my responsibility, the Home Secretary's and the Prime Minister's, to have to say, "Here but not here," or, "This service here but not there." That is what we have to do.[86]

39. **We heard some criticisms of the use of science in the Government's updated response framework for CBRN events. However, it appears to us that in introducing changes the Government is making use of the evolving scientific evidence in a pragmatic way.**

Detection and modelling

40. We received information on the use of science in detecting CBRN materials and predicting how they are expected to spread during an incident. For instance, as our predecessor Committee noted during its inquiry into science in the Met Office, the Numerical Atmospheric-dispersion Modelling Environment (NAME) is used in the context of CBRN and Hazmat incidents to predict how material will be dispersed in the atmosphere and on the ground.[87] We heard that the Met Office also provided weather scenarios for training events, and could run dispersion models to inform them.[88]

41. We heard that "joint agency modelling" was connecting models such as NAME with those used by other agencies to improve understanding of how events might unfold.[89] However we were also told that better use could be made of the expertise in the national laboratories—the National Nuclear Laboratory and the National Physical Laboratory (NPL) and others.[90] We heard that it was important for these bodies to making working together routine in order to prepare for an event involving multiple types of dangerous materials.[91]

42. The NPL explained that a network of Geiger-Müller tubes known as 'RIMNET' (Radioactive Incident Monitoring Network) provided a radiation monitoring system for the UK.[92] However, the NPL warned that currently RIMNET could only provide limited information in the form of count rates rather than identify the material or its origin, with a corresponding difficulty in determining what the response should be. The NPL is discussing with RIMNET how this system should be upgraded,[93] and has recently developed a mobile "lab in a van" to aid with detection and analysis of radiological threats:

> If there is a radiological incident, or something goes up on RIMNET that gives a signal and you do not know what the radiation is, rather than having to go up there, take samples and take them back to the laboratory, there is a fast response laboratory with spectrometric detectors and state-of-the-art

86 Q251
87 Science and Technology Committee, Thirteenth Report of Session 2010–12, *Science in the Met Office*, HC 1538, para 50
88 Q82 [Phil Evans]
89 Q84 [Dr Ion]
90 Q76 [Dr Ion]
91 See Dame Sue Ion (CBR 22). Preparation for events involving a combination of incidents was also highlighted by the Royal Society of Edinburgh as an area for further attention, see (CBR 19) para 6.
92 National Physical Laboratory (CBR 9) para 5
93 National Physical Laboratory (CBR 9) para 6. See also Met Office (CBR 24).

> radio chemical separation devices in it. The idea is that you drive it up there and it takes hours, not four weeks, to get radiological measurements and numbers from such an incident.[94]

Investment in R&D

43. We asked the Home Office to provide figures for its research and development expenditure in relation to CBRN. The data they provided showed a significant decline in spending in recent years (see Table 1). Alongside its direct investment in R&D, the Home Office highlighted its investment in a range of other programmes which provide scientific support for CBRN preparedness, including laboratories offering analytical capability and detection facilities.[95] The Minister told us that the research programmes included "making sure that the fire and police services invest in the right kit and that we make sure that that kit is maintained, as well as DIM kit—detection, identification and monitoring equipment—and making sure that is up to speed, modern and capable of doing the job it is supposed to do".[96] Relevant research also takes place in other departments such as the Ministry of Defence, DEFRA and the Department of Health, which is "designed to support independent research programmes to develop capabilities or fill knowledge gaps relevant to their specific responsibilities within the overall Government response".[97]

Table 1: Home Office Science and Technology R&D expenditure on CBRN

2013/14	2014/15	2015/16	2016/17 (expected)	2017/18 (expected)	2018/19 (expected)
£1,456,056	£815,640	£560,683	£550,000	£550,000	£550,000

Source: Home Office (CBR 28) para 2

44. The Minister explained that Home Office research programmes were often demand-led, and could be triggered by gaps identified during one of the regular exercises to test response capability,[98] or by a focused review:

> For example, we constantly review the process in which we respond and the anticipated needs of people affected. When we look at decontamination times and limits, that will trigger us, effectively, to commission scientific advice.[99]

Maintaining expertise

45. Several of our witnesses thought that the future supply of people and expertise was currently a bigger issue than gaps in the relevant CBRN or Hazmat research. Phil Evans, the Government Services Director at the Met Office, told us that:

> Although there is not a particular area of research that I would say is lacking […] there are some potential issues about the availability of people with the

94 Q40 [Professor Regan]
95 Home Office (CBR 28) para 3
96 Q190
97 Home Office (CBR 17) para 18
98 Q197
99 Q196

> right skills and expertise. We have to do an awful lot of in-house training for people who work in [dispersion modelling]. It is a broader point about capability.

Witnesses from DSTL, AWE and PHE acknowledged that retention of expertise was an issue in their organisations,[100] and Dr Gent described how these challenges affected Public Health England:

> The problem is that we then have some very highly desirable people, and there are other organisations out there that will aggressively recruit them and can offer terms and conditions of service that we cannot match. It is a particular problem, for instance, with mathematical modellers, scientists and computer people; they are a very good example. We recruit some absolutely superb people, but retaining them against the offers they get from outside, with their knowledge, experience and ability, is difficult.[101]

Dr Dame Sue Ion, Chair of the Nuclear Innovation Research Advisory Board and a member of the Scientific Advisory Group for Emergencies (SAGE) set up for the Fukushima disaster in 2011 (see Box 1), warned us that:

> The UK was only able to mount the excellent response it did in the aftermath of Fukushima because of expertise grown over 6 decades of continuous investment in applied research. Many of the subject matter experts involved have since retired and a pipeline of targeted applied research investment has yet to emerge following two decades of stagnation.[102]

46. Dame Sue explained that GO-Science maintained a register of experts who can be called upon to join a SAGE during an emergency.[103] More broadly, she highlighted "the importance of nuclear engineering expertise and know-how, not just the scientific elements" in the context of providing advice during an emergency.[104] She explained that:

> In many instances, engineering is key to understanding how events might unfold in the case of a problem with a facility, and I suspect that would be true of chemical and biological facilities as well as nuclear facilities. It is not just about the science; it is about engineering barriers and general facility engineering and understanding the hazards and risks as events unfold. One of the benefits at Fukushima was having access to people who understood how those types of reactors in Japan worked and what the consequences were likely to be. Having access to industry in a SAGE environment, as well as academic expertise, is important and potentially could be improved.[105]

The Minister acknowledged similarly that "engineers are probably more in the capability solutions, I would probably say, than they are in assessing the scientific advice".[106]

100 Q183
101 Q182
102 Dame Sue Ion (CBR 22)
103 Q73
104 Q78
105 Q78
106 Q230

47. ***Effective science advice for a CBRN or Hazmat emergency relies on the ongoing availability of such expertise within the UK. The Government Office for Science should review its list of experts that can be called upon during an emergency to check where gaps are likely to emerge as individuals retire, and determine whether suitable experts will be available in these fields to replace them. It should also consider whether the available expertise includes sufficient specialists with CBRN-relevant engineering and industrial experience and ensure that the need for this expertise is considered when determining the membership of a SAGE.***

4 Communicating science to the public during a CBRN or Hazmat emergency

48. While the focus of our inquiry was the use of science *by the Government* in the context of incidents involving CBRN materials, we also explored the related issue of communication of science to the public during such an emergency, including through the media. Many of the issues here intersect with those we have been exploring through our separate inquiry into *Science communication and engagement*.[107]

Education in anticipation of incidents

49. The Home Office told us that "most communication plans are drawn up to assist in the circumstance that an emergency occurs, rather than being pro-active plans designed to help educate the public in advance of an event which might be highly unlikely".[108] There are some exceptions to this, however. Information on how to respond to nuclear incidents is issued routinely by nuclear facilities to local residents, as required by the Radiation (Emergency Preparedness and Public Information) Regulations 2001, referred to as REPPIR.[109] Similarly the Control of Major Accident Hazard Regulations 2015 (COMAH)[110] places requirements on sites holding various hazardous substances to provide information on these dangers to the public in the local area[111] and guidance on how to respond in an emergency.

50. We asked our witnesses whether there was a need to educate the wider public about CBRN and Hazmat risks in advance of an incident occurring, beyond those living in areas covered by these regulations. Andy Bell, representing the Chief Fire Officers' Association, explained that:

> There are almost two schools of thought. We can try to educate the public further. There has always been Government concern that that raises concerns among the public that do not need to be there. We can do it that way, but then you are open to how people interpret that information and how well they understand it. I would much rather give the information at scene to the affected people, because then it is clear, consistent advice to them based on the situation they find themselves in. There is obviously some value in the pre-emptive thing, but there are some dangers as well, in that pre-education can be misinterpreted.[112]

51. In contrast, Professor Paddy Regan from the National Physical Laboratory advocated greater investment in public understanding of topics such as radiation in advance of an incident occurring, since:

> a large amount of public fear can spread over things that may have no real health risk for the public […] A very simple example is the NHS hotline

107 Science and Technology Committee, Eleventh report of Session 2016–17, *Science Communication and engagement*, HC 162
108 Home Office (CBR 17) para 25
109 Radiation (Emergency Preparedness and Public Information) Regulations 2001 (SI 2001/2975), regulation 16
110 Control of Major Accident Hazard Regulations 2015 (SI 2015/483) regulations 17–18
111 Known as the Public Information Zone—see Home Office (CBR 17) para 43.
112 Q28

> set up after the Litvinenko inquiry. They said, "If you are worried that you might have had exposure to polonium 210, call the NHS hotline." They had 10,000 phone calls, which presumably blocked the NHS hotline for everything else. The reality is that the radiological risk to almost any other individual from that was zero—minimal—so the fear of radiation rather than the scientific underpinning of it probably needs to be dealt with".[113]

Similarly, Dame Sue Ion warned that:

> Unless more is done to correct the misunderstanding and lack of knowledge on radiation and its potential impact (or rather lack of impact) in the general populace, and indeed in a number of politicians and policy-makers, there is a real danger of unnecessary stress and concern and wrong actions following a nuclear event were one ever to occur.[114]

Professor Wade Allison of the University of Oxford argued that:

> The commonly held view that radiation is exceptionally dangerous has been sustained by: a) residual memory of Cold War threats; b) unfamiliarity with the broad role of biology; c) a taste for the more exciting stories of accidents offered by the media; [and] d) the guidance offered by a network of international safety committees that prefers caution to scientific evidence.[115]

52. To deal with incidents that have occurred, Andy Bell assured us that the Fire Service had undertaken "a significant amount of work with communications experts and behavioural scientists to develop communications advice we would use immediately at scene".[116] The Service was not, however, "doing preemptive education of the public—that is obviously a Government policy decision that was considered previously and not taken forward—we have worked hard to make sure that we can provide appropriate advice at scene quickly".[117]

53. **We appreciate that this is an area of science in which providing ever more information to the public may not always be the best approach, because of the understandable desire to avoid unnecessary alarm. For the advice received during a CBRN or Hazmat emergency to be understood and interpreted by the public, however, it needs to build on a basic level of understanding of science topics such as radiation and its effects. There is more to be done to increase this level of understanding through public engagement. *The Government should commission the Government Office for Science to produce clear and simple guidance for the public for dealing with different types of CBRN or Hazmat emergency; not just in terms of the actions they need to take but also the science that underpins that advice.***

113 Q5
114 Dame Sue Ion (CBR 22)
115 Professor Wade Allison (CBR 4)
116 Q17
117 Q17

Use of the media in an emergency

54. Professor Allison argued that "The real impact of such accidents is transmitted through public opinion and the media. The damage to health is essentially social and mental—it manifests itself as public panic and a loss of confidence in science and society".[118] The Science Media Centre (SMC) believed that improvements could be made to the way in which the Government interacts with the media during an emergency. Specifically, the SMC suggested that more experts could be made available to speak to the media and that SAGE could give more attention to providing timely information to the media through changes in processes and membership.

Mobilising expertise in arm's-length bodies

55. Dr Edward Sykes of the SMC told us that better use could be made of the "hundreds and thousands of scientists" in arm's-length bodies and Government-run organisations, who "are top specialists in these areas, often ones you will not find in industry, or even in academia and the universities in quite the same way".[119] He told us that confidentiality was perceived to be a barrier to these scientists engaging with the media:

> We know of scientists who said they felt they could not speak to the media because they had signed the confidentiality provision of the Official Secrets Act and so on and were worried about what they could and could not say. They would rather not say anything in case they got themselves into trouble inadvertently.[120]

56. He also argued that official sign-off processes in these organisations were delaying responses to the media, and that there was a "massive difference"[121] between the approaches that different bodies took to requests for information during an incident:

> It is part of the culture; if you have a scientist who has to make a statement, they have to get it checked by, say their departmental press officer, and that departmental press officer has to get it checked by the senior departmental press officer and so on, and sometimes it goes three or four steps up to central government.[122] […] Sometimes you have what we class as antipress officers who have come from a sector where they have been trained almost to keep stuff out of the news, and it is about saying no to everything. If you end up having those in certain places, it puts the plug on everything, and everything becomes extremely difficult.[123]

He suggested that a "culture shift" was needed, so that "where possible, scientists should have explicit permission to speak and should be encouraged and supported, and helped through it so that the more nervous ones who are concerned about saying the wrong thing have support and advice".[124]

118 Professor Wade Allison (CBR 4) para 4
119 Q77
120 Q98
121 Q99
122 Q99
123 Q99
124 Q99

57. The difference in the extent to which agencies are currently equipped to engage with the media was apparent from our questioning of witnesses from the constituent parts of ECOSA. Dr Gent told us that Public Health England had "a significant media team feeding the traditional media and social media, making sure there is advice and guidance on accessible internet sites, and bidding into media outlets if we think there is information that needs to be put out, or indeed briefing the media directly".[125] Gary Butler's view from the Atomic Weapons Establishment was somewhat different:

> Quite honestly, some of our scientists are not generally trained in publicfacing media. They would very much talk in scientific language, so we tend to defer—pass the buck, if you like—to [Public Health England] to take that very technical information and present it in such a way that the general public can perhaps have greater understanding of it. […] I do not think there is anything that says we cannot speak to the media. However, it is not something that we have ever been asked to do.[126]

58. We asked the Minister whether improvements could be made here. His primary concern appeared to be the need to manage the information produced during an emergency:

> I cannot resile from the fact that we have to have a controlled message during the middle or the initial phases of an incident. Certainly the aim of a terrorist attack is to spread panic, terror and confusion. We have to make sure that we do our best, that the advice given and the police type of advice is consistent and sticks to what [responders] think is the best way forward.[127]

We heard similar perspectives from Sir Mark Walport, the Government Chief Scientific Adviser, during our *Science communication* inquiry:

> One does not want too much of a running commentary from all sorts of different voices. We are very clear that in the context of the SAGE—the Scientific Advisory Group for Emergencies—when we have external experts we encourage them to communicate, but not to use confidential information that they have acquired during the context of the national emergency. One needs to be practical and pragmatic during an emergency. You want sensible voices, you want people to be able to communicate but not to be managing an emergency through a megaphone.[128]

59. The Home Office later told us that:

> Communications with the public are a vital part of both the Initial Operational Response and the Specialist Operational Response […] The Fort Invicta exercise in November 2015 (a chemical attack) showed the need for good communications with the media not least in combatting misinformation. This is being further developed.

125 Q163
126 Qq161–2
127 Q238
128 Oral evidence taken on 16 November 2016, HC 162, Q265

Communication from SAGE

60. Dr Sykes from the Science Media Centre believed that members of a SAGE were not being given explicit permission or encouragement to speak to the media, and that:

> As a result, you end up having a top level of scientific expertise carved off and lost to the public, because understandably they are having meetings but not sharing that information with anyone apart from Government. That in itself is not necessarily entirely problematic, but the information from them is not then coming out elsewhere.[129]

In contrast, Paul McCloghrie from the Civil Contingencies Secretariat told us that the Chair of SAGE "often tells the members who have been pulled together that, while they should not talk about the discussions that happen in the meeting, that should not stop them talking to the media about their areas of expertise and how they relate to a certain incident. It is not a blanket, 'You do not talk to the media'."[130] Similarly, Dr Dame Sue Ion, a member of the Fukushima SAGE (see Box 1), recalled that:

> As far as speaking to the press was concerned, the advice we got at the time was, "Provided you do not relate what you are saying to SAGE, and you are giving your professional opinion, please respond to what the media are asking for"; otherwise, if you have taken out those the media know to be your top experts and there is radio silence, suspicion builds. It is possible to give dispassionate advice and talk to the media without compromising your position on SAGE.[131]

61. More broadly, Dr Sykes told us that the approach taken to communication by previous SAGEs had varied according to the emergency—some had engaged with the media well, but others had not:

> For example, during swine flu Liam Donaldson was giving briefings every week—almost every couple of days—and every time he put packages of information together on what SAGE were doing, it was shared with lots of people. Journalists had lots of opportunities to speak to experts and the information was coming out. […] That was one example where it went very well […]
>
> When it comes to things such as Fukushima, it is more difficult. I believe the Government were basically asking the experts to advise them as a priority, and not to think about advising the public.[132] […] There were about 40 or 50 scientists we were working with day in, day out to try to get their voices heard, but there was not as much information coming out from Government Departments as we would have hoped, and hopefully that is something we can learn from.[133]

129 Q77
130 Q236
131 Q95
132 Q93
133 Q93

62. To tackle this, Dr Sykes proposed that an independent scientific press officer could be included as a member of a SAGE in order to provide advice on how best to interact with the media and to ensure that communication was considered as part of the process of providing scientific advice to the Government. He argued that "If there is someone thinking about the media at the same time as lots of people are thinking about how to advise Government, the information will get out in a much better way".[134] Dr Sykes gave us some examples of press officers who "understand the scientific issues and how the media work" and who could be called upon to participate in a SAGE in this role.[135] He suggested that such a press officer could also ensure that the information that arm's length bodies or third party scientists needed in order to engage with the media is made available to them.[136]

63. The Government's *Enhanced SAGE Guidance* already states that "consideration should be given to whether communication experts should be included [in the membership of SAGE] to help SAGE communicate potential complex concepts and key messages to the general public, media and policy and decision makers".[137] We asked Paul McCloghrie whether this option had been taken up for any of the SAGEs established; he told us that this was "part of the process on an ongoing basis rather than there being a member who is the communications member".[138] We did not receive any evidence of a member of a SAGE having specifically been appointed for this media officer role.

64. The Minister thought that having an independent scientific press officer as a member of SAGE was "certainly a good idea". However, he drew a distinction between "the 'Go home, be safe and don't do this' message" in the earliest stages of an emergency—which the emergency services would "own"—and the more general engagement with "the 24-hour news cycle" during an incident.[139] He summarised that:

> One of the jobs of whoever is chairing Cobra is to make sure there are no confusing communication lines […] I think scientific advice is very important, and we must make sure we get approved people to say things, without controlling what they say—people who are accredited or have the respect of the community.[140]

65. We concluded during our inquiry into *Science in emergencies: UK lessons from Ebola* that "Communication with the public is one of the most important aspects of any emergency or crisis situation".[141] We recommended that the evidential basis for interventions during an emergency should be communicated clearly to the public, "especially if [the advice] goes against established guidance from trusted advisory bodies".[142]

134 Q96
135 Q96
136 Q77
137 Cabinet Office, *Enhanced SAGE Guidance: A strategic framework for the Scientific Advisory Group for Emergencies (SAGE)* (October 2012), para 41
138 Q237
139 Q236
140 Q237
141 Science and Technology Committee, Second Report of Session 2015–16, *Science in emergencies: UK lessons from Ebola*, HC 469, para 78
142 Science and Technology Committee, Second Report of Session 2015–16, *Science in emergencies: UK lessons from Ebola*, HC 469, para 79

66. **Communicating accurate science to the public in the event of a CBRN or Hazmat incident is an essential part of the response. There are concerns that media access to informed government scientists is not always possible, and that there is a 'cultural difference' between agencies as to whether their experts should speak to the media.** ***The Government should develop advice to its agencies to ensure that the media can be provided with informed science voices during an incident. The need to provide timely and accurate information to the public and the media could in itself be a prompt for setting up a SAGE.***

67. **The Government's existing SAGE guidelines include a provision for a press officer as a member of SAGE, but it appears that this has not been taken up when a SAGE has been activated. It is understandable that meeting the media's demand for expert spokespeople may not naturally be the first priority for a SAGE in providing science advice to the Government, but it is clear that the media also need to be able to access good science during an incident. We have concluded previously—in our Ebola inquiry—that it is helpful for the public to be provided with the evidence behind the advice that it receives during an emergency.** ***We endorse the recommendation made by the Science Media Centre that all future SAGEs should include a dedicated independent scientific press officer to ensure that the communication of science to the public is as good as it can be during an emergency. This member of SAGE could ensure, for instance, that other members engage with the media direct, and that information is quickly cascaded to other scientists to support their own engagement.***

Conclusions and recommendations

Introduction and definitions

1. A distinction between deliberate 'CBRN' incidents and accidental 'Hazmat' releases of the same materials may leave grey areas in between, which could lead to confusion or affect the mechanisms which planners can access. It is important that definitions do not stand in the way of organisations receiving science advice that is relevant to the emergency in question, however it is described. *We recommend that the Government consult further with Local Resilience Forums regarding these definitions and explore how any ambiguities could be resolved—such as by referring simply to 'malicious CBRN' incidents and 'non-malicious CBRN' incidents where the distinction is of any significance.* (Paragraph 10)

National mechanisms for science advice during CBRN and Hazmat incidents

2. ECOSA is a relatively new mechanism that has not yet had to react to an emergency. *We recommend that future exercises and practice scenarios for CBRN and Hazmat incidents include 'live' unscheduled drills which test the speed and effectiveness of the provision of science advice at all levels and stages of the response, including ECOSA. Scenarios should also test how these mechanisms would function during emergencies that cross national borders within the UK.* (Paragraph 21)

3. It is important that local resilience forums are clear about what scientific support is available to them to support planning and response to CBRN and Hazmat incidents, including how that might be different for each type of emergency. *The Government should investigate whether there is sufficient clarity amongst all LRFs and how this could be improved—such as by assembling all of the relevant information in the Resilience Direct secure website. In particular, the Government should clarify whether the ECOSA mechanism should only be used for scenarios with suspected malicious intent (and consequently what routes are available for securing advice in relation to Hazmat incidents), or whether the service can be used more generally.* (Paragraph 27)

Use of science in planning and responding

4. We heard some criticisms of the use of science in the Government's updated response framework for CBRN events. However, it appears to us that in introducing changes the Government is making use of the evolving scientific evidence in a pragmatic way. (Paragraph 39)

5. *Effective science advice for a CBRN or Hazmat emergency relies on the ongoing availability of such expertise within the UK. The Government Office for Science should review its list of experts that can be called upon during an emergency to check where gaps are likely to emerge as individuals retire, and determine whether suitable experts will be available in these fields to replace them. It should also consider whether the*

available expertise includes sufficient specialists with CBRN-relevant engineering and industrial experience and ensure that the need for this expertise is considered when determining the membership of a SAGE. (Paragraph 47)

Communicating science to the public during a CBRN or Hazmat emergency

6. We appreciate that this is an area of science in which providing ever more information to the public may not always be the best approach, because of the understandable desire to avoid unnecessary alarm. For the advice received during a CBRN or Hazmat emergency to be understood and interpreted by the public, however, it needs to build on a basic level of understanding of science topics such as radiation and its effects. There is more to be done to increase this level of understanding through public engagement. *The Government should commission the Government Office for Science to produce clear and simple guidance for the public for dealing with different types of CBRN or Hazmat emergency; not just in terms of the actions they need to take but also the science that underpins that advice.* (Paragraph 53)

7. Communicating accurate science to the public in the event of a CBRN or Hazmat incident is an essential part of the response. There are concerns that media access to informed government scientists is not always possible, and that there is a 'cultural difference' between agencies as to whether their experts should speak to the media. *The Government should develop advice to its agencies to ensure that the media can be provided with informed science voices during an incident. The need to provide timely and accurate information to the public and the media could in itself be a prompt for setting up a SAGE.* (Paragraph 66)

8. The Government's existing SAGE guidelines include a provision for a press officer as a member of SAGE, but it appears that this has not been taken up when a SAGE has been activated. It is understandable that meeting the media's demand for expert spokespeople may not naturally be the first priority for a SAGE in providing science advice to the Government, but it is clear that the media also need to be able to access good science during an incident. We have concluded previously—in our Ebola inquiry—that it is helpful for the public to be provided with the evidence behind the advice that it receives during an emergency. *We endorse the recommendation made by the Science Media Centre that all future SAGEs should include a dedicated independent scientific press officer to ensure that the communication of science to the public is as good as it can be during an emergency. This member of SAGE could ensure, for instance, that other members engage with the media direct, and that information is quickly cascaded to other scientists to support their own engagement.* (Paragraph 67)

Annex: Visit to Glasgow, 19 January 2017

Two members of the Committee met resilience and health officials from the Scottish Government and Health Protection Scotland at the Scottish Government's offices in Atlantic Quay, Glasgow: Stephen Metcalfe MP and Carol Monaghan MP.

The visit included discussion of matters that had arisen during the Committee's inquiry. Key points arising included:

a) *Definitions:* The distinction between 'CBRN' and 'Hazmat' incidents based on intent (as highlighted by witnesses to the inquiry) was also embedded into planning and response processes in Scotland and elsewhere in the UK. From a public health perspective, the distinction between CBRN and Hazmat is not significant as the response would be very similar; however CBRN incidents would involve bodies such as the police in a lead role. The nature of CBRN meant that identifying substances or the nature of the exposure might be more difficult, whereas in a Hazmat incident the substance is likely to be documented and accompanied by safety procedures and emergency plans.

b) *Structures for science advice:* The equivalent to COBR for the Scottish Government is SGoRR (Scottish Government Resilience Room). A SAGE would advise COBR and for Civil Nuclear emergencies the Chair of the SAGE would dial in to SGoRR meetings to provide advice. For CBRN incidents this is a working principle but has yet to be formalised. Regional Resilience Partnerships (Category 1 and 2 responders) lead on planning civil response, and are the analogue of Local Resilience Forums in England and Wales. As in the rest of the UK, local Science and Technical Advice Cells (STACs, usually health board led) provide the route for scientists and other experts to feed into the response to an incident. STACs focus on operational issues; SAGE focuses on strategic issues and provides peer review to STAC advice.

c) *Cross-border working in CBRN or Hazmat incidents:* Health policy is devolved to Scotland, and Health Protection Scotland (HPS) holds the responsibility for providing advice to those front line agencies responsible for directly advising the public in an incident response situation. Nevertheless, Public Health England (PHE) has some UK-wide functions, and also provides radiation expertise to Scotland. PHE can provide advice and support to Scotland STACs even when HPS are the main health agency involved. The Fukushima response was UK-led, and took input from HPS and PHE together. Coordination with PHE is working well.

d) *ECOSA:* ECOSA exists to coordinate scientific advice during the earliest stages of a CBRN incident; duplicating this mechanism in Scotland would risk discoordination, and thus ECOSA is expected to be used for such incidents in Scotland (although ECOSA has yet to be formally triggered). Public Health England, as part of ECOSA, would engage with Health Protection Scotland for an event in Scotland. ECOSA hands over to a STAC once the STAC has been established. A STAC would include local health bodies involved, and normally Health Protection Scotland, who would provide a link as required with other sources of expertise, including PHE. ECOSA gives advice direct to first

responders, including what protective equipment needs to be worn—without this there could be competing advice on what precautions were necessary, creating confusion and delay. Testing of responses is undertaken through participation in exercises, both 'live' and table-top. It is important to maximise learning from exercises.

e) *Public communication and education:* Communicating with the public is part of a STAC's objectives (Risk Analysis: "Risk assessment, risk management, risk communication"). Regional Resilience Partnerships include a public communications subgroup. Hazmat sites have communication plans, and some nuclear power stations issue emergency potassium iodide supplies to the nearby community as part of education and preparedness. Communication with the public in an emergency could potentially be enhanced through effective use of social media, and work was ongoing on how this could be managed. Messaging quickly through social media was made more complex by the need to ensure that (for CBRN or other malicious incidents) messages do not prejudice any future criminal proceeding, and that that messaging does not cause panic. An example of proactive communication for a particular terrorist threat was the "Run, Hide, Tell" guidance,[143] which helped communicate the risks that the public could face from this threat and how to respond.

f) *HMNB Clyde and Hunterston power station:* The Office of the Nuclear Regulator (ONR) tests the off-site emergency arrangements at civil nuclear sites and MOD-licensed defence sites in accordance with the Radiation (Emergency Preparedness and Public Information) Regulations 2001. The Scottish Government will lead on the consequence management for 'off-site' response to MOD-site nuclear incidents.[144] It has an MoU with MOD for this liaison, setting out where the boundaries of responsibilities lie and how both MOD and the Scottish Government will interact with each other. There is an 'Off-site Emergency Plan' for radiation emergencies at HM Naval Base Clyde and the Faslane, Coulport and Lochgoil Berths.

g) *Research and development:* The Home Office and other Government departments funds/commissions research to inform the response to CBRN incidents. The National Risk Assessment process also feeds into that. R&D to inform terrorism-related CBRN incidents require more development than Hazmat planning, not least because the motivations and attack possibilities are always being expanded. This is an area where new science is continually needed.

143 National Counter Terrorism Security Office, *Run Hide Tell* (18 December 2015)

144 Scottish Ministers have policy responsibility for emergency planning at civil nuclear sites in Scotland as it is not reserved. The Scottish Government is the Lead Government Department responsible for coordinating the national response in the event of a civil nuclear emergency in Scotland.

Formal Minutes

Wednesday 22 March 2017

Members present:

Stephen Metcalfe, in the Chair

Victoria Borwick	Carol Monaghan
Jim Dowd	Gareth Snell
Chris Green	Graham Stringer
Dr Tania Mathias	Matt Warman

Draft Report (*Science in emergencies: chemical, biological, radiological or nuclear incidents*), proposed by the Chair, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 67 read and agreed to.

Annex and Summary agreed to.

Resolved, That the Report be the Twelfth Report of the Committee to the House.

Ordered, That the Chair make the Report to the House.

Ordered, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

[Adjourned till Monday 27 March at 4.00 pm

Witnesses

The following witnesses gave evidence. Transcripts can be viewed on the inquiry publications page of the Committee's website.

Tuesday 7 June 2016

Question number

Christopher Abbott, Chairman, Emergency Planning Society CBRN Professional Working Group, **Professor Patrick Regan**, Science Area Leader for Radioactivity, National Physical Laboratory, **James Webster**, Civil Contingencies Officer, Staffordshire Civil Contingencies Unit, and **Andy Bell**, Deputy CBRN(E) Lead, Chief Fire Officers' Association Q1–70

Phil Evans, Government Services Director, Met Office, **Dr Dame Sue Ion FREng FRS**, Chairman, Nuclear Innovation Research Advisory Board, and **Dr Edward Sykes**, Senior Media Manager, Science Media Centre Q71–102

Tuesday 13 September 2016

Gary Butler, Assurance Director, Atomic Weapons Establishment, **Simon Earwicker**, Division Head, Chemical, Biological and Radiological Sciences Division, Defence Science and Technology Laboratory, **Dr Cerys Rees**, Fellow, Chemical, Biological and Radiological Science Division, Defence Science and Technology Laboratory, and **Dr Nick Gent**, Deputy Head, Emergency Response Department, Public Health England Q103–186

Ben Wallace MP, Minister for Security, Home Office, and **Paul McCloghrie**, Deputy Director, National Risks and Infrastructure, Civil Contingencies Secretariat Q187–252

Published written evidence

The following written evidence was received and can be viewed on the inquiry publications page of the Committee's website.

CBR numbers are generated by the evidence processing system and so may not be complete.

1 ADS Group (CBR0016)

2 Atomic Weapons Establishment (CBR0027)

3 BAE Systems CORDA (CBR0014)

4 Dame Sue Ion (CBR0022)

5 Defence Science and Technology Laboratory (CBR0026)

6 Dr Ian Fairlie (CBR0006)

7 Dr John Drury (CBR0005)

8 EDF Energy (CBR0012)

9 Food Standards Agency (CBR0011)

10 Home Office (CBR0017) and (CBR0028)

11 Institute of Physics and Engineering in Medicine (CBR0015)

12 Keith Riley (CBR0025)

13 Met Office (CBR0013) and (CBR0024)

14 Nuclear Industry Association (CBR0007)

15 Parents Concerned About Hinkley (CBR0001)

16 Professor Wade Allison (CBR0004)

17 Public Health England (CBR0029)

18 Roderick Pond (CBR0023)

19 Science Media Centre (CBR0020)

20 Staffordshire Civil Contingencies Unit (CBR0010), (CBR0021) and (CBR0030)

21 The Emergency Planning Society (The EPS) (CBR0008)

22 The National Physical Laboratory (CBR0009)

23 The Royal Society (CBR0018)

24 The Royal Society of Edinburgh (CBR0019)

25 Weinberg Next Nuclear (CBR0031)

List of Reports from the Committee during the current Parliament

All publications from the Committee are available on the publications page of the Committee's website.

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2016–2017

First Report	EU regulation of the life sciences	HC 158
Second Report	Digital skills crisis	HC 270 (HC 936)
Third Report	Satellites and space	HC 160 (HC 830)
Fourth Report	Forensic Science Strategy	HC 501 (HC 845)
Fifth Report	Robotics and artificial intelligence	HC 145 (HC 896)
Sixth Report	Evidence Check: Smart metering of electricity and gas	HC 161 (HC 846)
Seventh Report	Leaving the EU: implications and opportunities for science and research	HC 502 (HC 1015)
Eighth Report	Setting up UK Research & Innovation	HC 671 (HC 1063)
Ninth Report	Future programme: 'My Science Inquiry'	HC 859
Tenth Report	Managing intellectual property and technology transfer	HC 755
Eleventh Report	Science communication and engagement	HC 162
First Special Report	Satellites and space: Government Response to the Committee's Third Report of Session 2016–17	HC 830
Second Special Report	Forensic Science Strategy: Government Response to the Committee's Fourth Report of Session 2016–17	HC 845
Third Special Report	Evidence Check: Smart metering of electricity and gas: Government Response to the Committee's Sixth Report of Session 2016–17	HC 846
Fourth Special Report	Digital skills crisis: Government Response to the Committee's Second Report of Session 2016–17	HC 936
Fifth Special Report	Robotics and artificial intelligence: Government Response to the Committee's Fifth Report of Session 2016–17	HC 896
Sixth Special Report	Leaving the EU: implications and opportunities for science and research: Government Response to the Committee's Seventh Report	HC 1015
Seventh Special Report	Setting up UK Research & Innovation: Government Response to the Committee's Eighth Report	HC 1063

Session 2015–2016

First Report	The science budget	HC 340 (HC 729)
Second Report	Science in emergencies: UK lessons from Ebola	HC 469 (Cm 9236)
Third Report	Investigatory Powers Bill: technology issues	HC 573 (Cm 9219)
Fourth Report	The big data dilemma	HC 468 (HC 992)
First Special Report	Royal Botanic Gardens, Kew: Government Response to the Committee's Seventh Report of Session 2014–15	HC 454
Second Special Report	Current and future uses of biometric data and technologies: Government Response to the Committee's Sixth Report of Session 2014–15	HC 455
Third Special Report	Advanced genetic techniques for crop improvement: regulation, risk and precaution: Government Response to the Committee's Fifth Report of Session 2014–15	HC 519
Fourth Special Report	The science budget: Government Response to the Committee's First Report of Session 2015–16	HC 729
Fifth Special Report	The big data dilemma: Government Response to the Committee's Fourth Report of Session 2015–16	HC 992