



HOUSE OF LORDS

Select Committee on Risk Assessment and Risk Planning

Uncorrected oral evidence: Risk Assessment and Risk Planning

Wednesday 2 December 2020

10.30 am

Watch the meeting

Members present: Lord Arbuthnot of Edrom (The Chair); Lord Browne of Ladyton; Lord Clement-Jones; Baroness McGregor-Smith; Lord Mair; Lord O'Shaughnessy; Lord Rees of Ludlow; Lord Robertson of Port Ellen; Lord Triesman; Lord Willetts.

Evidence Session No. 2

Virtual Proceeding

Questions 15 - 27

Witnesses

L: Professor David Alexander, Professor of Risk and Disaster Reduction, Institute for Risk & Disaster Reduction, University College London; Dr Piers Millett, Senior Research Fellow, Future of Humanity Institute; Professor Ortwin Renn, Scientific Director, Institute for Advanced Sustainability Studies.

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Examination of witnesses

Professor David Alexander, Dr Piers Millett and Professor Ortwin Renn.

Q15 **The Chair:** Good morning and welcome to this evidence session of the Risk Assessment and Risk Planning Select Committee. A transcript of the meeting will be taken and published on the Committee website. The witnesses will have the chance to correct any errors.

Again, welcome, Professor David Alexander, professor of risk and disaster reduction at University College London, Professor Ortwin Renn, scientific director at the Institute for Advanced Sustainability Studies in Potsdam, and Dr Piers Millett, senior research fellow at the Future of Humanity Institute, Oxford University. You are most welcome this morning. Please feel free to answer the questions that you think are most appropriate. It is not necessary for each of the witnesses to answer every question. I ask the members of the Committee and the witnesses to keep an eye on the time.

I will ask the first question. What are the key challenges associated with national risk assessment and risk planning?

Professor David Alexander: One of the key challenges is to identify the principal risks. The second challenge is to connect them up, which I am not sure the current approach does adequately. We have concurrent risks, various kinds of connected risks and cascading risks. Very often, we find that we are not dealing with a single risk but with a series of risks in connected format. Virtually all disasters are cascading events to a greater or lesser extent, because we live in a networked society. The consequences of impacts are therefore propagated in different ways, and in that process, we get escalation points where the interaction of different kinds of vulnerability can increase the effect of the impact.

Technically speaking we do not have disasters in the UK, we have only major incidents, but the reality is that we do have disasters. Coronavirus, in some respects, is the mother of all disasters because of its size, complexity and enduring nature. That really needs to be got to grips with.

Professor Ortwin Renn: I would add one aspect. When we are trying to do national risk assessments, we need to apply a common denominator for comparing different types of risks, including those risks that have just been characterised by Professor Alexander. Some of them have a very different distribution of impacts in time and space, so it is difficult to compare risks by using only a probability times magnitude scale.

One of the major challenges is to infer from the national risk assessment the key message of how to prioritize risks. It is sometimes important to compare risks not only in one dimension, which is normally the risk profile, but also on the basis of additional characteristics of risk, such as delayed consequences, major uncertainties about impacts or the likelihood of cascading effects that may not be very well understood by science.

One of the challenges here is to find an appropriate common denominator. I recommend having multiple dimensions and multiple attributes in order to characterise the various risks so that our assessments result in a more comprehensive judgement.

The Chair: We will come on to that later this morning and we will ask you questions about that in detail.

Dr Piers Millett: I want to unpack what Professor Renn said about risk being a component of both likelihood and impact. It is very easy to get caught up in the likelihood, especially as we consider things in terms of political durations, terms of Parliament, five-year plans and so on. We can often forget the impact assessment and therefore forget that very unlikely and very infrequent risks have an impact that is so large that we cannot afford to set them aside. Traditionally, we have not focused enough on those very low probability, very high impact events.

Q16 **Lord Mair:** My question follows on from what we have just been hearing about cascading. More generally, are there particular types of risks which the UK is poorly prepared for?

Dr Piers Millett, that leads on to asking about whether there are any key biosecurity risks that the UK faces. How adequately is the UK prepared for those?

Professor Alexander, how well does the UK's risk assessment process account for the cascading risks that you have just been describing?

I am sure that Professor Renn would also like to comment, but perhaps we could start with Dr Piers Millett on the biosecurity risks.

Dr Piers Millett: It is important to remember that we face a very wide variety of risks. They can be natural, and the current pandemic demonstrates that we still need to be worried about that. It can be accidental. Back in 2007, foot and mouth disease escaped from a lab here in the UK and there was an outbreak. Equally, the last case of smallpox in the world was a lab escape here in the UK.

It can also be deliberate. It could be acts of bioterrorism, biological warfare, assassination—we have seen that recently with chemical agents, but biological agents may well fit into that world view—as well as, increasingly, espionage and stealing IP. We have seen the attempts to either sabotage or steal information on vaccine development in the UK. Those would fit under the spectrum of biological risks that we should be considering.

The target of those attacks could be humans, animals or plants, but most importantly these days it could also be the bioeconomy. I see Lord Willetts is on this panel. He has spent a lot of time over his career helping the UK to be at the forefront of making things with biology. That could be targeted.

The impact of those events could be localised, like the 2007 event of foot and mouth disease I mentioned. It could be national, like the one that

happened in 2001 with foot and mouth disease, or it could be international, like the current pandemic.

The likelihood of those events also varies. Perhaps most likely is some sort of small natural disease event. That is really a question of when it will happen. It is certainly possible. Again, in the case of small-scale events with accidents or deliberately caused events, the question is when, although they may be less frequent. Least likely would be some sort of sophisticated attack with a biological weapon. That is why I wanted to stress that likelihood does not by itself equal risk; we need to bear in mind the consequences.

Of course, the UK preparedness for each of these individual risks varies. In general, we are much more prepared for a natural event than one that occurs accidentally or deliberately. Our national security apparatus has had little interest or capacity to consider those threats in recent years. It has been focused on stabbing incidents and the misuse of cars and vans, for example. The human resources and support for those tasked with working on these issues have been stripped away in recent years, and we may have crossed a critical threshold this year with the loss of key experts in the Foreign Office and the Ministry of Defence.

The UK is much more prepared for a localised event than a national or an international event. With colleagues at the University of Oxford and others, we have been attempting to engage policymakers for several years on large-scale biological events. As recently as this time last year, there was incredulity at a meeting of senior policymakers that a disease event could still happen that would lead to tens of millions of cases and millions of dead, and we have certainly seen that this year.

In 2019, the national risk register for civil emergencies put the likely number of deaths from an emerging infectious disease, other than pandemic flu, at about 100. We are seeing a 600-fold increase on that right now. Last year, the UK reported to the World Health Organization that it had 93% of the capacity it needed to implement the international health regulations, suggesting that we were almost there in having all the necessary prevention, mitigation and response capabilities we would need. We have seen that tested this year. I think we need more preparedness.

Finally, I think the UK is much more prepared to deal with traditional risks than those that stem from the negligent or malicious use of advanced biotechnologies. Those traditionally involved in providing expert advice to the UK Government, on these issues at least, are on the record as doubting whether the deliberate use of biology and the potential misuse of biotechnology to compound that threat will ever happen. I am not sure that there has been sufficient engagement with alternate voices within the expert community.

The UK's national biosecurity strategy sets out in broad terms what needs to happen. It has very few details about how that should happen. There has certainly been a rigorous internal stocktaking of current government

efforts, but I have seen no publicly available implementation plan, and as far as I am aware there have been no consultations with the expert community outside of government. Implementing the existing national biosecurity strategy would go a long way to addressing the current gaps.

Q17 **Lord Mair:** Thank you. Professor Alexander, you have already talked about cascading risks, secondary emergencies and interdependencies. Can you elaborate on that, please?

Professor David Alexander: One thing that the UK is not well prepared for is a space weather event, a Carrington event, which refers to the work of the amateur astronomer Richard Carrington, who discovered a very large coalescence of sun spots in 1859. A comparable event narrowly missed the earth in 2012. If it had hit, there would have been trillions of dollars of damage. Parts of the globe would have been without electricity for years. There would have been substantial damage concentrated in mid-latitudes, including the UK, with a special reference to electricity transformation, large scale not small scale, and global navigation systems would have been damaged or knocked out. The UK is fully aware of this, but it is very difficult to prepare for it and I do not think that we are yet adequately prepared in any way.

I believe that planning should take place on the basis of scenarios, and the scenario for a large pandemic was worked out by research over the period 2003 to 2009, which followed on from the SARS pandemic of 2002 to 2004. I heard an exposition of the scenario on 17 November 2008 that was more or less complete and pretty much an exact prediction of what occurred in 2020. Admittedly, it did not include the recovery phase, and we really have no adequate scenario for that at all. For the actual impact, we had a very good, very clear scenario. I am referring not merely to the medical side but to the social, economic, psychological and behavioural side of it. One thing about pandemics, of course, is that the behavioural, social and economic consequences are as serious as the medical ones in many respects. So, we knew all of that.

We also had three major exercises in which many of the assumptions of that scenario were tested. It has been argued that there is a difference between an influenza pandemic and another kind of viral pandemic such as the SARS one. No doubt this is very true in medical and epidemiological terms, but in emergency planning terms the overlap is at least 95%, possibly more.

In point of fact, I do not think that we were well prepared for the present pandemic. One reason is that although there were plans, there was an immense gap between the planning and the activation of the plans. This really is a logistical problem. One of the things about large, all-embracing, all-encompassing disasters such as the one we are currently living through is that you do not only have to plan, you also have to be able to put the plan into effect when the event occurs. In managing emergencies, there are procedures, plans and improvisation. The right technique is to reduce improvisation to a necessary minimum. The plans will orchestrate the procedures.

We need foresight. Well, we had plenty of foresight, we had plans and we have procedures, but there was rather a mismatch. Therefore, what we have seen this year is an enormous amount of improvisation. Although at a certain minimum level improvisation is necessary, at higher levels it could be regarded as negligence and it is, at the very least, inefficient and often ineffective. That, I think, is where the problem lies.

Q18 Lord Mair: Thank you. Before we finish on the subject of cascading, can you say something about how low-level hazards can accumulate or can have secondary effects that lead to what amounts to a major disaster?

Professor David Alexander: You cannot really understand disasters without understanding the context. Therefore, we need to look not merely at what causes the disaster, what the impact is and what the basic cause of the impact is, but at what context it occurs in. If it occurs in the context of poverty or deprivation, for example, we get very much longer-lasting events or effects. For example, it appears that coronavirus is endemic in places like Burnley, Bolton and Oldham now. In other words, it is just not going to go away. It may become less lethal, but it is just simply there. Why is this? It has a lot to do with the social and economic conditions in which people are living there.

Although we can concentrate our efforts on reducing the effects, the impact and the risk of particular events, behind that there is a whole series of things that make these events more probable because what is needed is to reduce the effects on other things that are contributory factors, such as poverty or deprivation.

Q19 Lord Triesman: Good morning, everybody. In the view of each of the witnesses, what are the main weaknesses of the UK's current national security risk assessment process? Professor Alexander, you look as though you are about to start answering the question.

Professor David Alexander: Thank you. I did not wish to monopolise the conversation. I notice in each edition of the risk register that it does not connect up the risks very well. You can imagine a situation, just to take one example, where you have a coastal storm surge that takes the top off a landfill and spreads toxic material around the landscape. That would be what you might call a natech, a natural technological impact.

We need not so much an assessment of the risks of individual events such as a flood or a storm, but an assessment of the scenario of the event; in other words, what will happen more generally, not merely what the direct impact of heavy winds, heavy rainfall or a storm surge on the coast will be. What will the effects be on other things, for example the transportation network, or the mother of all critical infrastructure, electricity, on which the other eight or 11 categories of critical infrastructure depend? You cannot have fuel unless you can pump it. You cannot have water or sanitation unless you can pump things. You cannot have banking unless you have electronic transfer of funds, and so on.

We need to look a little more holistically, and I believe the Government do that. I believe there is a document that possibly does that very well. I

cannot comment any further, because it is secret. I have seen that document in a corridor in Horseferry Road with an official looking over my shoulder to make sure that I did not photograph anything, and I only read three pages of it. I do not think that we will get anywhere with that sort of approach. What we need is a great deal more transparency and rather open discussion of what the risks actually are.

Lord Triesman: I do not know whether Professor Renn or Dr Millett want to comment. I would be very grateful if they do.

Professor Ortwin Renn: Perhaps I will step in here, because, as Professor Alexander just explained, we need a good categorisation of the interactions between different risk agents.

The main message of our risk perspective, specifically the way in which we conceptualise risk assessment, is that we have three natural risk agents and three societal agents, which all interact. The first natural agent is energy; that could be all kinds of energy—kinetic energy, radioactive arrays, explosions or fires. The second agent refers to substances, i.e. toxic material that we might be exposed to. The third, biota, is very obvious in these days: viruses, fungi and bacteria.

The first societal agent is information; we know that wrong information kills, and it is also a major promoter for the other agents. The second is money, which is also one of the powerful drivers of risk. The third is violence or mal-actions.

The special advantage of this risk perspective is that we have the tools to understand and explore the interactions between these six agents. We can see, for example, that a natural hazard destroys a chemical facility and people get exposed to toxic substances. When new substances are released and people get contaminated, we get more information on potential economic losses which will have an impact on the stock value. This economic impact may result in excessive monetary losses and many people might get very upset. As a consequence, we might experience social unrest and then people would protest against, for example, governmental inaction leading to violence.

We can see multiple cascades to emerge. The interesting thing is that each is dependent on context in which they occur, but given these six very generic agents, we can construct better scenarios in which we look at the interplay between all six and ask ourselves, "Could one of these six be released or not?" This view across agents is often missing in conventional risk analysis. I am not talking only about the UK here. I am talking here about risk governance structures around the world where I have looked into risk management and emergency preparedness systems. Our institutions are built to deal with one agent at a time: natural hazards, social hazards, economic hazards or cybersecurity, but they do not pay enough attention to their interactions.

The same type of deficiency can be observed now with the pandemic. We were very well prepared to analyse and manage exposure to the virus,

but all the indirect effects on the economy, on social isolation or information sharing or not sharing—leading people to drink detergents because the US President made a wrong remark—cannot be totally envisaged in advance. It is crucial to consider interactions between the six agents, as the analysis of their interactions help us to be better prepared for all these secondary and tertiary impacts once a catastrophe has actually occurred.

Dr Piers Millett: I will reiterate the diversity of opinion in the risk assessment process. That feeds into something the UK does very well, which is foresight. The Government Office for Science produced a foresight toolkit a few years ago, which is world leading. It was recently recommended that the US Government follow that foresight toolkit. I hope that it is integrated into our national security risk assessment process, too, because it is an invaluable tool.

Q20 **Lord Robertson of Port Ellen:** I want to continue with that discussion and to come to Professor Alexander. In an article you wrote for the magazine of the Institute of Art and Ideas—I cannot say I have ever heard of it, but it is an interesting title—you said that disaster studies have been catastrophically marginalised, which is pretty strong criticism of the existing system. Do you want to expand on that accusation?

Professor David Alexander: Yes. It was actually the practical side of emergency management that I find to be catastrophically marginalised. By the way, I had not heard of the Institute of Art and Ideas either until it contacted me about this. That is one of the effects of Covid, I suppose.

The problem is that SAGE, the scientific advisory committee, contains no risk managers, no emergency managers and no emergency planners. It might be rather extreme, but you could argue that much of the problem of Covid is an emergency planning and management or a risk management problem. Many of the medical controversies and issues boil down to a simple yes/no answer, even though there often is not one and the complexities are absolutely enormous—not that I wish to marginalise epidemiology, virology, medicine and so on; on the contrary.

However, in the end we have to deploy resources to manage events. I think that resources have been very poorly deployed. Money has been wasted on a truly gargantuan scale. At present, I believe we still have large numbers of containers stuck in Felixstowe container port because of a lack of ability to get them distributed. In pandemic planning, we knew a lot of what was going to be required. If we did not know it from existing plans and existing expertise that had been brought together, we had Exercise Cygnus, which had a report that was secret but was leaked. I have a copy in front of me. It was fairly explicit about what many of the needs would be.

I know someone who got Covid who works as a paediatrician in a hospital that simply lacked appropriate personal protective gear. There just was none. That is a most unfortunate situation. Why was there none? What would you do about that? Using scenarios for emergency planning, if you

cannot stockpile such material—there are reasons why it might be difficult to stockpile: things reach a sell-by or use-by date, warehousing capacity is expensive, and so on—you should have express manufacturing agreements fully in place such that a factory can drop all its work and start churning out aprons, visors, ventilators or whatever is needed.

That should not be improvised at the time when these things are needed, because that is inefficient and leads to delay. In the UK case, it has led to the importation of a large amount of material from Turkey, which arrived not only one month late but was not up to specification, so was not useful. That is merely one example, plus all the work that was done to produce testing and tracing apps that people could use that never worked. We have a tracing system that apparently is simply not up to the job.

If we want to get the economy going, if we want to get people safe and so on, we really have to test, trace and isolate an awful lot more. This is not something that we did not know beforehand. One of the reasons why we are in this difficult position is because of excessive centralisation. A good civil protection system is one in which the local area can operate very well and very quickly with appropriate harmonisation and support from regional and national levels. That is because, whatever the disaster or incident or problem, no matter how large the event, the theatre of operations is always local. Therefore, if we do not have the local capacity we are in trouble.

We did not have the local capacity. We did not have the potential to build local capacity up quickly in a harmonised way. That is absolutely what was needed. We should have known about that, because we had the scenario for what a pandemic was capable of doing. That was worked out in the 2000s in considerable detail by groups of researchers in the UK, the Netherlands and a number of other countries.

Lord Robertson of Port Ellen: You made that criticism in an article in the *Guardian*, which is not the Institute of Art and Ideas, on 8 May. This is now December. Your criticism was that there were no disaster experts on SAGE. Since then, have any of your criticisms landed? Has SAGE been reconstituted? Has anybody listened to what you said?

Professor David Alexander: The only effect of my criticisms has been that a number of emergency managers have written to me to say that they thoroughly agree. That is about all. The UK has very good risk managers, emergency managers and emergency planners. They are feeling dreadfully overworked, but I am not sure that they are put in the most effective and well-supported positions. That is a very serious problem and it leads to yet more improvisation, which can lead to the waste of billions of pounds rather than millions if one is not careful or if things do not quite go according to plan.

Q21 **Lord O'Shaughnessy:** My question is about the extent to which there is enough engagement with independent experts during the national risk assessment and risk planning process. The question has been slightly

superseded by discussion so far, which is clearly that there is a feeling that there is nowhere near enough of that engagement. Words like “secrecy” have been used and a desire expressed for more transparency.

Perhaps I could phrase the question slightly differently. How ought we to engage more with independent experts? How can we provide more transparency without exposing ourselves to greater national security and other risks during the planning process, and—again, following on from what has been discussed this morning—during the implementation of those plans in the case of emergencies? Could I ask each of the panellists, starting with Professor Renn, for a reflection on that?

Professor Ortwin Renn: In the past, the International Risk Governance Council in Geneva recommended to establish a risk council for each country. The risk council should be composed of people representing the various disciplines and sectors that deal with risk and disaster. The disciplines we need are natural science, social science, economic science, psychology and the humanities; the sectors include the various agencies and political administrations dealing with natural hazards, technological hazards, social and habitual risks and security threats.

The main idea behind the recommendation of a risk board or council is that we need people to look at national risk assessments in total as a means to determine what needs to be prioritised. That is one major issue. The other refers to having a group of experts prepared to come to joint conclusions when a complex risk cascade occurs like the one we are experiencing now with coronavirus. It is crucial to have competent people in place who understand each other’s rationale and can swiftly look into the secondary impacts of risk measures and the interplay between risk agents.

Such a group of interdisciplinary experts who are used to work together is a major asset in any crisis. We have seen it in Germany and all over the place. Most emergency responses had only the medical aspects on the agenda, which, of course, is extremely important. However, you may lose sight of some of the secondary impacts that are either economic or social. In Germany—I do not know enough about the UK—we experienced, for example, a major increase in domestic violence among families who suffered from the lockdown. We faced a problem with an increase in suicide specifically among disenfranchised, lower-class people. Such risks could have been anticipated before making decisions of how to design lockdowns.

All these secondary impacts were known to psychologists and social scientists, but they were not part of the emergency board that were called in to cope with the crisis. If something like Corona happens and we had something like a national risk board already established, including a whole set of interdisciplinary experts who are well prepared, that council could act quickly and effectively. Each of the expert would ask him- or herself: “What does this crisis mean for my specific expertise and what do we need to consider in the light of all the risk agents’ interaction?” Such a Council is what we would recommend to establish.

Some countries, such as the Netherlands, have taken up that recommendation. Others have not. My own country, Germany, has been more reluctant to follow our advice. It has honoured some of our recommendations but not the suggestions for a national risk council. I am not so familiar with the UK, but my colleagues here could probably say more about it.

It is a good idea to be prepared when things happen. During a disaster you need to act swiftly. You cannot come up with new institutions and ad hoc expert communities in these situations since you do not have the time to do so. This has to be prepared before the event.

Lord O'Shaughnessy: Thank you, Professor Renn. The absence of such a group also led to a frankly not very good impact assessment being published in the UK this week. Part of the problem has been trying to adjudicate between the different priorities.

Dr Piers Millett: I will confine my comments to the bio-risk component of this and leave the others to speak more broadly on risk.

Under the existing national biosecurity strategy, there is a very clear need to create something like a biosecurity leadership council, probably supported by a liaison officer, to improve co-ordination between the biosciences and the security and risk communities. The council's role could be to do something like develop policy-relevant advice through collaboration between government, academia, business and other relevant stakeholders.

The UK Synthetic Biology Leadership Council is an excellent role model, in my opinion. We could build something very similar to that. It would provide an official channel for co-ordination to ensure that there is dialogue between all the relevant stakeholders. A liaison officer would be important for co-ordinating what happens out in the world with what happens behind closed doors—building on that transparency idea. It is certainly in line with practices in other countries; similar positions exist in the FBI in the US, for example.

I stress the value of having a person to build trust and to be a face and a relationship to work off. If you are asking large numbers of stakeholders outside government to contribute to what is largely a one-way flow of information—they provide input and often do not get much back in return—that trust and relationship is critical.

With several other bio-risk experts, we put together an idea of what something like that could look like and submitted it in writing to other committees. I would happily make it available to this Committee if that would be of interest.

Lord O'Shaughnessy: Thank you. Would you see that sitting alongside the Joint Biosecurity Centre? You would see it being separate to it, by the sounds of it.

Dr Piers Millett: Yes, this would be a way to bridge the gap between government and outside government rather than technical advice. I will come back to some of the technical pieces as we move forward in the discussion.

Professor David Alexander: I think that the whole civil protection system in the UK needs a very strong overhaul. It is absolutely staggering to me that the Civil Contingencies Act has been completely marginalised during the Covid emergency. Countries have basic laws that predispose the system and determine how it will work. Why did we abandon this? The Coronavirus Act is an enormously complex, and I am afraid in certain places farcical, piece of legislation. I could quote on that. I have bits of it in front of me that are completely unintelligible to me.

Apart from that, the Irish risk register is a much more open and consultative document. I have it here. Its exact title is the *National Risk Assessment 2019 Overview of Strategic Risks*. It is a very much more open and consultative document from the Government of Ireland's Taoiseach's Office. It goes rather further than the British one does.

Finally, Sweden has been very controversial because of the way it has decided to handle Covid. Overall, regarding all risks, I think the Swedish are very much better at consulting academics, experts, technicians, scientists and so on and bringing them into the loop. One of the problems with Britain is the secrecy side of it, which really needs to be abandoned, in my view. I do not believe it is helpful or serves any useful purpose. I have never heard of a terrorist going down to the library to read an emergency plan before committing some dire act, for example. It simply does not happen.

The Chair: Thank you. Dr Millett, if you could provide us with that document, that would be much appreciated.

Q22 **Lord Clement-Jones:** Professor Renn, I was previously unfamiliar with your system for characterising and representing how risk works. I was particularly taken by your use of Greek mythological characters to describe the individual risks. Could you outline how that system works and tell us what the problems are that you were seeking to address?

Professor Ortwin Renn: Thank you very much. This was an innovative way to look at different, almost mathematical risk properties but giving them Greek mythological names. I think it helped us to communicate this work to the outside world, and I see that it has also resonated with you.

In the beginning, we learned that putting likelihood and magnitude of risk into an equation and multiplying the two did not give enough justice to the context and to the specific properties of risks. On the other hand, we could not say that every risk is unique. We do need a workable classification. Greek mythology has helped us to focus on specific elements of the combination of the two risk components.

Let us start with the risk type that we called the Damocles sword. That is the one where we know the magnitude of the danger, but we have

absolutely no idea about the likelihood. There is a lot of uncertainty about when and if it will happen, but we know that if it does happen it will be a major risk. Cybersecurity is a good example. We do not have a very good sense of the probability of this or how it will happen, but we know that if the internet were to be disturbed, if there were a total collapse of the internet system, it would have a disastrous effect on the world economy and on many other things.

Such risks need specific management, because if we do not know the probability of something happening but we know it is high impact, we need to concentrate on the risk-absorbing system, i.e. on the target that is exposed. We have to make sure that we install redundancy, a lot of diversity in the safety and multi-layered buffer zones because we do not know when it will happen. It could happen tomorrow, it could happen in 10 years, but since we do not know we need to invest heavily in resilience. .

Then there is the opposite, the Cyclops. With the potential collapse of computer operation at the turnoff the millennium we had a very clear idea about the probability but we did not know the magnitude. In a case like that, it is much better to have a containment management strategy so that we can limit the maximum loss by avoiding exposure or blocking the chain between exposure and impacts. A lot of ecological, slowly emerging risks and disasters fall in that category. We know it is coming for sure, but we need to adjust, to adapt or to mitigate so that the impacts are less severe.

We have a third type called the Cassandra risk. This is where experts know that the risk is high in probability and magnitude, but nobody seems to be concerned because they do not feel that it will affect them. Growing disparities between the rich and the poor have, in the past, always led to some kind of historical unrest or social revolution. We observe a major trend to growing inequities in the world but not much is being done about it. That is like Cassandra, who trumpets messages about the coming threats but nobody believed her.

Then we have the Medusa, the opposite phenomenon of phantom risks. We see a lot of Medusas in all the conspiracy theories, in particular about the risks of vaccination. These vaccination sceptics around the world are extremely vocal. The risk of vaccinations in both probability and magnitude are extremely low, as we all know. Nevertheless, there is some psychological impact that is associated with vaccination that triggers fear and concern.

The last one that we looked at was called the Pythia risk. Pythia risks occur when we face uncertainty on both sides, the probability side and the magnitude side. In these cases, we recommended precautionary approaches as being most effective.

That is a very short summary of the risk types- They can help us to develop better management categories. Multiplying probability and magnitude is only a crude measure of risk; we need to ask how we can

characterise these components of risk within the context in which they occur. The Greek mythological figures help us to place these differentiated risk types into an easily communicable container. The risk types facilitate risk management and governance phase but also communication.

I am very happy to provide you with more detailed information. It is a little complex, but it has helped. The Netherlands, Switzerland and Germany and many other nations have used this classification. They chose different names for it because they did not want to refer to Greek mythology, but they relied on the same rationale of classification.

Lord Clement-Jones: It is a really interesting system and, putting words into your mouth, I understand that if you add the probability and the impact, that leads to an understanding of how to mitigate. How do you deal with the connective aspect that Professor Alexander talked about earlier? How do you judge the mitigation where you have, say, two mythological creatures alongside each other?

Professor Ortwin Renn: I referred to this problem when answering the first question. We can combine the six risk agents with the five risk types. If you think about the six risk agents and connect them with the risk types you end up with a powerful matrix. The matrix tells you that with Damocles, for example, there is a very low probability but high magnitude kind of risk. That magnitude is often associated with cascading secondary impacts. Then you follow these cascades on your six risk agents in order to investigate how one affects the other.

If you take the BSE crisis, for example, you can see that very few people actually got sick from Creutzfeldt-Jakob disease. This outcome was extremely rare, but BSE had a lot of impact on the economy, the political system and the erosion of trust in the political process. It revamped the institutions in the UK as well as in Europe.

We can see that depending partially on the composition of probability and magnitude in combination with other factors, (we added seven additional characteristics) the involvement of the six risk agents vary. If we take for example Pythia, the likelihood of secondary social impacts is quite high because uncertainty triggers major social responses. If we take Medusa, there are little secondary impacts other than psychosomatic or social amplification effects. That helps you to develop more realistic scenarios that Professor Alexander was talking about, which helps us to find the cascading effects over time.

The Chair: Perhaps you need a Hydra risk.

Professor Ortwin Renn: Yes. We had a lot of different classification schemes and, in the end, we looked at different figures of Greek mythology. The interesting insight from Greek mythology is that the myths addressed the questions that we wanted to highlight already at a time where risk was not a topic of discourse. It was not only metaphor; it seems that the risk types that we observed had emerged early in the

process of civilisation. Of course, in those days they had to phrase them by using mythological figures, but these figures were often linked to powerful management advice specifically for agricultural practice.

Q23 Baroness McGregor-Smith: I think my question on the weaknesses that the pandemic has exposed in our national risk assessment processes has already been semi-answered. We have had quite a lot of discussion about this area already, so could we talk about some of the continued weaknesses that we could face with the rollout of a vaccine?

Professor David Alexander: The vaccine problem involves a tremendous dilemma of medical ethics regarding who gets it, in what order, how quickly, and by what means. That will have to be solved one way or the other, which will further test the civil protection system.

In my view, we need a better-quality civil protection system generally. I know of no other country that has abandoned its basic law on managing major emergencies. The reason why we have a basic law is to set up a system and describe the criteria by which it works. The Civil Contingencies Act does this to an extent, although it is very much a top-down law for a system that needs to be rather more bottom-up than it is at present, because it needs to have a very strong local presence and regional co-ordination, too. In other words, we need to weld the entire country into a proper civil protection system. It evidently does not do that well enough.

The Cabinet Office Minister, Michael Gove, described it as a measure of last resort. In fact, no country uses its basic law on how to manage emergencies as a matter of last resort. India passed its law in 2005 and modified it in 2010. The Stafford Act in the United States has existed since the 1990s. The Italian law dates from 1992 and so on. Countries have to have a basic law because they have to create a system to manage things. It has to be robust at all levels and it has to integrate. I do not believe it is doing that, and I do not believe that the local level at which things actually happen has enough capacity to manage emergencies, whether Covid or other emergencies. That desperately needs to be dealt with very quickly to weld this into a system that will work when we get major emergencies.

Covid is different, because most emergencies are local or regional in scope and they last for a certain amount of time. This is a wave emergency. It is global and it affects the entire country, although to different degrees around the country. That is something that countries are grappling with considerably.

Take the Italian example. I am binational Italian and British. I watch with interest the way Italy does it. It is not going perfectly well, but it is probably going rather better in some respects. The health system is run by the regions and the response is largely regional. The national government co-ordinates the regions. The regions respond at the regional and the local level to what is going on. We have local red zones that appear and disappear, and we have a regional response that co-ordinates

under government harmonisation as much as possible. It does lead to interregional problems, especially with people who live on the margins of regions, but it is, nevertheless, much more focused on the level at which things happen. That really needs to be done much more in Britain.

If the Civil Contingencies Act has proved itself to be inoperable in Covid and has been replaced by an Act that has some ridiculous provisions in it—I could quote from it, but I do not want to waste time with it—where one struggles to understand how to make this active, you need an Act that is in simple language and understandable, and creates a system that is robust at all levels and fits together. That is what needs to happen next.

Dr Piers Millett: This idea of bigger, better systems is critical. If you take a step back and look at what capacity we have to deal with Covid-19 in the UK, you see that the UK has hit well above its weight. A key part on the technical side, in diagnostics, was Oxford Nanopore, a UK-based company. Obviously, we have the Oxford vaccine coming online. As of today, the UK is the first country to grant vaccine approval. We have a remarkable lead in regulatory oversight of some of these technologies, and the Government taking a stake in or buying a vaccine production plant to come online late next year is a key piece of the capabilities. I am not sure that we have figured out how to put all those things together and to take advantage of the tremendous capacity that we have in the UK, perhaps outside of government, to address some of these issues.

Q24 Lord Rees of Ludlow: I want to ask a bit more about the extent to which Governments should involve the public in all these aspects. You do not want to scare the public unduly about potential risks, and there are security issues. I would like to ask Professor Renn about the best way to deal with the public during a pandemic. I know he has written in particular about the need to differentiate communication to the public based on reactions that could be freeze, flight and fight. Could you explain this idea to the Committee and outline how you think, perhaps more generally, communication not only of the present risks of the pandemic but of other potential threats should be communicated to the public and, I guess, to the press?

Professor Ortwin Renn: Thank you very much for this question. It is very important, particularly with risk communication and crisis communication, that we understand the basic mechanisms of how people respond to information and how they react to various images associated with the respective risk and how their own role is being defined.

The three very generic approaches to this are to ignore the risk—the freeze reaction—to fight the risk or to flee. These three responses go back to early behavioural patterns of leaving the jungle and moving towards the savannah. If you are exposed to a danger, let us say a wild animal, the first thing you do is freeze, hoping that animal may not recognise you. If that does not work, you run away, and you have to do this very quickly. If that is not possible, the only thing you can do is to fight.

Those three generic response modes are still part of our cultural evolution. We can see in the pandemic now, but also in a lot of other threat situations. Although all three patterns occur within the same individual, choice preferences are not equally distributed among the population. We have people who tend to flee more, people who tend to fight more and people who tend to ignore the risk more.

Risk communication requires target group differentiation because you need to address these three different groups in a different manner. The flight people in the pandemic are the people who totally retreat and are likely to state: "The danger is out there. I don't want to be out there. I don't want to be exposed. I'm the most vulnerable person in the world". Then risk communicators may respond; "Yes, it's good that you retreat, but don't dehydrate, make sure you get good food, make sure you get some social bonding with others but keep the physical distance. Just continue to do what you do, but don't overdo it."

The people who prefer to ignore threats are much more difficult to reach. They are people who feel that nothing will not happen to them as long as they are able to keep the danger away from their awareness. They hide behind the risk, saying, "It won't happen to me. I'm invulnerable", or, "If I don't think about it, it will go away". If communicators tell them that they are as vulnerable as anybody else they will not believe it. In a pandemic, the only good way to communicate to them is to say, "Look, you may be invulnerable, you may be in excellent health condition, but you could be a carrier for someone else. You don't want to have other people contract the disease because you haven't been complying with the rules". For quite a large group of people who believe that they are invulnerable, but felt obliged to others this message worked well.

The fight people are also hard to reach. When you cannot fight the virus directly, you need scapegoats. You need substitutes to which you can direct your aggression. If you believe the Government is overdoing it, you target the Government or you attack public representatives, such as health professionals, regulators or street workers. If you believe that the Government is not doing enough, you target all your fellow citizens who are not wearing the prescribed protective gear such as masks. The more people feel frustrated about the inability to fight the virus directly the more they show aggressive behaviour against substitute objects or individuals. The only viable way to deal with them is to give them behavioural advice for something they can actively do. People who like to fight do not want to wait or just retreat. They do not want to flee nor accept the threat as it is. They want to do something. Give them opportunities to act, like being engaged in the neighbourhood, helping vulnerable groups to meet basic needs, assisting elderly people, providing spaces for people in highly crowded areas, distributing masks or, under tight supervision, helping police to monitor compliance. Get them involved. That is very important.

There is another aspect that I also wanted to stress: how to include people in the design of risk management measures. In a crisis, public

involvement is difficult to accomplish. We tried it in Germany, but you have to do it quickly. That, again, is a very good argument for having a risk council installed before the crisis. Then the risk council could prepare specific activities for getting stakeholders and the general public involved in designing most suitable response actions before the disaster actually happens. I think that Professor Alexander made this point before.

If you face a national pandemic, a national health issue or a big technological accident, you can count on a multitude of secondary impacts on the economy, on people's psychology, on schooling and social activities. Having people who represent these activities before the crisis hits involved is of tremendous advantage. You ask them before the crisis: "What should we do? How can we engage ourselves and our members so that they know what to do?" is crucially important to have stakeholders take part in crisis management. But this is hard to arrange during the crisis it must be prepared and rehearsed before the crisis.

Talking about contingency and emergency planning, it is good to be very inclusive from the start. Once the crisis is there, there are limits for inclusion. Being timely is here the first priority. Lengthy processes of consultation are inappropriate if direct action is required.

Lord Rees of Ludlow: Thank you. Dr Millett, it is easy to get people's attention when the pandemics come, but do you think it would be better if the public were aware of the potential of bio-threats of various kinds before they have happened, or is it best not to scare people too much?

Dr Piers Millett: My considered opinion is that they are informed anyway. Bio-threats are a common factor in popular culture. They are in movies, TV shows, books, computer games. This is where the public are currently getting their information from. With due respect, I would rephrase the question: do we think we want to educate the public through science fiction or through some sort of official communication and having some control over how that information is put forward? I personally think it would be much better to engage actively on that.

Lord Rees of Ludlow: That is the answer to your own question. Thank you very much.

Professor David Alexander: I will cite very quickly four examples from London. The first is that London Resilience has held some wonderful simulation exercises. In one of them, about a storm over London, I noted that the people with the stripes on their shoulders, the representatives of the blue light services, tended to treat the public as pawns on a chessboard, passive entities to be moved around. The research tells us that it is not like that, and we made this point.

At a later stage, London Resilience convened a wonderful meeting with 70 civil society organisations from the civil sector in an attempt to start the ball rolling in getting the public organised against various hazards and disasters. Unfortunately, circumstances conspired against this going ahead at the London level, although at a later meeting it was clear that

the boroughs were working quite hard on this. Then, of course, Covid hit, but in Covid we have the spontaneous emergence of a large number of civil society organisations co-ordinated by social media.

My final point is that when the Grenfell Tower fire occurred, civil society organisations, particularly faith-based ones, essentially replaced government at the local level. They imposed democracy on the London Borough of Kensington and Chelsea, in effect, until things were finally rectified in public administrations.

Q25 Lord Browne of Ladyton: I am conscious of the time, so we might have to rush through quite a big subject here. This question was designed to elicit evidence about the adequacy of international collaboration and what we can learn internationally from each other as best practice. I will give each of you a very specific question in the hope that you can answer it in a minute or so. That will leave enough time for the last question.

Dr Millett, is there sufficient international collaboration on biosecurity efforts, in your opinion? By sufficient, I mean: is there enough planning in the international community to meet the scale of the risk, particularly now we know the scale of that risk?

Dr Piers Millett: I think the structure is there. There are the right discussions in the right places to identify the lessons and capacity we need. If you break it down, some of that happens in the World Health Organization, and some of it happens through the World Organisation for Animal Health, the Biological Weapons Convention, UN Security Council Resolution 1540—the list goes on. Those pieces are there.

What worries me much more is that the UK has not been able to participate in those as actively as it has done in the past. That is worrying, and I think it is down to a few different reasons. It is largely to do with resource restrictions. A classic example is the co-operative threat reduction activities based in the Ministry of Defence. Those are in-country practical activities, working with partners around the world. It has seen a dramatic reduction in budget in recent years, meaning that it is no longer able to do those sorts of activities internationally.

Equally, there is the UK's disarmament mission in Geneva, which is a city that deals with many of these. Many of the organisations I mentioned are either based there or meet there regularly. That disarmament mission has been reduced in scale, meaning that we just do not have the capacity to cover all the relevant biosecurity issues in Geneva.

Finally, I mentioned very briefly earlier that we have lost key institutional knowledge. This year alone we have lost key national experts in the Ministry of Defence and the FCO. They have been a critical resource, internally and internationally, for that institutional knowledge and acting as the voice of expertise inside planning in both cases. There have been discussions about defunding those posts, and the expertise that we have lost is potentially irrecoverable.

In each of these areas, in each of those places inside the UK Government, we are looking being less well-resourced and less well staffed than a local McDonald's to deal with an issue like biosecurity. They seem to be incomparable in my mind. The resources and the effort we put into dealing with nuclear weapons and the threat posed by them are orders of magnitude larger than they are for biology. There is much more we need to do in this space.

Q26 Lord Browne of Ladyton: Thank you very much. Professor Alexander, turning to international collaboration and what collaboration exists to respond to global risk, in your opinion specifically are the international agreements that are in place sufficient to mitigate against the risks of an interconnected world, and how should they be changed if we seek to make improvement?

Professor David Alexander: This is quite a complex question to which there is no simple answer. We have the Sendai framework for disaster risk reduction 2015-30, which is a non-binding UN agreement to which most countries have signed up. It suggests guidelines. It has a monitoring arrangement, but it is always non-binding. The trouble with it, if there is a serious problem, is that it is top-down and it tends to peter out when we get to the local level. This was also true of its predecessor, the Hyogo framework for action.

Nevertheless, we need international collaboration. One of the great lessons of Covid-19 is looking at what is happening in other countries. It will happen very soon in your country. We need prompt action based on careful assessment of what is going on elsewhere in the world.

There are plenty of useful examples from other countries which the UK could study in detail. At present, my perception, my feeling, which of course may be inaccurate, is that the Japanese Government are more interested in cascading disasters than the British Government are, yet all disasters are cascading to a greater or lesser extent. We live in an increasingly networked world. We are dependent on critical infrastructure and on networks to survive for very many things. Hence, it is expedient to share our knowledge and information and face up to the fact that we also live in a globalised world. When the Japanese earthquake, tsunami and nuclear release occurred in 2011, the Japanese Government shut down car production in Sunderland because of the movement of components and things like that. There are many more interactions of this kind that we also need to look at.

There are other excellent examples. Italy has 3,600 civil protection volunteer organisations, 36 of them federated nationally. They are capable of putting into the field vast numbers of operatives, and in the last three earthquakes there were more emergency responders than population in the field. They are organised to act very quickly. There are lessons there about how to do that, how adaptable that might be to the UK and so on.

In Sweden, after the tsunami in the Indian Ocean, which led to the fall of the Government because they were unable to cope with the repatriation of 492 Swedish bodies and the mortuary arrangements, they created a full civil protection system within a matter of months. It did not work terribly well, so they created another. They were honest enough to face up to the deficiencies of it and do a proper assessment of how to put it right. It works at the local level, to my knowledge.

There is really an enormous amount that could be learned from practice in other countries. The very fact that we have a Civil Contingencies Secretariat reflects Italian practice. It was a non-binding directive of the European Union, when the UK was a member, that it is not good to have civil protection dependent on your Home Office or Ministry of the Interior because it tends to exclude other ministries in something that is very interdisciplinary. Put it as part of the Cabinet Office and it has much better connections with other ministries. That went from Italy to the EU, and Sweden, Britain and some other countries adopted it, which is an example of the value of international collaboration.

Lord Browne of Ladyton: Thank you, Professor Alexander. In the interests of time, Lord Chair, can I be allowed to challenge Lord Willetts to find a way of integrating lessons from Germany into the interesting last question that I know he is about to ask?

The Chair: Very good.

Professor Ortwin Renn: Let me assure you: Germany is not the role model for everyone. I think we should be very careful about value judgments when making transnational comparisons. The international cooperation among experts and scientists but also experts from the Government's agencies has been crucial for being as effective as we have been. All nations have been benefiting from each other and none has done it all good or all bad.

There are three points that I would like to mention about the German experience. The first, even in pre-disaster management, is not wise to maximise efficiency at the expense of other objectives such as resilience. What we have learned in Germany is that we made major investments in resilience specifically in the hospital systems; we have many more emergency care beds per 10,000 inhabitants than anybody else in Europe. That has paid off in the present crisis. The fairly low number of fatalities during the first wave (the second has been less successful) in Germany is mainly due to the health system being able to cope with the growing demand. Of course, it is totally inefficient to have 10,000 or 100,000 emergency care beds available above average need, but in cases like this it may save thousands of lives.

This leads to my second point. When designing or evaluating public investments, it is prudent to use four criteria: First, is it effective? In complex systems, that is not trivial. Second, is it efficient? Are we wasting valuable resources? Thirdly, is it resilient? Does it really help in cases of severe stress? Is the capacity there if we really need it? Fourth,

is it fair to the various parts of the population? We have learned that the lower-income parts in all countries—Germany included, the UK even more so—have suffered much more than the higher-income classes from the Corona crisis. It is not true that the virus is classless, at least not concerning its impacts. Its specific secondary impacts are unequally distributed among different social groups. Lower class families suffer much more than other parts of the population. Risk management needs to address this issue.

My third point is a more political one. It is difficult to enforce, but there is a very good study by a group of investigators who asked people to explicate the main reason why they complied or not complied with governmental measures¹. The best predictor for compliance was if people believed that the Government was acting predominantly for the public good. This finding was independent of other variables such as governmental structures, the severity of sanctions or belief in self-efficacy. That is an important point. We see that Governments who mixed their Covid response with other political issues lost credibility and, hence, decreased compliance.

It may also be good to have something like a risk communication tsar, as the new Biden Administration plans to do, who is there only to serve the public good and become a liaison between the government and the public. That would help to clarify and crystallise the idea of a unambiguous public good orientation.

In Germany, this aspect has been rather important in the crisis. At least Chancellor Merkel was always seen by the vast majority of people as one who has no second thoughts, pursues no hidden agenda. She pushed forward to protect the citizens without any other (hidden) agenda. The state governments acted a bit differently, and that tuned out to become a problem with respect to credibility and compliance within each state. Nevertheless, the lesson learned is to make sure that, at that point in a crisis, Governments show that they are not politically manoeuvring with other kinds of issues or pursuing hidden agendas. If they do, they lose trust and compliance, which has direct impacts on fatalities.

Q27 Lord Willetts: Thank you for the fascinating points you have been making during our session. If there is one policy recommendation that each of you would like us to make to government, what would that be?

Dr Piers Millett: The creation of a biosecurity leadership council that I mentioned is too low-hanging fruit for a question like this, so I will give you a stretched goal, a much more ambitious opportunity.

On the level of safety that the UK public will demand in the wake of Covid-19, core capacity is missing from the current discussions. It may

¹ Van Bavel, J. J., Boggio, P., Capraro, V., Cichocka, A., Cikara, M., Crockett, M., ... Willer, R. (2020, March 24). Using social and behavioural science to support COVID-19 pandemic response. <https://doi.org/10.31234/osf.io/y38m9>

be integrated into the National Institute for Health Protection or better instituted somewhere else. While that new national institute will focus on managing the UK's response to immediate threats such as Covid-19, we need a capacity to focus on prevention and preparedness for future-based, large-scale, high-priority biological threats faced by the UK, regardless of origin.

Such a group would need to provide strategic direction over policy and technical solutions. It would need to undertake national-level co-ordination and integration of expertise. It would need to increase preparedness against biological threats. It could complement the proposed new UK ARPA by filling a think tank function that delivers insights on areas of new opportunities and promising technical solutions.

In short, it has to focus on the biological security of the UK and could focus on four particular areas of highest priority: first, prevent and counter the threat of biological weapons from both state and non-state actors, treating them with comparable seriousness as nuclear weapons; secondly, develop effective defences to biological threats, helping bring horizon technologies such as pathogen-blind diagnostics to technical readiness; thirdly, promote responsible biotechnology development across the world, "responsible" being the key word in that sentence; and, fourthly, develop talent and collaboration across the UK biosecurity community, cementing the UK as a world leader in safe and responsible science and innovation.

I have a better-thought-out concept note that I have worked with others to put together, and again I offer to provide it to the Committee, if interested.

Lord Willetts: We would be very interested in that. Thank you, Dr Millett.

Professor David Alexander: A simple answer would be to put qualified emergency planners and managers on SAGE. At present, epidemiologists, virologists and politicians, and perhaps a few psychologists, do the emergency planning and managing. We need people who have a better understanding of logistics. A more ambitious answer would be to abandon the Civil Contingencies Act and pass a new law that sets up a proper, more robust and comprehensive civil protection system, one that ensures that the local and regional levels are fully developed, operational and integrated into the system—one that is less top-down, in other words.

Lord Willetts: Thank you very much, Professor Alexander. Finally, Professor Renn.

Professor Ortwin Renn: I would like to enforce the proposal of a national risk governance council for the UK. I would also recommend it to all other countries, and the EU as a whole (knowing that the UK will not be part of it after 2021). The main point is that it should be a council that operates across different types of risks, because they all interact, as we have heard before. It should go across disciplines and should include

people who come from different sciences but also from practice. The importance of expertise in emergency practice was already mentioned by Professor Alexander. It is also very important that they operate across different sectors in government and include all aspects of assessment, management, governance and emergency response.

This kind of body cannot, of course, become a super-agency for all risks. It could, however, prioritise risks and risk responses. Most importantly, it should be mandated to ensure that cascading effects are being followed up through their various cascading phases. This can only occur if we gather interdisciplinary experts that are familiar with each risk agent and each phase of the various cascading scenarios. That is my final recommendation.

Lord Willetts: Very good. Thank you.

The Chair: You have been fantastic witnesses, and it was a really rich discussion. Although we have run out of time, I would like to ask the Committee whether there is any burning question that has to be asked or that could it perhaps be put in email. I can see no hands raised. I am relieved, because we have run out of time.

Thank you very much to all our witnesses. Please feel free to contact us with any suggestions or further evidence that you would like to give us, because what you have been telling us has been really important.