HOUSE OF COMMONS

Environmental Audit Committee

Oral evidence: Flooding: Cooperation Across Government inquiry, HC 768

Wednesday 27 January 2016

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Watch the meeting

Members present: Peter Aldous (Chair), Caroline Ansell, Mary Creagh, Geraint Davies, Mr Peter Lilley, Caroline Lucas.

Questions 1 - 69

Witnesses: **Lord Krebs**, Chair of the Adaptation Sub-Committee, Committee on Climate Change, **Matthew Bell**, Chief Executive, Committee on Climate Change and **Daniel Johns**, Head of Adaptation UK, Committee on Climate Change, gave evidence.

Q1 Chair: Good afternoon, gentlemen. Many thanks for opening the batting on our first flooding evidence session. The intention is to have a cross-departmental response to flooding at a strategic level rather than responses to specific incidents. It is very much looking at it globally and trying to draw out your own particular views. I will start proceedings by asking our first question. In the Committee on Climate Change's 2105 report to Parliament, "Progress in Preparing for Climate Change", you said that there is not a substantial plan in place to address flood risk. You also said that little progress is being made in managing our vulnerability to flood risk. Could you briefly explain why you came to this dual, some might say damning verdict?

Lord Krebs: Yes. Thank you very much, Chairman, for inviting us to this session. As you know I chair the Adaptation Sub-Committee; Daniel Johns on my right is the Head of the Secretariat of the Adaptation Sub-Committee and Matthew Bell on my left is the Chief Executive of the Committee on Climate Change.

Why did we reach that conclusion? Because we had developed a whole suite of indicators of how current vulnerability may change in the future as a result of climate change— the future impacts of climate change is our focus—and what measures were being taken to manage current vulnerability. To give you one example, one reason why flooding is an increasing problem, apart from the impacts of climate change, is because we are still building houses in high flood risk areas. We estimate about 4,500 a year. In that sense, the measures that are being taken at the moment are making the problem worse rather than better. Of course you could say, "That is one side of the equation". Another side of the equation is that we are spending money on flood defences and we are spending money on

trying to make individual houses more resilient to flooding. When you look at the net effect from our analysis in relation to flooding, we thought that the residual risk was likely to increase rather than remain stable or decrease, so an analysis of the detail led us to those conclusions. Daniel, would you like to add anything further to that?

Daniel Johns: That is based on the Government's own assessment as well. In December 2014, they published an updated set of long-term investment scenarios. That showed that, even if investment levels were to increase with the long-term need, even if there was no new development in the flood plain and even if optimal investment choices are made, every year over the course of several decades, you will still end up with about 40,000 more properties in areas of high flood risk than there are currently, and any new development in the flood plain will add to that total.

Q2 Chair: You have started on the point I was going to move on to, Mr Johns. If we carry on with this approach, what are the consequences across the UK going to be?

Daniel Johns: In October we published an updated assessment. That takes into account the latest projections from climate change and account trends in terms of the growing population and development in the flood plain. That showed that, with 2ºC of global warming, we would need to take every conceivable step to adapt the country to avoid climate change increasing flood risk, but if we end up with 4ºC of warming this century, even the most ambitious, comprehensive set of proposals and policies to avoid flood risk increasing would still mean flood risk increasing across the country.

Q3 Mr Peter Lilley: Is there any hard statistical evidence that the frequency of extreme rainfall events has increased? I will just give you the data that I am relying on to ask my questions, which are the rainfall figures from the Met Office for 250 years. It does not obviously look as if there is any great rise in the extremities.

Daniel Johns: Certainly the data show there has been an increase in river flows.

Q4 Mr Peter Lilley: River flows? I am talking about rainfall. The river flow will depend on all sorts of additional matters; how the river courses have been dredged and how the run-off and so on has changed.

Daniel Johns: Indeed, river flows but also rainfall. There is a trend towards increasing heavy rainfall events, particularly in the north and the west of the country. There have not been sufficient extreme events to be able to plot a long-term trend with any statistical significance but, certainly, the trend is towards increasing bouts of heavy rainfall.

Q5 Mr Peter Lilley: You say "certainly the trend". At what level of certainty is the trend measured? You have presumably done a statistical analysis. Was it 95%?

Daniel Johns: There is not sufficient confidence yet to say categorically that there has been an increase in heavy rainfall events.

Q6 Mr Peter Lilley: When you said "certainly the trend" you misspoke?

Daniel Johns: No. Certainly the trend is in that direction but it is not statistically significant at this stage.

Q7 Mr Peter Lilley: So you are not certain about the trend if it is not significant statistically.

Daniel Johns: The trend is still upwards but it is not significantly different from zero at this stage.

Mr Peter Lilley: Right.

Lord Krebs: But the projections from climate models are that the trend will increase and, therefore, the risk will increase. That is generally recognised from the modelling.

Q8 Mr Peter Lilley: Have those models been validated at all where rainfall is concerned?

Lord Krebs: The models have been validated across a whole range of measures by asking—

Mr Peter Lilley: We are talking about rainfall.

Lord Krebs: —how good they are postdicting past trends, as well as testing them in model experiments: the ability to predict and how sensitive that is to certain assumptions.

Q9 Mr Peter Lilley: I did not detect an answer to my question. Have they been validated as far as rainfall is concerned?

Lord Krebs: Rainfall is one of the more difficult areas for the models to predict, but the models do predict that there will be an increase in the severity of rainfall events in future.

Q10 Mr Peter Lilley: Do they predict there should have been in the past even though, statistically, there is no significant trend in the past?

Lord Krebs: I will have to turn to Matthew. Do you know the answer to that?

Matthew Bell: As you know, the models are trying to predict a whole range of different outcomes of which rainfall is one, and rainfall is a particularly regional metric and the models currently, for a whole range of reasons not least of which is computing power, are now getting into more and more accurate forecasting of regional level effects.

More generally, the question that we ask ourselves and in the committee is: are the plans, processes and mechanisms in place such that the right decisions can be made at a regional level. As we say very clearly in the report, that is a combination of urbanisation and population growth, as well as climate change effects at a regional level, and you have to look at all those and whether the measures in place are likely to result in decisions at a regional level that end up reducing the risks of flooding. Our conclusions are based on the fact that we did not feel that the combination of mechanisms in place at regional level are likely to lead to the right decisions being made to alleviate future risks of flooding.

Mr Peter Lilley: I think we can all agree that, if you build houses on a flood plain, there is quite a good statistical likelihood that you will get flooded as time goes by. The

village of Kimpton in my constituency was flooded in 2002. That had not happened for ages, but it happened in a place called Claggy Bottom so we realised it used to happen in the past.

Q11 Geraint Davies: Peter's statistics are useful to show that the overall aggregate amount of rain has not changed that much but, in terms of when it rains, am I right to say that there is data suggesting that we are having hotter summers and wetter winters and precipitation is more focused and flash flooding is more likely?

Daniel Johns: Absolutely. The science of climate change attribution to individual events is maturing all the time. Days after the Storm Desmond event in early December, a scientist in Oxford was saying that the extreme wet winter, extreme wet month, that we saw was 50% to 75% more likely because of the global warming that has taken place already; that they can run the models with anthropogenic warming, they can run it without, and the difference tells you about how the likelihood of individual extreme weather events has changed already around the degree of global warming that has taken place over the last 100 years.

Q12 Geraint Davies: The point is that flood risk is not about the overall amount of rain in a year, although that has a bearing; it is whether the overall amount of rain is focused in a small amount of time and then obviously overwhelms flood defences.

Daniel Johns: Indeed. It is a combination of rainfall totals, which can cause surface water flooding, and the event we saw in December was because of a combination of extreme levels of rainfall—more than a foot of rain fell in one 24-hour period in one rain gauge—and also record river flows, which again were off the scale.

Q13 Mr Peter Lilley: I saw a report of the Oxford study you mentioned. I was puzzled by this idea that the storms that have occurred are 40% more likely because of global warming, but there has not been a 40% increase in the number of them. I wonder how you reconcile those two things, or how they did.

Daniel Johns: They look at particular events, rainfall in certain places at certain times of the year, with and without the global warming that has taken place over the last 100 years, and so you can say something statistical about the chance of particular events happening with and without climate change. Part of the issue here is that extreme events are quite rare and you need a long time series and lots of events over time to tell you something with statistical confidence; that something really has changed. The question is only a matter of time; that we just need slightly longer data sets with global warming—that really has only picked up since the 1970s—to tell us something statistically sound about what is happening.

Lord Krebs: Can I just add to that? In the conversation here we are perhaps conflating three different things. One is the average monthly rainfall, which are the figures that Peter Lilley produced in his chart here. The second is the frequency of extreme events and the third is the intensity of individual events. The particular statistic about Storm Desmond that was referred to was the intensity of an individual event, and I think the Oxford study suggested that, in their estimate, extreme rainfall of that kind has been made 50% to 75% more likely as a result of global warming over the past 150 years. That would not

necessarily show up in these average monthly rainfall figures because they are measuring two different things.

Q14 Caroline Lucas: The Government says that the National Planning Policy Framework provides strict tests to protect people and property from flooding. Do you agree with that?

Lord Krebs: The answer is that in theory it does. The question is what is happening on the ground in practice. In our analysis and review of this, we found a number of possible lacunae, a certain lack of transparency. For example, the responsibility ultimately lies with the local authority and the planning authority but they consult the Environment Agency on flood risk. It is not always clear what response the local authority makes to the Environment Agency's recommendations. They do not always feed back to the Environment Agency what decision they have taken. It is not clear that the Environment Agency is able, given its staff reductions, to scrutinise every application, particularly small ones. I think the answer is that, in theory, yes it ought to provide a robust mechanism; in practice it probably does not.

Q15 Caroline Lucas: You focus specifically on transparency there, and I noticed in one of the Government's responses to your report they say very clearly, "We do not intend to publish the findings", so do you think transparency is an issue across the board here in terms of being an obstacle?

Daniel Johns: Absolutely. The National Planning Policy Framework says all the right things. When we look at how the process is implemented, those steps are being taken, so the Environment Agency is giving advice. The local authorities are in general applying the recommendations to individual developments, but there is no check at the end of that process that the properties being built are being built in sensible places in sensible ways. Within the system there is an overreliance on flood defences to provide adequate levels of protection, and we saw in December that flood defences provide only limited protection.

There is also a reliance on uncertain flood models to tell you how high to build the level of each ground floor. There is an example where, in 2012 in Cockermouth, a new care home was built in the area that flooded in 2009. It was built in 2012, in accordance with Environment Agency advice, above the level of a supposed 1 in 1,000 flood event, and in December 2015 it flooded again and the residents had to be rescued. In that case, the process worked exactly as it should but there were still consequences and flood damage.

Q16 Caroline Lucas: The Government have also pointed to data showing that planning policy is being effectively applied, and they argue that because they say that only 7% of new homes were built in areas of high flood risk in 2013-14. Is that something that you would agree with?

Daniel Johns: Certainly our own statistics back up the principle that most new development is being steered away from the flood plain but, nevertheless, about 4,500 new properties are being built in areas that are more at risk from flooding than Cockermouth in any one year. Part of the problem here is a simple misunderstanding of statistics. The chance of a flood event in one place might be one in 100 but there are lots of places in England that could get wet, so the chance of some part of the country flooding each year is

much greater than one in 100 and, if you are building new properties in the flood plain, it is just really a question of when and where rather than whether it will flood next.

Matthew Bell: To pick that up, in that context, the question is whether local authorities in the general sense—so including lead local flood authorities, for example, as well as the local authorities themselves—have the right mechanisms and the right incentives in place to manage their catchment areas effectively, such that each one individually is taking action appropriately. Again, looking at that, we had some questions about the lead local flood authorities, which have been created, but do not have specific duties to decrease flood risk in the considerations that they take into account. They have duties to produce strategies, but most of them have not produced strategies, and so there is a question about whether the system that says that certain things should be happening is actually delivering that in each particular area of the country, such that you could be confident that the right actions were being taken in each area.

Q17 Caroline Lucas: I am sure that, as a Committee member, I am not supposed to put words in your mouth, far from it, but would you agree that there is perhaps some complacency in terms of the Government's response to the Committee on Climate Change's recommendations? I am struck time and again that, when there is a recommendation—for example, that the DCLG and the Environment Agency should publish an assessment quantifying the impact of new development on long-term flood risk, and the Government's response last October was, "We do not think it is necessary". Another recommendation was that there should be clearer guidelines about residual risk and, again, the response comes back really quite firmly saying, "We believe that a strategy to address future residual risk would not be appropriate at this time". How would you describe that response?

Lord Krebs: For us it was a little disappointing that, having done a very thorough analysis and come to the conclusion that—for the various reasons we have discussed plus others—there was a need to look again at the whole strategy that the country has for managing flood risk, the Government basically said, "No, we are perfectly happy with what we are doing". What we have seen as a result of the December and early January floods is that the Government is now undertaking a review, under the chairmanship of Oliver Letwin, as well as a more specific review under the chairmanship of Rory Stewart, concerning the flood risk in Cumbria. So perhaps some of the questions that we raised in our June report last summer will now come back on to the table and we will have a further opportunity to press the Government to reconsider their position that they were taking sufficient action already. We hope that they will look at it again.

Matthew Bell: The only thing I would add to that, which might be relevant to your inquiry, is that there clearly is a distinction between the Departments that have the main statutory lead—DEFRA in this case—and the other Departments that also have to be involved in making sure that the right actions are taken, notably the Department for Communities and Local Government. I think there is a question about whether some of those responses are given by Departments that do not necessarily have the main statutory responsibility in that sense and whether flooding, and indeed other related issues, are sufficiently high up their list of considerations when it comes to the very important primary programmes that they are trying to deliver; whether they are taking some of these considerations sufficiently into account in the context of delivering their main outputs.

Q18 Chair: Is there a conflict between the desire not to build on flood plains and the desire not to build on greenfield sites? There was a very strong lobby against building on greenfield sites, which elected politicians are well aware of. You might find in some old settlements built by rivers that, if you are not building on the flood plain, you are going into greenfield sites, which itself is very contentious, and, therefore, perhaps then they might look at the flood plains again, which perhaps they should not be doing.

Lord Krebs: You make a completely valid point. I live in Oxford and the clue is in the name; it is a place where presumably oxen forded the River Thames and the River Cherwell. There are many reasons why one would want to build in the flood plain close to centres of economic activity, close to existing infrastructure, and as you say, therefore, not impinging on greenfield sites or maybe sites of special scientific interest or other things outside the flood plain. These are trade-offs, and I think planning authorities have to make trade-offs in their decisions. What is really important—coming back to Caroline Lucas's question—is that there is transparency so we all understand what factors were taken into account, whose advice was taken, how that advice was responded to, so that the people who are going to inhabit these properties know what is really going on rather than just being told, "Here's a house you can buy" and in small print at the bottom somewhere hidden away, "By the way, it is in a flood plain or flood risk area". I would not say that we should stop building in flood plains. I would say we should be transparent about how we assess the risk and the trade-offs associated with building and how we are going to deal with the cumulative longer-term effects, because by locking ourselves into more and more development—the build and defend strategy that we have taken up to now—we are going to lock ourselves into further expenditure on flood defences in decades to come. As long as we are transparent about that and people know what is going on, I think there could be cases where it would be valid to build in the flood plain.

Q19 Geraint Davies: You have already mentioned the fact that local authorities are building something like 4,500 houses a year on flood plains. Do you feel that, if they are doing that, even with flood defences, there should be more prescription in terms of the resilience of those houses, so that when they are flooded at some point—and you did the statistics of one in 100; occurring in 100 places means that it is quite likely that it is going to occur in one place—after the flood occurs, they can be washed down, with plugs up walls and waterproofing and not having soft-furnishing on ground floors and this sort of thing, and obviously a different approach to businesses from that to residential homes for vulnerable people.

Daniel Johns: The strategy to date has been to try to avoid the flooding of towns and cities by building defences. With climate change we have to recognise that floods will happen; that defences, no matter how good they are, will be overtopped. There is always a chance of that happening at least somewhere in the country every couple of years. If you take that kind of approach, you have to end up spending much more money on dealing with the consequences, paying for flood recovery, and compensation for farmers, householders and others. Whereas if you take an approach more about resilience, accepting that flooding will happen from time to time and making sure that, when it does, homes are put back in a much more resilient way—exactly how we can do that is relatively well understood—you will be reduce the long-term consequences of flooding.

One of the issues that we touched upon in our statutory report last year was that the Flood Re subsidised insurance scheme for high-risk homes at the moment has no incentives to promote property-level flood resilience and, in fact, it is counterproductive because it takes away any financial incentive for households to protect themselves better against long-term flood risk. We have been calling quite consistently for Flood Re to promote property-level flood measures, and potentially even to pay for those measures to be installed should a flood event take place.

Q20 Geraint Davies: As you have linked in the local authority insurance, if it is the case that local authorities are giving planning permission above and beyond the recommendations of the Environment Agency, is there perhaps a case to devise an insurance system where the local authorities provide the insurance so that, in the event there is flood risk, they have to cover the cost and they would have an incentive to provide resilience as well?

Matthew Bell: More generally, there is clearly a case for somebody to be responsible for how flood risk is managed within a catchment area, to try to make sure, whether it is flood defences or a range of other measures—property-level defences or different approaches to land use or whatever it is—that the range of measures being taken is appropriate to the flood risk in that catchment area and how it is evolving. It is clearly very important for somebody to hold the ring in that debate, which currently is shared between lots of different bodies. Whether the solution coming out of that is the local authority having insurance, or households having to pay something, or what Flood Re's role is, whatever solution comes out of that, we will have to see what the best solution is, and it may be different in different places. The difficulty right now is that, at that catchment level, there is no single person who is saying, "This is the flood risk and these are the sets of measures that are appropriate for managing that risk in this particular catchment".

Q21 Geraint Davies: My point was that, if local authorities, as well as being able to give planning permission, had to pick up the cost, which would be involved with the insurance and the resilience, they might have some incentives to do the right thing.

Matthew Bell: That would be one way of providing that incentive. We have not done an analysis to understand whether that would be the right particular measure to take.

Lord Krebs: As I am sure you know, Flood Re is a limited-lifespan arrangement. It has 25 years to develop an exit strategy and, in our view, part of the transition plan should be a plan that describes how properties that are a flood risk will be made more resilient in the ways that you were discussing with Daniel so that, at the end of the 25 years, those people can still get insurance for their homes. Your suggestion that maybe someone else should bear part of the risk may be part of the transition plan. We will see what Flood Re develops. I think they are due to publish the transition plan this year, aren't they?

Daniel Johns: Yes.

Q22 Caroline Lucas: I asked a question of the Minister, Rory Stewart, about this just last week. I asked whether payments made under Flood Re are subject to any provisions to ensure that the rebuild is done to higher flood resistance. The answer was that there was no such duty in relation to payments made by Flood Re. I am not quite sure if you are suggesting

that there could be something rather than waiting for the 25 years to elapse. Is there anything that Ministers could do now in terms of inserting some kind of clause? I don't know how Flood Re is set up. Is it too late now to retrospectively say something should be there now, which would mean there was a built-in incentive to make sure that the rebuild was done better?

Lord Krebs: I tabled an amendment when the Bill went through the Lords to try to get this put on the face of the Bill, but it was not successful. However, I think it hinges on Flood Re's transition plan. I don't know whether Ministers could revisit the arrangements if the transition plan did not make it sufficiently convincing that resilience of properties would be part of the—

Q23 Caroline Lucas: When did you say the transition plan had to be done by?

Daniel Johns: It has to be published by 11 February. Basically Flood Re as the scheme administrator were appointed in November. Under the Water Act they had three months to publish the plan and that is due by the 11th. What Minister Rory Stewart announced in a debate in September was that, for the first two years of its operation, Flood Re does not need to do anything that might promote property-level flood resilience and betterment, so essentially they parked this whole issue for the next two years.

Q24 Mary Creagh: I remember this very clearly, when we were going through the whole Flood Re debate, because the insurance industry does not want to do these property-level measures because it might involve difficult discussions with householders, "You cannot have a nice wooden floor; you have to have tiles or stone" and that is obviously difficult for them on an individual level. But isn't there a risk of a perverse incentive with Flood Re because, if the insurance industry can park the most difficult and hard-to-insure homes with the Government underwriting the risk, it does not really matter how many people have wooden floors because we—the taxpayer, the Government—will always underwrite it. Could you let us know why you think the Government is resistant to that? Is it because the insurance industry is resistant? Is it because it interferes with the free market—although there is no real free market in this flood insurance? I am trying to get to the bottom of that.

Lord Krebs: I do not understand why there is so much resistance to it. Having spoken to Brendan McCafferty, the Chief Executive of Flood Re, he is very sympathetic to the idea of what he calls betterment, so that when properties are refurbished after a flooding event they should be refurbished in a more resilient way. Part of his problem is that Flood Re is hidden from the consumer, so you still go and get your insurance from Saga or whoever and Flood Re is in the background as the reinsurance pool to cover Saga if your house gets flooded. He has a problem of how he is going to communicate directly with the consumer. One of the things that we considered was whether part of the risk should be retained by the actual insurer rather than handing it all on to Flood Re. That would mean the insurer was incentivised to communicate directly to you, the householder, "I am sorry, we would love you to have a wooden floor but it would be much better to have tiles or flagstones" or whatever. I think there is a problem with the current system and it is not clear to me why Ministers are resistant to there being a greater incentive for betterment, but I don't think Flood Re is resistant to the idea.

Q25 Mary Creagh: The pool of properties covered under Flood Re will only get bigger, so the risk borne by Government will only get bigger unless you put these resilience measures in because then, in theory, properties could leave Flood Re if they were fully resistant. It is somewhat unlikely, but you could have a more dynamic pool.

Lord Krebs: Properties built after 2009 are not covered by the Flood Re scheme so, you are right, the pool could increase because of the effects of climate change but not because of new build.

As I understand it, the way Flood Re is funded is that each of us pays a little bit extra on our household insurance, which goes into the pot that Flood Re will then have to cover people whose homes are damaged by flooding. In a way, it is a tax on all of us through our household insurance. Clearly, if Flood Re is going to come to an end in 25 years, it needs to start work early in making sure that the pool of houses affected gets smaller. That picks up on what Caroline says: there is no point in waiting until the end of the 25 years and saying, "What are we going to do now?" We have to start acting very early on.

Q26 Caroline Ansell: An extension to a previous question on local government and their planning duties, and around this notion or risk and responsibility: how should they be more responsible for local solutions? They may take different decisions around prospective planning applications. I want to put a particular scenario to you, a theoretical situation that there is a large-scale development proposed in Eastbourne on an ancient pastureland and flood plain, which is declined by the local authority and is upheld on appeal by a Bristol inspector, for example. Where then would responsibility lie?

Lord Krebs: A very good question.

Matthew Bell: Even hypothetical questions are difficult to answer very specifically. I don't know what precisely the appeals process should be, but I think it does come back a little bit to what I was saying earlier, which is: first, the points we were making about transparency and that decisions and the reasoning should be made transparent for everybody, and, secondly, that it is clear who the single body is for managing the flood risk in that area—in the area that you were talking about in your example—and that if the requirement is, for example, on the lead flood authority in that area to have the responsibility for the new development, and what appropriate measures should be taken to reduce the risks of flooding on that new development, that it is clear they will have—

Q27 Caroline Ansell: My point is: what are the safeguards for the local authority in the event of a hostile decision from outside the area?

Daniel Johns: The other option I guess is for the developer to retain some kind of long-term liability, given that the developer commissions the flood risk assessment. The developer clearly then builds the development and takes any precautions that they are required to in line with Environment Agency advice, and so, as well as the council retaining some kind of liability, the other model is for the developer.

Lord Krebs: Yes. There could be other players as well. I think we are going to come on to this, but we have said repeatedly—as have others indeed, including Dieter Helm who I gather you are speaking to later on—that managing flood risk is not simply about building hard defences. It is about managing the flow of water in catchments, so landowners, farmers, as well as developers, local authorities, the Environment Agency, and central

Government, all have a role to play. As Matthew has said, all these individual parties could have some accountability but there needs to be somebody who draws it all together and says, "This is the overarching strategy". That could be a role for central Government or it could be a role for another organisation.

Q28 Chair: Can I pick up on Caroline's hypothetical planning application? I think you used to have a situation in the planning system whereby certainly the Highways Authority could not just recommend a refusal; they could direct a refusal if they thought a scheme was dangerous on highways grounds. Is there any merit in the Environment Agency being given such a power and responsibility when it comes to these types of planning applications?

Lord Krebs: To be able to veto an application rather than be a statutory consultee?

Chair: To say, "You cannot do this; it is something you have to go along with".

***Daniel Johns*:** I think it would be an interesting question to ask the Environment Agency, if they would welcome such a power. It does sound quite a draconian measure. I am not sure it would too popular with the Agency or with the planning authorities.

Q29 Caroline Ansell: I have more questions, but no more theoretical planning applications on ancient pasturelands. We have touched a little on this but it would be good to have the opportunity to do justice to it: in your interim report, you talked about the expected increase in the number of homes and properties likely to be at high flood risk over the next 50 years. Can you elaborate on the causes—and I know there are many—of this expected increase?

Lord Krebs: Yes. I am going to let Daniel answer that one.

Daniel Johns: Sure. Essentially it is a combination of different things. First, just to make clear that any new development has been ignored for the purposes of that assessment, so the 4,600 new properties going into the flood plain will add to that number. It is a combination of two things. First, the changing climate—instances of heavy rainfall and high river flows that we have been talking about earlier—but also the fact that we have about £20 billion-worth of flood defence assets already out there in the country. That takes money just to keep going, not only to maintain and upgrade those defences over time, but to build new defences in parts of the country that are currently pretty exposed and undefended. You need to run, in flood defence terms, just to stand still. The combination of how much investment is going in, together with the changing climate, means that overall you will see, even in the best case scenario, more homes falling into that high flood risk category by the 2060s.

It also relies on certain assumptions about how much efficiency you can get through the system and about, say, over the course of several decades, not seeing the kind of reduction in expenditure we saw during the last Parliament, so sustained investment—every single worthwhile flood defence being built over the course of the next 40 or 50 years—and no new development in the flood plain. Even in that best case scenario, you will still see an increase in those high flood risk properties.

Q30 Caroline Ansell: That answers my next question: can anything be done to stop the number from rising? Can anything be done to stop the rate at which that number is rising? Is it sustained investment? Is it increased focus on planning?

Daniel Johns: Certainly sustained investment is the first part. Secondly, as we have said, no longer should the flood defence strategy in this country be about flood defences. It is a simplification to say that it has been about investment in new and approved flood defence assets, but it is not too much of a stretch to say that that has been the general thrust of the flood defence strategy in this country for probably a decade or more; that there has been at certain times a focus on "making space for water"—that was a 2006 strategy. The Pitt Review talked about understanding the long-term consequences of building in the flood plain, about the need to improve flood resilience, and managing the consequences of flooding as well as just reducing its likelihood through flood defence projects.

We need a much broader strategy that works at the catchment scale; that tries to hold water in the uplands. You provide the right incentives for landowners in the uplands and farmers in the lowlands to hold water back to avoid peaks of floodwater occurring downstream into towns and cities. We need a much more comprehensive flood risk strategy that puts as much emphasis on resilience and managing consequences as it has in the past on managing flood likelihood.

Q31 Caroline Ansell: Thank you for that. You recommended that DEFRA publish a strategy to address the expected increase. This recommendation was not in fact taken up by the Government. Do you have any ideas as to why that might have been the case?

Lord Krebs: Not really, no, is the short answer. No. I don't know. I think you would have to ask the relevant Ministers why they chose not to.

Q32 Caroline Ansell: They did not offer any rationale; that there were other strategies in play or work was already being done in this area? There wasn't a—

Lord Krebs: They felt that the current strategies that were in place were sufficient and that they would produce the desired effect but, as Daniel has just explained, we do not think they will. There will inevitably be an increase in risk and perhaps that is the Government's position: that we accept that there will have to be an increase in risk. We think if you adopted a broader approach—and one very much hopes that the Letwin Review will take this broader approach—of asking: how you manage water rather than how do you build hard defences, the Government may rethink its position and be able to manage the risk more effectively.

Q33 Mary Creagh: A follow-up question on your £20 billion-worth of hard assets under management. Have you done a calculation on what the percentage is for the run-rate costs, the annual costs, of that? If it is £20 million, should we be looking at 1% management a year; 2%? Have you any idea what it is?

Daniel Johns: The Environment Agency has done that assessment. They commissioned an independent assessment of long-term flood defence asset needs—it is called the Worsfold Review—by Mark Worsfold, who works for Ofwat. That review has never been published.

Q34 Mary Creagh: When was that?

Daniel Johns: I believe it was done in 2014.

Q35 Mary Creagh: Do you know why it was not published?

Daniel Johns: I don't know, to be honest. I am not sure.

Q36 Mary Creagh: Okay. Thank you. So there is a number but we do not know what it is.

Daniel Johns: There has been a review. The number that the Environment Agency say is sufficient to maintain defences over time is somewhere between £170 million and £190 million per year. That is the revenue cost of defence maintenance. They are currently spending £170 million per year and have said they will protect that in real terms over the course of this Parliament, so I guess you could say they are spending at the lower end of the ideal range. A valid question is: would you get additional benefit in risk management terms if you were to increase that maintenance expenditure further?

Mary Creagh: That is very helpful. Thank you.

Chair: Carol, do you have any more?

Q37 Caroline Ansell: Yes, just one. It is quite nuanced but, in the response to the recommendation, the Government said that the long-term investment scenarios on which the data is based do not take into account local choices on flood risk management, but I understand that you say that you regard these estimates as a best case scenario. Can you shed any light on the difference here?

Daniel Johns: Again, the long-term investment scenarios assume that you take an economically optimal and rational approach to every single flood defence decision. We know that in reality sometimes communities opt for a different solution. They opt for a more expensive solution that provides a better standard of protection. If that were the case systematically, that would increase the costs of long-term investment. I guess it is important to recognise that that level of local choice is important, that communities have to be happy with the standard of protection they are being provided with and they have to be content with the impact on visual amenity and other aspects of the town. Certainly the assumption taken, in the long-term investment strategy, is that new development does not add to long-term costs and risks, whereas I think that assumption is quite a brave one. Also the assumption is that, at every point in the process, the economically optimal decision is made at every point in time.

Caroline Ansell: I see.

Chair: Mary, you were going to have a few words about the Pitt Review, I think.

Q38 Mary Creagh: I was. Obviously we had the Pitt Review post the 2007 floods, which is very dear to my heart because I had 1,000 homes in my city flooded but we did get some flood defence spending. The key finding from Pitt was that the Government had to

increase spending by more than inflation every year, and obviously that did not happen with the reductions in 2010, and then putting things back in. I wonder if you could say a few things on that, what you think the reduction—the slow down—in that spending has meant. Also we have not made enough progress on sustainable urban drainage—one of those things that is only for the truly dedicated among us, but there is nothing like a bit of sustainable drainage when you have sewage coming through your front room. If I can use the word, where are the blockages on urban drainage? *[Laughter.]* Totally unintentional!

Daniel Johns: Shall I pick up the spending question first?

Mary Creagh: Yes.

Daniel Johns: It is clear that there was underinvestment over the course of the last Parliament. We valued that at about £200 million in total over the five years. That was because of the significant reductions in both capital and revenue spending that were made in 2010.

Q39 Mary Creagh: Can I ask how you came to the £200 million? When I asked the House of Commons to do that figure, I had a capital reduction of £240 million.

Daniel Johns: Our assessment is based on the Government's own data, which says how much should be spent in optimal terms over the course of the next 40 years, so essentially the long-term investment scenario in 2014 said how much we should be spending over the next six years and then over the next 50 years. You can then roll that number backwards over the course of the last Parliament, and so you have a trajectory: if you hindcast that and overlay that with the actual expenditure, you have a gap of about £200 million.

Mary Creagh: I would like to see those figures if you can give them to the Committee.

Daniel Johns: Absolutely.

Mary Creagh: I would also share my figures with you as well, because mine come in slightly higher but I did a forecast from 2010. I think that would be helpful. Thank you.

Daniel Johns: Looking forwards it is a much better picture. The 2013 Spending Review led to a significant increase in capital expenditure. In the wake of the 2013-14 winter storms, maintenance budgets were put back up to the level of £170 million and there is a six-year programme of 1,500 flood defence schemes that have been taken forward. In rough terms, as long as you take and accept the assumptions that were made by the Environment Agency in their 2014 long-term investment scenarios, they are broadly spending an appropriate amount over the next six years. But, as I say, as soon as you start to factor in these suboptimal decisions potentially being taken, and as soon as you take into account the impacts of new development, you might come to the conclusion that we are probably again spending at the lower end of the ideal range.

Lord Krebs: Could I just pick up on SUDS? Clearly everybody thinks SUDS are a good idea, but the uptake is relatively low, disappointingly low. As you will have seen in our report, we did suggest some measures to try to encourage more rapid uptake. One was to withdraw the automatic right for new developments to connect to the sewage network, and the second was to make water companies statutory consultees on planning applications

with drainage implications and, at the same time, to put in place monitoring of the uptake of SUDS. The Government response said they did not think that that was necessary, as the planning process had been strengthened in 2015 to encourage uptake of SUDS, and lead local flood authorities are statutory consultees on drainage issues.

I think we would still hold the view that those measures are not sufficient to achieve the level of uptake we would like to see, and I guess the resistance to it is probably that it is extra work for developers: they would have to create soft surfaces or drainage areas that use up space, and it costs them money, and it is far more desirable for them just to slap up as many houses as they can as close together as possible. Why the Government is resistant to it, again, I am not quite sure. You would have to ask the relevant Ministers. But we were disappointed they did not feel more sympathetic towards our proposals for increasing the uptake of SUDS.

Q40 Mary Creagh: Thank you. That is very helpful. Can I just ask one very quick supplementary? Lord Krebs, we have it in our notes that you wrote to the Prime Minister, on behalf of the Committee on Climate Change, offering to help after the 2013 floods, about the Somerset Levels and so on and the resilience side of things. Did you ever receive a reply? Did you ever give evidence or provide any data to that review into the flooding of the Somerset Levels?

Lord Krebs: We did talk to Oliver Letwin after that. I do not think—

Daniel Johns: We had a formal letter in reply essentially saying that Oliver Letwin was taking forward the annual resilience review and we had meetings. It is also worth noting that the annual resilience review—which was a real review, because we have talked to the team involved—was never reported. So, even eight years or so on from the Pitt Review, we still don't know to what extent infrastructure in this country is better prepared now than it was back then, for the kind of flood events we are seeing increasingly frequently.

Q41 Mary Creagh: I read that part of your report very carefully while Leeds was under water over Christmas. You seem to imply that there was some sort of national security concern. Is there somewhere that report could go that could have democratic oversight? I suggested the Intelligence and Security Committee because we are talking about national infrastructure assets, airports and ports.

Daniel Johns: Indeed, but I don't think the kind of report we are talking about needs to go into the details of individual sites, where they are and what they do. It can be done in a way that does not breach any kind of security concerns, because we are after data that shows that particular assets were at high levels of flood risk but that there has been investment and there has been progress.

For example, within the electricity industry, the distribution and transmission companies have a standard that says what level of resilience they want to aim for in substations. They have an investment programme that is going to achieve that over the next decade. The concern is that every single flood event that occurs seems to involve a substation somewhere in the country flooding, and the one in Lancashire that flooded in December was protected to a one in 100 standard five years ago. The question again is: is the standard being implemented? Is the one in 100 flood event really the right benchmark to be protecting assets to, particularly in light of climate change?

Q42 Geraint Davies: Of course the one in 100 has become the one in 50, has it not, with climate change? I headed up Flood Risk Management Wales, which was a team that Matthew alluded to in a sense that included council leaders, the farming unions, the business community and industry. It basically spent all the Welsh Government's money through the Environment Agency. I wonder, in terms of having a joined up approach, whether you felt that major infrastructure projects should be integrated in such a way that they themselves may be flood defences. In the case of Wales, I am thinking that is what we are going to do with the M4 relief road. In fact, the North Wales railway line acts as a flood defence. Secondly, to move on, on SUDS, would you agree that part of the issue is creative ways of water capture on buildings, which are then contained in water butts that are relieved over a longer period so that rainwater does not create flash flooding in sewers?

Lord Krebs: Yes, that could be part of the solution as could the use of permeable paving. As we have said in our reports, a lot of soft surfaces in towns and cities have been paved over, front gardens being used for parking space, for example, within permeable paving, so I think your measure of capturing the water and releasing it slowly could work alongside a number of other small measures that, together, would add up to help to reduce the risk of flash flooding.

Matthew Bell: More generally—at the risk of returning to a theme, though—as you say, the use of infrastructure, given that it is going in to potentially act to prevent future flooding, the use of other measures, SUDS and buildings to prevent future flooding. In a sense, the main issue that we are highlighting is that it is not clear that the incentives are correctly in place at local levels, such that, whatever combination of measures is chosen as the appropriate combination at a local level, it will never be possible for us or another national body to say precisely what types of measures are appropriate in which areas, so the concern is: are the institutional structures and the incentives in place at that local level so that the right decision emerges? It is not clear that is the case.

Q43 Geraint Davies: That is because in England, obviously, the huge Departments are in silos whereas in Wales there is a small Government that can talk to each other.

Matthew Bell: Yes.

Chair: Thank you very much for that and thank you very much, gentlemen, **f**or your time this afternoon.

Examination of Witness

Witness: **Professor Dieter Helm**, University of Oxford, gave evidence.

Q44 Chair: Professor Helm, welcome to our first session on flood resilience. I think it is the first time you have come in front of this Committee in this Parliament. I am sure it will be the first of several occasions. Basically, we are looking at a cross-departmental response to flooding, at what I would say is a strategic level rather than looking at specific

incidents. I will start by asking for your assessment of the effectiveness of Government approaches to flood resilience post the Pitt Review.

Professor Helm: Thank you very much for inviting me. I should stress at the outset that my remarks are personal. The Natural Capital Committee has a chairman—me—but no members yet and so, therefore, I could not reflect the views of the Natural Capital Committee in any event. I hope the Natural Capital Committee will be of enduring interest to your Committee, and I am sure we will look forward to explaining our views when we have a committee in order to express such views. I think Sir Humphrey might have put it like that.

The normal way of dealing with flood events is as follows: you have an unexpected disaster; a lot of people are terribly inconvenienced and suffer accordingly; money is thrown at the problem in emergency funds; there is a call for a review; there is a review; the review recommends spending some more money and a lot of other sensible measures; some of these things get implemented and—as I would describe them—many of them are very useful but they are essentially sticking plasters. So you wait until the event happens again and then you go through exactly the same process and then again, because this is the third one in a row, and what I describe is exactly the process we are currently going through.

We have had a really horrible event for people. We have had some emergency money thrown at it. We are now going to have a review and so the question is: is this an opportunity, the third time round, to get it right and realise that there are substantial and structural things that ought to be done? Or do we simply say, "Look, it is bad luck. These things should not happen this often. I am sure we could find some more measures to do and a bit more money and it will be fine"?

Q45 Chair: What should they be doing differently? As we heard Geraint say earlier, are there too many Departments working in silos? Are there opportunities for better co-ordination working between Departments in the Government and other bodies?

Professor Helm: Typically it helps quite a lot, in these really important public policy issues, to get the question right in the first place. If you don't have the right question, you are unlikely to get the right answer. If you think about the problem of flooding, if you start by focusing on how you fix the problem in some particular location that has been badly affected, you will miss most of the interesting stuff. Flooding is about what happens to catchment systems. It is not about individual houses and it is not about individual flood defences, although they all have roles to play. To work out how much you should spend and how you should spend it on flood defence, you need to start with a proper catchment view. For example, if you say, "Should some of these houses be put on a flood plain in a particular location?" it is not the right question to then ask, "Will they flood?" It is not just whether they will flood. It is what the impact on everybody else's houses will be by putting that particular development in a particular location.

We need to start with a proper assessment of what is required on a catchment basis and recognise that a lot of money is spent on catchments. It is not just about flood defence money. It is about agricultural subsidies and all kinds of other revenues. Then we have to work out whether a Government run, Comprehensive Spending Review type of financial structure is appropriate for maintaining these assets through time, financing them and charging from them. Then we have to work out: do we have the right institutions in place to

sort this out? Broadly, that methodology does not approach what one would want in terms of working out: how much flood defence to have and where. The short-term Treasury framework is not the right way to manage long-term assets in a sustainable framework, and I think the reason why we have the Environment Agency doing this is an accident of the way in which the first attempt at water privatisation was handled.

As an aside, it is not just not good to have the Environment Agency doing flood defence but when they are doing it, as one of their senior executives said recently, "All of our people are completely focused at the moment on floods". Well, then they are not focused on all the other things they ought to do and it tells you spades about what is happening in enforcement, protection and other environmental areas. This is too many functions in one place and the consequence is that we end up, despite the very hard work and efforts of all the people involved, with a very suboptimal outcome.

Q46 Chair: There appears to be a disagreement between the Government and the Committee on Climate Change about whether the Government should be doing further catchment management pilot programmes. Who do you side with on that particular view, the Government or the Committee?

Professor Helm: I think it is a wider question. I proposed that we ought to have a catchment system operator—like we have National Grid as the operator for the electricity system—not doing all this stuff, but co-ordinating what happens throughout the catchment. This would involve co-ordinating the activities of the water companies, the farmers and the subsidies, the planning, the development and so on within the range. Of course, flood defence has to be thought of in that catchment framework.

When the Environment Agency was set up to do this stuff, essentially, the bits of the old water authorities were taken out, after the first privatisation failed, put into the National Rivers Authority, which was supposed to do this on a catchment by catchment basis. That then got cobbled together with the waste and HMIP type functions and we now have anything but clarity about, for example, take my own river, the Thames, what the relationship is between Thames Water, the agricultural subsidies throughout the Thames, indeed many of the things the Trust do, the wildlife programmes, the upper catchment management and so on, and flood defence. These are all in silos and the consequence is that we have a very inefficient outcome. It is very much more expensive to get the same level of protection that we currently get than it needs to be. Or put the other way, we could get a lot more protection for the same amount that is currently spent.

Q47 Geraint Davies: On that point, in Wales you probably know that Environment Agency Wales has been merged with Natural Wales and with the Forestry Commission, with a view to providing a holistic approach to land management, flood risk management and environmental regulation. From what you are saying, you think that is completely the wrong approach. You think the Environment Agency should be chopped into little bits that are basically the regulation of pollution, for example, industrial regulation of emissions and all the rest of it quite separately. You seem to be saying that flood risk management should be just pigeonholed somewhere. It seems a bit strange.

Professor Helm: With respect, chopping into little bits is a fairly laden notion. I am simply saying—

Q48 Geraint Davies: You seem to be saying these agencies cannot cope with these distractions.

Professor Helm: No. I am saying it should be split in two. That is not lots of bits, but two. I think this country needs a clear, focused environmental protection agency. I have argued that for at least a decade and I have argued that in the triennial review. That environmental protection agency would be very much focused on the very effective, small and extremely professional HMIP, which was cobbled into the NRA to create the current Environment Agency.

On the flood defence side, I think that flood defence should be seen as part of the catchment and the institutions of the catchment. That is neither the water company nor the NRA bit, but that is a catchment system operator that tries to bring together the components of the catchment in a coherent, integrated and sustainable way. For example, again, I will just use one particular catchment, the Thames, if you add up the amount of money that is spent on the environment in the Thames, including all the environmental subsidies that go to farmers within the frame, and look at the net effect of that—near where I live there are people ploughing up right to the edge of the Thames in flood plain areas and so on—if you look at what is happening there, there is no attempt to bring together the environmental subsidies to farming, the planning framework and the spend of the water companies. So, another example of—

Q49 Geraint Davies: That was my point. In Wales, there is an integration of Natural Wales and there could be with Natural England here. There is an integration of a socially owned water company, and there is a process of bringing people together rather than breaking them up.

Professor Helm: Bringing people together is a good idea but the question is whether what you are doing is bringing together, on top of all that lot as well, the environmental protection functions. I am saying, when you bring all those together to handle the management of catchments, what about all the other environmental stuff? They are excellent people, but I baulk at the idea that you could be chief executive of something effectively that has X thousand manual workers and skilled workers doing production stuff, you have expertise in prosecution, you have expertise in giving policy advice and doing all the other protection functions, all within the scope of one management board. I think that is just a big stretch.

I have no expertise about precisely how it is done in Wales. I have great reluctance about the idea that forestry should be brought within the framework of a single body with all these other component parts, but it is pragmatic in the end. Exactly where you draw the line is a matter of costs and benefits and so on. But it did seem to me an extremely striking comment when the chief executive of the Environment Agency said, "All my staff are 100% focused on flood defence". That just tells you that you cannot have an organisation with multiple responsibilities, and when you have a problem in one area, shove everything into that and neglect the other components. The scale of the challenge in flood defence is enormous and it biases the organisation. I think the environmental protection side of this suffers as a consequence.

Q50 Geraint Davies: But that statement was self-evidently false. It was not the case that all the resources of the Environment Agency were in flood risk management. I appreciate that he said it but, clearly, these other functions were carrying on. You are just making a case on the back of a stupid comment.

Professor Helm: No, I don't think it is a stupid comment. I suspect that the senior management of the Environment Agency were overwhelmingly focused on this problem, as they should be, because they are the Environment Agency, they do have all these other responsibilities, but there are people really suffering in a particular circumstance. There are no optimal organisational designs, but the focus of what I have argued for in my paper on catchment system operators and so on is to bring together the water companies, the flood defence, the agricultural land use side and the planning on a catchment by catchment basis, which is what used to happen in the pre-privatisation world except it was done through public water authorities. The farming was outside, but MAFF looked after that component. That is essentially all I would suggest.

Q51 Caroline Lucas: First, thank you very much for the "Time for a Radical Rethink" paper. That is really helpful, the one that was circulated in January. I wondered if you had any indication that the Government is thinking in the terms that you were describing. We have heard about the review that Oliver Letwin was overseeing a couple of years back, and that committee only met three times and it never even published a report. Oliver Letwin is now in charge of another process and I think Liz Truss is in charge of another one. In the discussions you have had so far, do have any confidence that this broader approach you are advocating is being supported?

Professor Helm: In a very serious sense I have no idea, by which I mean they have announced a review—

Q52 Caroline Lucas: They have not asked you to go and talk to them about it?

Professor Helm: I suspect the review has only just been set up, so I would be surprised if they had come round to asking people along yet. It is as I described at the outset. We are following the normal pattern. There is a disaster. There is some short-term money and then there is a review. The question is—and I think it is just an open question—is this going to be a serious thing? That is why I wrote the paper.

Q53 Caroline Lucas: I just wondered if you had any feedback. You wrote it about three weeks ago, or at least it was circulated about three weeks ago, and wondered if you have had any indication yet of a hopeful nature.

Professor Helm: No indication either way.

Caroline Lucas: Pending, okay**.**

Professor Helm: There was a statement in the Secretary of State's speech to the Oxford farming conference that advice from the Natural Capital Committee would be sought in due course in these areas, although I think it referred to me personally. I suspect in this world it is pretty hard not to have an input into that process, but whether people listen and use this structural opportunity, I don't know. All I can say on the negative side is that there was an opportunity, in the quinquennial review of Natural England and the Environment Agency, to look at the structures and this was not taken. I think that is a mistake.

Hopefully some further progress can be made this time, but I just don't know how this will play out.

Q54 Caroline Lucas: Thank you. I want to go back to the NPPF and the issue that the Government is at the minute standing by it, basically saying, "It provides strict tests to protect people and property from flooding and, therefore, we do not need to revisit it or any other assessment of planning". What would your response be to that?

Professor Helm: Do you mean in terms of the planning regime or the way the risk assessments are done?

Caroline Lucas: I mean in terms of the planning regime.

Professor Helm: My take on this is that there are lots of areas where people fully appreciate that there is flood risk. There is an issue about building houses on flood plains and they want people to contribute and influence the decisions that are made, taking those things into account. But it seems to me that that is what you might call a necessary condition. It is not sufficient because it depends on what you think flood risk is and what you think is relevant to a particular development.

If, for example, we have a new housing estate in my village, it has lots of impacts. The houses themselves in my village probably will flood, but that is an aside. Supposing they would not, then they are going to displace a lot of water. It is going to affect the other flood risk down the road from where the estate is and so on. Is this taken into account? I think a very narrow notion is taken of thinking about what planning and other considerations should be, on the basis of the risk to those properties, as opposed to the risk to the catchment and to others. Where I live in the upper Thames, we absorb a lot of water in the fields. The Wildlife Trust, which I am a vice-president of, bought a farm that deliberately floods every winter. This reduces the costs and the impacts of building hard flood defence infrastructure in Oxford to prevent it. That is what it is for; it is a flood meadow. If you build houses where we are, they may or may not flood, but they will certainly have an impact on Oxford. The question is: is the assessment taking this into account? My answer would be: no, not really, because it is focusing on those properties at risk, not the risk to the catchment and all the components of that catchment.

Q55 Caroline Lucas: I think you have answered my second question but to clarify it, essentially, when the Government was saying that it had data indicating that planning policy is being applied effectively, and the criteria it was using for saying that planning policy is being applied effectively was precisely that only 7% of new homes were being built in areas of high flood risk, would your response be essentially that that is the wrong question, that we are fixated on those 7%?

Professor Helm: It is one of the questions. It is deeply interesting to the people whose houses they may be, but it is not the most interesting question. That comes back to where is there a genuine, for example, Thames catchment plan, which includes the flood components of that, but also obstruction, droughts and all sorts of other components, river-flow pollutants? There is a whole chunk of things here that fits into an integrated framework.

Just the final point, which is very important—it might sound slightly technical—almost all project appraisal, including the Green Book, looks at the risk of a particular project, and it is amenable to what we in economics think of as cost benefit analysis. Cost benefit analysis is a marginal technique about a marginal project, given the rest of the system. This is a system question, and the planning and so on ought to address the system consequences of what is being done. That is why I chose the notion of a system operator over this system; in the way that everyone understands that National Grid is a system of electricity supply and not individual components on their own. It is a slightly techie and academic point, but it is fantastically important as to how you apply the methodology, and in part that is also the problem with the Environment Agency's assessment of risk.

Caroline Lucas: That is helpful. Thank you.

Q56 Caroline Ansell: You touched a little earlier on agricultural subsidies and how some could be considered inconsistent with flood defence and should be redirected. How would you see this process taking place?

Professor Helm: There are lots of dimensions of agricultural subsidies that could be better run for sustainable economic growth and for a sustainable environment. We pay X amount—either indirectly or directly—to farmers to do things that, presumably, they otherwise would not have done. Since it is public money for public purpose, we want to get the best environmental catchment and other bucks for that outcome. A radical idea would be to ask farmers, who want to receive these subsidies, to bid for them, not for money but for the environmental improvements; to auction and say, "What can you offer, so that we give you subsidies rather than someone else?" If you have a catchment plan and you say, for example, "In the Upper Thames we want the land close to the river to flood or to be able to absorb floodwater. We do not want it ploughed up". That is a fairly obvious thing to do.

When I see a field, such as one up the river quite near Lechlade, where it is ploughed to the river bank, you can see the soil flowing off into the river and you can see the effects. We saw the effect of the maize crops in the upper reaches of the Somerset Levels, putting the silt in, which we have now been paid to clear out and remove. I would try to structure a system approach asking, "Who should get subsidies for what?" so that we, as a piece of public policy, decide what those billions are spent on. In this case it is pretty clear in lots of circumstances what you would want to do.

Caroline Ansell: An auction sounds very innovative.

Professor Helm: But it is not for a price. It is an auction to ask people who want to receive public money, "How much can you do for it? What are the benefits?" Then we work out the environmental best bucks for society that come from that. It is net to the farmers because it is the same level of subsidies. The only difference is some farmers might get more of these subsidies, some might get less and some farmers might have to do a lot more for their money. They might have to deliver the stuff, as opposed to some of the things that are in the environmental schemes, which are, frankly, more cosmetic.

Q57 Caroline Ansell: Sure, but do you think this would be a more dynamic approach?

Professor Helm: The scope for improvement is enormous. It is not asking for more money to be spent or something, it is just asking for the money to be spent in a constructive way to address the set of problems we want addressed, as opposed to an income support scheme, which is an alternative and, in an agricultural case, a perfectly understandable regime that might be put in place.

Q58 Caroline Ansell: That might be one way to involve farmers because the criticism was that they were not fully engaged. Are there others? Can you see any other ways in which they might—

Professor Helm: It is incredibly important to involve farmers. They manage the huge quantity of land.

Caroline Ansell: How might you do that?

Professor Helm: You might think economists say this sort of thing but most people respond to incentives. If you think about: what are the incentive structures that confront most farmers? If you pay them in a particular way, they will rip out hedges. If you pay them to put them back, they will put them back. Like any other business, they will think about the most profitable outcomes for spending their resources that are available. This is not an industry like the car industry. This is an industry whose entire structure depends on public support. The idea that there are markets determining outcomes—the Common Agricultural Policy does not do that. Land prices are much higher than they otherwise would have been because of the nature of the support regime; there are environmental subsidies and so on.

We have an economic output of about £9 billion, we have about £3 billion of direct subsidies and then there are all the externalities. If you are a car maker and you fiddle the diesel, you have consequences because you are causing pollution. You must pay for it. But if you are a farmer and you apply fertilizer, you don't pay for the consequences of what flows from that. There are all sorts of distortions in this world. You don't want to attack farmers' incomes; you don't want to attack farmers' activities and what they do. They are all thoroughly supported, but we could do it in a much more incentivised way that is good for farmers, good for the environment and good for flood protection. It seems to me that it is not rocket science to realise that there is a win/win/win solution in that frame. For a bucket of money, you can produce a much better outcome for all the players. I put it to you the other way round, could it be worse? Can you design a system of agricultural support that produces a worse outcome, in terms of the net outcome for the economy as a whole for economic growth and prosperity? I sometimes struggle with that, to try to think what that would look like.

Caroline Ansell: My best answer.

Q59 Geraint Davies: What you have been suggesting is the Environment Agency has a more marginal cost-benefit analysis approach, rather than a system analysis, although—

Professor Helm: I can describe the methodology, I did the peer review for the 2011 document and very good hard work is done by people who really think about these problems. It is not criticism of the individuals or the team. But the starting point is—the objective at that stage was—to reduce the number of properties at risk and to assess how

to do that. You might think, "Find out who is most at risk and let's spend most money on them" but if you stand back from that problem it is not anything like obvious that that is the optimal thing to do. There is a house right next to the Thames near me, it always floods and it is at risk. Should it have lots of money put at it? If it did its house price would go up quite substantially. It is all capitalised in prices.

Q60 Geraint Davies: Do you agree that the Environment Agency should be able to trump local authorities and, rather than just advise, stop them? Secondly, you suggested that properties in flood-risk areas should not receive any insurance and I was wondering what you thought of this flood recently?

Professor Helm: It is the same question; it is about the incentive structure. If society socialises flood risk away from individuals and away from property owners, you will get sub-optimal location of houses and more flood risk than you otherwise would have done. If I want to buy a house in my village, which was flooded in the 2007, the house price is substantially different from the house price of those that were not flooded. If you look at the Environment Agency's map, you can correlate the blue bits are the flood bits, you can correlate them with the house prices. If you say to me, "You buy that house that floods, we will make sure you are subsidised so you don't suffer the consequence of doing that" and you will have less flood protection, I am not going to pay the full cost of it.

It comes back to the central point of insurance: insurance is about randomised risk. The thing about flood insurance is that it is very predictable which houses are most likely to flood. It is like saying, "Should you pay the same car insurance if you have had 15 accidents in the last year, caused serious injury to people?" In other words, you are a much higher risk. If you then give that person car insurance, they go on driving their car. That is the point about misconceiving what the problem is, you do not want to give people the wrong set of incentives, so they should face the true costs of the risk that they face in making the choices that they make.

Q61 Geraint Davies: You mentioned system management and you have alluded to use of flood plains and others to absorb flooding, rather than building on them. Do you think there is a lot of scope in addition to that, from engineering solutions that might consist of re-diverting rivers upstream, when there was extreme weather conditions, into makeshift reservoirs or possibly even tunnels and things like that, or don't you favour that?

Professor Helm: In some circumstances that might be a good idea, but let me give you the sorts of trade-offs and choices that ought to be in this flood assessment. You could build a hard concrete bypass around Oxford to get the water past Oxford as fast as possible or you could support the Otmoor and Upper Thames projects to increase—through the application of the way agricultural subsidies work, through environmental trusts and so on—the ability of the Upper Thames, where I live, to absorb the water. They both have costs and benefits. It is not always the case that what you might call the more natural catchment approach is the better one, but at least you ought to take that into account. Who monetarises this? Who pays, for example—in our case the Wildlife Trust—to make sure that we run our land so that it floods, to run off more in that way? There is no obvious monetary payment but there is a monetary payment required in respect of the hard landscape and what water companies do. All I am saying is that, from a catchment point of view, you want to weigh these alternatives up before you reach decisions. In some

circumstances, it would be nonsense not to have hard-flood defences for London. It would be nonsense not to have a Thames barrier. Of course you need those components.

Q62 Geraint Davies: As far as you are concerned, your proposals for incentives for land use management that you have mentioned, as a technical point, are they allowable under EU rules for farm subsidies and taxation or—

Professor Helm: I am not a legal expert.

Geraint Davies: I am not trying to be difficult; I just want to know if we could do what you are proposing.

Professor Helm: If you look at the pillars, in my mind there is considerable scope for how the environmental monies are spent and the framework. Provided one does it in a co-operative fashion, if you have farmers and your catchment system operator and water companies and others all in favour of pursuing a particular route, that is quite powerful. If it is illegal, and my experience of environmental regulation in Europe is that they are never precisely prescriptive, so there is a lot of scope for manoeuvre, that is exactly the kind of thing that the Government ought to be thinking about trying to persuade the European Union to do differently, or even trying to persuade them in their negotiations at the moment to give them more flexibility but I cannot see that that is going to be an obstacle. Remember, in the circumstance you are faced with the alternative, which is a crisis, a flood, almost anything turns out to be reasonable to do to mitigate a disaster, and I suspect it would be very hard to argue against but I am not a legal expert.

Q63 Mr Peter Lilley: Could I begin by asking—which is a follow-up to both Caroline's and Geraint's questions—do you know whether there is discretion under EU law as to how agricultural subsidies are used, so that they could be used in the very imaginative way you suggest? I was under the impression that they were rather more specific, they have had to go in certain ways for certain uses to certain kinds of farmers of certain size and so on.

Professor Helm: There are constraints and there are directions for these things, but we have a whole series of schemes, stewardship schemes, and high-level schemes and so on. As far as I understand it, there is a great deal of discretion in what goes into those particular schemes and how they are agreed and negotiated. In my area, the nearby farm has a wildflower meadow as part of their Higher Level Stewardship scheme. Along the Thames, just down the road from me, there is an agreement not to cut the grass by the river until the curlews have gone and the end of the breeding season is over. The practice is very pragmatic. If someone wants to resort to lawyers to defend particular lines, that is another matter. I don't see it as a powerful obstacle. If it is, the obvious answer is get it changed, but you are lawmakers and I am not.

Q64 Mr Peter Lilley: In that area we are not lawmakers. Could I move on to your idea about having catchment or river system operators taking this more holistic view on flood defences and water management and funded by a levy on water bills? Could you flesh out a bit more how this would operate? For a start, how many such water basins are there—catchment areas or catchment basins, whatever you call them—in the UK roughly?

Professor Helm: I was thinking more of England than Wales or Scotland to check for catchment, but they follow roughly the river catchments that were the basis of the design

of the water companies and the water authorities we have and the environmental areas that were set up. The Thames is roughly the Thames, though there is a little bit about overlaps and other component parts, Severn and Trent cover Severn and Trent. Some of them are a bit more complicated, like the Wessex area and so on but, broadly, it is a relatively small number, a dozen or so. You can argue exactly where it is the margin, and you don't have to do it all in one particular go. What do you do? Just like the system operator in the electricity system, the system operator has the framework—call it a plan, call it whatever you like—in the way National Grid has a plan for the system as a whole. It is responsible for that. Then—this is the bit that some people miss—it becomes extremely competitive because, having decided what it is that you want, the system operator does not do it. The water companies can do some of this stuff, new competitors to water companies have come in to do some of these bits, and farmers can bid for some of these components, and a host of other players. Anyone can come into this framework to offer to carry out these functions, in the same way as National Grid owns wires but, of course, it does not own any power stations or any of those component parts.

This goes with the grain of what Ofwat is trying to do in trying to effectively open up water supplies, abstraction, all those kinds of things in its framework. It goes with the grain of trying to integrate the flood defence into the catchment, and it goes with the grain of trying to make the agricultural subsidies part and parcel of the package. I see it as a very much more open, much more fluid set of suppliers—not just monolithic water companies and so on—within the framework of delivering these outputs—the outputs that are sorted out at the catchment level. That is a small organisation, probably smaller than the NRA's/Environment Agency's current component of catchments. The thing with the Environment Agency was it inherited 6,000 people from the water companies and built itself into a large productive organisation doing industrial stuff, bigger than the ScottishPower group, to give you a comparison. That is a million miles from a system operator that decides what is done but does not do it.

Mr Peter Lilley: But does fund it—

Professor Helm: The funding question is substantive and it can go in one or two directions. It can go directly to the people doing the stuff or it can come to the central point and then be bundled out. In electricity, it goes to the generators, the suppliers and to the grid but if you want to centralise it, you could. The point is that the people who are paying are going to go on paying. If you think about it, flood defence is paid for, there is money that goes into it, and there are revenues. The question is: can those revenues be better deployed? Whether those revenues come from the taxpayer or from a levy on households or from insurance, these are our choices. As I have tried to point out, flooding is largely not an insurance problem. It is very important trying to fix it by a cross-subsidy in insurance to people who are at high risk. It is like having an insurance system that goes and finds very high-risk young drivers and gives them low-risk, low-price insurance for driving their car. Insurance is about randomisation, it is not about predictable outcomes, so that is not a good one.

The taxpayer one has the consequence, first, that it is short term, and we have seen the hand-to-mouth way that it flows, but, secondly, it rules out using the normal way in which you would finance fundamental infrastructure. You would have a balance sheet in a normal organisation and you would have pay-when-delivered, so you borrow the money to

finance the investment and then the customers pay when it turns up. Government is pay-as-you-go; it is cash in, cash out. When the question was raised earlier about the capital maintenance: if you have a proper asset base for a flood company or flood organisation, that asset base needs to be maintained. That is the capital maintenance charge in a current cost-counting framework. That is a first claim on revenue and that should come out of cash probably. There is an additional investment programme and that should be pay-when-delivered. That should have a balance sheet and normal borrowing against the assets.

You cannot do that, as we have tried with PFIs and all sorts of things for a long time, in the public sector as part of the Comprehensive Spending Review. My framework enables you to take this out. It does not necessarily privatise them. They can be trusts. They can be all sorts of organisational forms, but they are free of the short-term financial framework. But you do need a system operator on top of them to make that function and to test them to competitive options. For example, some water companies say they can do this better than the Environment Agency. Let them try. Let's see what their bids are. Let's see what their prices are. Let them try to compete in this space and vice versa. I cannot speak for them, but I am sure my Wildlife Trust would like to offer a flooding solution for the land we manage in the Upper Thames, compared with our flood defence offer in Oxford. Someone has got to adjudicate that; you cannot just say that is a market process. Someone has to decide and that, in my model, is the system operator.

Q65 Mr Peter Lilley: The system operator has some funds—either coming from the taxpayer or a levy on households in the area—and the operator specifies what it judges needs to be done and then asks for bids or who does it but would it be redeploying some of the agricultural subsidies? Would it have control over some of them?

Professor Helm: Here is an important distinction. Someone can bid to do something. The water companies currently bid for capital programmes in their periodic review to the regulator. The regulator says, "Okay, you can build this sewerage works and you can charge your customers, who must pay, the amount of money that I allow to do that". The system operator can do exactly the same thing. It can say, "You can bid to do this particular activity and then you can charge your customer base". Then you have to ask: what are the customer bases for charging? There is the water customer base, there is the Council Tax base—these are options—and there is the agricultural subsidy base. If you do the following things you offer to do this, you can have this part of agricultural subsidies from the Higher Level Stewardship or whatever the scheme might be. The money does not all have to come into some huge bucket and which people pile it out, that is the Treasury model for public expenditure.

This can be the right to charge customers for the system component that you are offering. As I said in my paper, there is a terrible reluctance—and I understand it politically—to have any user charge for flooding because it looks like another tax and so on. But there are two options here, one is we can say, "It is a political obstacle, cannot do anything about it, so we will stick with taxpayers paying anyway". It is a tax that you pay in order to do flood defence, and we will have the same hand-to-mouth Comprehensive Spending Review structure that we have and some all the time will tell you it is incredibly long term, it is not or you can genuinely get this done more efficiently and properly, but then you have to have some charging base and then you have to confront the consequences. But I genuinely believe you could get more flood defence for the same amount of money that is

currently being spent, so we don't avoid the costs of flood defence by saying it is paid by taxpayers, rather than by a utility base and the utility base is pretty comprehensive.

Q66 Mr Peter Lilley: But where there is a conflict between, say, flood defences or flood-avoidance measures and environmental objectives, as allegedly there have been in various parts of the country, should we dredge more and know that that might help get rid of bottlenecks so we have flow of water over the basin but it might also change the biodiversity if you dredge or something? If you separated off the environmental side from the flooding side, who is going to make those trade-offs?

Professor Helm: First, let's be rather clear about what the so-called trade-offs are here. There were repeated interviews during the flood events in which people were asked, including the Environment Agency, what comes first, people or the environment? It is a fundamentally misconceived answer to say people. If you don't have a properly managed catchment you will not have well-defended people. It was particularly odd for the Environment Agency to think it was black or white in this framework. If you ask, "We would like to dredge this bit of the river but it is going to take out some species and so on", there is a prior question that is: why do you want to dredge it in the first place? What is the problem that dredging is the answer to? The answer usually is that the upper part of the river is pulling the water too quickly into a particular location with this consequence. Then you ask: does your proposed short-term solution solve the catchment problem? First of all, I am not sure this trade-off is quite how people imagine it but the second point that you ask is: who makes that decision? If you have a catchment operator they will operate within the framework and environmental law, like everybody else does.

You can imagine that if I had my way and there was an Environment Protection Agency, they would be a consultee. Whether they would have a right to veto or whether they would have a right to being consulted, they would be the experts on that piece of advice but not the people making the decision about that, which is the catchment system operator deciding what should be done in the light of the environmental constraints.

Q67 Mr Peter Lilley: Where else out of household levy would that be related to the flood risk of the household, or would it just be a per capita thing or based on the rateable base of the house or something?

Professor Helm: Now there are two parts here. First of all, I have said the risk of flooding is a catchment-wide issue.

Mr Peter Lilley: I live on the top of the hill, we have never been flooded.

Professor Helm: Okay, but the chances of a particular house—you—being affected, that comes down to whether it is an insurable risk or not. I am contributing to the Thames super sewer, I live in the Upper Thames, it is socialised. Some of the sewage going down the river to the Thames comes ultimately from where I live but not much. But suddenly they are contributing for some of the things we are doing in the upper catchment. There is an inevitable public-good system property that means a degree of uniformity of charge. But then there is a particular additional point, you don't have a flood risk to your house, so presumably you don't want to take flood risk out for insurance, probably you don't. But if you lived right near the river and you have bought that house and you face the risk of being flooded, your particular property, you can either say, "I paid a much lower price for

the house because by buying it I knew I was taking this risk, and it has lowered the capital value and then I spend some money on preserving my house" or you can go along to an insurer and say, "This is quite a high-risk flood but it might not flood, so there still is some randomisation, we might not get a deluge, will you give me a much higher premium for doing that?"

Think about my car example too. If you are a high-risk young driver you may pay a lot of money for the insurance that you get for the high risk and you may not have an accident. But also a lot of money is spent on the road system, and all the support systems that we socialise to pick up the mess that is caused when that person has an accident, so it is both bits. What is the right balance? Not perfect.

Q68 Mary Creagh: On water bills, you have talked about the different routes and then obviously the National Rivers Authority does not exist. It is now the Canal and River Trust, which is a charitable body, so obviously your complexity model has extra complexity because some are public sector, you have the private-sector farmers and you have a charity in the mix as well. Are you aware that there is a £50 reduction on water bills in the South-west that the Government is funding?

Professor Helm: Yes.

Mary Creagh: What do you think about that? You are talking about a levy on households. We have just heard about a flood levy that is going on all our contents and buildings insurance policies, do you think a levy on water bills is a better model than the Flood Re model? Is that essentially what you are saying?

Professor Helm: Absolutely, absolutely. It is the right answer to a system question, as opposed to Flood Re, which is not.

Mary Creagh: It is only going to be for 25 years when Flood Re ends because this is a 25-year Government programme.

Professor Helm: Flood Re is a cross-subsidy programme to cross-subsidise houses at risk—

Mary Creagh: No, I understand what it is. But, in practical terms, you are positing a solution when there is already a subsidy going in through one way. What do you think public tolerance is of having another potential flood levy on their water bills?

Professor Helm: If you are in a hole, in general you try to think about stopping digging. If you cannot get out of the hole, the hole does not solve the flood risk problem, does it? All it does is deal with the consequences to the people who get flooded. That is what the Flood Re system is about. It does not do anything about the catchment issues about what you should do on this front or the amount of money that Treasury have to spend to run the system going forward. First, I would not do Flood Re and, secondly, I have no great confidence in Flood Re working very well. I have no idea what people will do in 25 years' time. It is an extremely inefficient system and it will not solve the flooding problem. The flooding problem is about catchments. We will still have to spend the money and the question is: do you want a balance sheet with debt for the investment and a proper funding framework integrated within the water framework system, or do you want to carry on with

what we have or pretend that Flood Re solves the problem? The problem will not go away because one does not like people having to pay fix. The £50 in the South-west has got nothing whatsoever to do with flooding or water, it is a social subsidy and that is—

Q69 Mary Creagh: Do you think that could be better spent? Would it be better spent?

Professor Helm: The problem in the subsidies for South-west is a generalised one. In the nationalised industries, we socialised all our infrastructure networks across the entire population. When we privatised and regionalised, we made each region face the full cost. If you are in the South-west you paid the full cost of distributing electricity. You paid the full cost of the water system and 30% of Britain's bathing beaches. For an area that had relatively poor incomes, the utility-bill hit came one after another after another. My view is that the right answer was not to try to face people with subsidised prices but to address the social security system that privatisation brought into focus, because it undid the massive cross-subsidies that were part of the nationalised system.

Chair: Very many thanks for that. We could have gone on much longer but there is a Division. Thank you very much, Professor Helm. That was invaluable. Thank you.