

Environment, Food and Rural Affairs Committee

Oral Evidence: The Work of Defra's Chief Scientific Adviser, HC 775

Wednesday 31 January 2018

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Members present: Neil Parish (Chair); Alan Brown; Paul Flynn; John Grogan; Sandy Martin; Mrs Sheryll Murray; David Simpson; Angela Smith, Julian Sturdy.

Questions 1 - 81

Witness

Professor Ian Boyd, Chief Scientific Adviser, Department for Environment, Food and Rural Affairs.

Examination of witness

Witness: Professor Ian Boyd.

Q1 **Chair:** Welcome, Professor. It is good to see you this afternoon. What would you prefer to be called: Professor Boyd or Ian?

Professor Boyd: Ian would be great, thank you.

Chair: Okay. We probably know what you are, but would you like to explain a little about exactly what you do? Then we will start firing questions at you. You are very much welcome this afternoon. We are very pleased to see you.

Professor Boyd: Thank you very much. I am chief scientific adviser at Defra and have been for five and a half years. Do you want me to expand slightly on the context of my role?

Chair: Yes, as long as it is not too long, that is fine.

Professor Boyd: Fundamentally, my job divides down to three activities. One is an internally facing activity which is about trying to make sure that science evidence and analysis is well organised and delivered right across Defra as a group. That includes Defra and its arm's-length bodies like the Environment Agency, Natural England, the Joint Nature Conservancy Council and the Animal and Plant Health Agency. There are a lot of those agencies—well over 20.

Q2 **Chair:** So you would advise virtually all the arm's-length organisations linked to Defra.

Professor Boyd: I have a strategic role to look over the top of them, and an internally facing function, where I chair a sub-committee of the Defra executive committee called the group science evidence and analysis committee, which has the heads of evidence and analysis, directors of research or chief scientists from all these bodies sitting on it and we have an agenda.

Q3 **Chair:** Is it the chief vet and all these people?

Professor Boyd: The chief vet is a member of it, as are the heads of profession, the chief economist, the chief statistician, the chief social researcher, but also the chief scientist from Natural England, the Environment Agency and those sorts of bodies. We take a collective role in managing science evidence and analysis across this whole group of people. Defra is changing rapidly, but it probably has about 23,000 staff and about 5,700 of those are scientists and engineers. It gives you an impression of the depth of talent that there is in the organisation. That is role number one.

Role number two is more of an outward-facing role. On at least a weekly basis, if not more, I give lectures, talks and speeches. That is about



HOUSE OF COMMONS

making sure that Defra is understood outside. I am one of the relatively few people who would be classified as a civil servant—I sometimes do not see myself as one, because I am an academic as well—who talks quite freely about what Defra does externally, other than Ministers. I take that role very seriously and it is very important.

The third role I have is in providing direct advice to Ministers and senior officials about key issues that have science related to them, with respect to policy implementation and that sort of thing. Some of the things are fairly obvious: neonicotinoid pesticides, bovine tuberculosis policy, plastics. All those sorts of things come into my remit. If I was to divide these three tasks up, I spend most of my time on the internally facing organisational function, and probably least on the externally facing function because that is quite acute. It is trying to make connections with people. Then the advisory role about acute issues sits in the middle somewhere. That gives you a flavour of the kind of things that I do.

Q4 Chair: Do you have regular meetings with Ministers, or is it as and when on an issue basis?

Professor Boyd: I have regular catch-ups with Ministers, roughly once a month. They go into the diary as a one-to-one. They often get moved because my diary changes, Ministers' diaries change, but I see Ministers almost on a daily basis. It is not quite, but it is almost on a daily basis. I see the Secretary of State pretty much every week at various meetings. I have a lot of contact with Ministers, so I never really have much concern about not being able to speak to Ministers if I need to.

Q5 Chair: You have three Ministers, with John Gardiner in the House of Lords, but of the two Ministers in the Commons you have Thérèse Coffey, who is dealing more with the environmental side, and George on the agriculture side. Do you spend time with them equally, or how does it work out?

Professor Boyd: It depends on the issues. It works out pretty equally. Minister Eustice has difficult issues to deal with—well, they all do—but I probably have slightly more regular conversations with Mr Eustice. That is on an as-needs basis, rather than anything else. I find all the Ministers are incredibly interested in what I have to say, and very engaged with and supportive of science. That goes without question at all. They are all very interested.

Q6 Chair: Thank you very much. That gives us an overall flavour. We will start to drill down on the individual questions now. The first one is from me. Can you tell us why you chose to focus on waste and resource productivity?

Professor Boyd: It has taken quite a while to get this report out. The decision about how to do that goes back probably almost two years. The genesis of this report is that it is one of a series that Professor Sir Mark Walport was producing as an "annual report." He had an ambition to make these things annual, but they are topic-based reports that he



HOUSE OF COMMONS

wanted to produce on a regular basis. He produced two before this, one on forensics and one on risk. There was a discussion, and the way that these topics tend to come up is that we have a discussion among all the departmental chief scientific advisers with the Government Chief Scientific Adviser.

At the end of the day, it is up to the Government Chief Scientific Adviser what the subject is going to be, but this came up as an important subject. One of our tasks as chief scientific advisers is to do horizon scanning, and this is a classic case where we got it right. At the time we were thinking about this report, waste was not really a very popular subject with Government. Now it is very different.

Q7 Chair: There is the 25-year plan, with the plastics in there and what have you.

Professor Boyd: Exactly. Plastics, in particular, have raised the profile of the issue very significantly.

Q8 Chair: What was the gestation period of this?

Professor Boyd: I cannot tell you exactly when we started to talk about it, but it is probably at least a year and a half, if not two years, since we pulled the trigger on saying, "This is what we want to do." Then it went through a whole planning phase, because, as you will have seen from the report, there are a lot of contributors to it, so we wanted to draw down on a lot of expert evidence and make sure the chapters were well formed.

There was a process of getting all the chapter authors together so that they understood the style we wanted to apply to this, and produced something that was not overlapping and congruent to the objectives. That process took perhaps a year to achieve. Then there was a whole editing process, and Mark and I wrote the report itself. The report itself is the small document that sits on top of the evidence document, which is the big thick report. That is why it took quite a long time to get through the system.

Q9 Chair: That leads me neatly into my next question. It is not the first report that was expected to be published a little earlier. Yours was a little bit delayed. Why?

Professor Boyd: As I said, it is a big complex report and it is an important area. We wanted to make sure that the messages from it were clear and were not going to be misunderstood. An important aspect of these reports is that we want to see a policy customer for them. We want them to have impact. One of the things we wanted to do was to make sure those policy customers were appropriately apprised of what was in the report, so that they had a chance to feed back.

That process took a while. The report, even before it was published, had already started to have its impact because, as you may be aware, Defra is going to produce a waste and resource strategy in 2018.



HOUSE OF COMMONS

Fundamentally, this is the evidence base for it. In co-designing it with the policy people—

Q10 **Chair:** You think the policies were evolving within Defra as your report was being put together.

Professor Boyd: Exactly. Mark can speak for himself on this one, but the two previous reports were slightly different, in that they were produced slightly separately from the policy professionals who are involved in this. We intentionally made this more of a co-design process. As a result, we have managed to make sure that what government policy is doing is well aligned with the evidence. That is the reason for the time it has taken.

Chair: It seems to be logical to me.

Q11 **David Simpson:** You are very welcome, Professor Boyd. There are many recommendations within your report, but there seems to be little calling for concrete action. Does the report go far enough in calling for practical methods for reducing waste? Is it strong enough?

Professor Boyd: The report is fundamentally an evidence document. I have to step back slightly and explain my position. My position is to try to make sure the evidence is available to anybody who wants it, but it is not to make the policy decision for them.

Q12 **David Simpson:** So your report does not make recommendations.

Professor Boyd: It makes some recommendations, but the recommendations are mainly aimed at improving the evidence base and steering the policy in particular directions. This is not about specifically recommending policies. That is not my role. It is not the Government Chief Scientific Adviser's role. That is for policy to decide, based on the evidence and all the other factors they take into consideration.

Q13 **David Simpson:** Your report was evidence-based, and someone somewhere in Defra will take that report and make some recommendations from that. Is that what you are saying?

Professor Boyd: They will make policy from that. The strategy that will come out later this year will translate this into what, I hope, will be clear policies. I will be watching that because I will want to see clear policies coming from it.

Q14 **David Simpson:** If there are not clear policies, you will raise your eyebrows.

Professor Boyd: If there are not clear policies or if they are misaligned with the evidence base that sits in here, I will ask questions of that. It may well be that I get a response that says, "Well, for X and Y reasons, yes, we recognise the evidence but there is a whole range of other factors we need to take into account." It is not for me then to necessarily disagree with that, as long as an explanation has been given as to why the evidence base has been departed from.



HOUSE OF COMMONS

Q15 **David Simpson:** Just to finish this question, I will take it that Defra policy people have already looked at your report.

Professor Boyd: Absolutely.

Q16 **David Simpson:** Are they pleased with your report?

Professor Boyd: I think so. I hope so. The very fact that they are willing to produce a strategy using this as the evidence base suggests to me that they are very pleased with it.

Q17 **Sandy Martin:** I am asking you this, Professor, out of a position of extreme ignorance, because I am a new MP so I do not really understand the way that this place works yet.

Chair: Do not worry. If you had been here as long as Paul, you would not understand.

Sandy Martin: How many pages is your report?

Professor Boyd: I cannot tell you straight off but I can tell you right now by looking at the page numbers.

Sandy Martin: Yes, why not?

Professor Boyd: The evidence part of the report is 219 pages and the report itself is 44 pages.

Q18 **Sandy Martin:** Right, so the 219 pages are there to back up the 44 pages, and politicians are more likely to read the 44 pages than the 219 pages.

Professor Boyd: Yes. Actually, the politicians are probably more likely to read the executive summary of the 44 pages.

Chair: You are absolutely right, Professor. I do not know whether I would get that far.

Professor Boyd: By the way, and sorry to interrupt, it is a really good read, even though I say it myself. In the evidence report, there are case studies.

Chair: It is going to be a bestseller, is it?

Professor Boyd: The case studies are really worth reading. There are some really great ones sitting in there, which I might come back to later on.

Chair: You are certainly tempting us to read it.

Q19 **David Simpson:** I have to admit, on an annual report, again, I go for the conclusions and the recommendations. That is all I need to see. I want to see good recommendations. We are going to see those eventually in policy, or whatever the case may be. Anyhow, one of the key themes of your report is that the price charged for product often does not accurately reflect the cost of recycling or depositing the material. Are you in favour of a waste tax?



HOUSE OF COMMONS

Professor Boyd: A waste tax is a specific policy to deal with a problem. You have quite correctly identified the problem. The problem is that we need to, in the technical jargon, internalise the environmental impact costs of waste. How you do that is a policy issue. A tax is one way of doing it, but there are other ways of potentially making that happen. You could charge people for bottles. There are all sorts of different ways of doing it.

Where you apply the tax is important as well. You could apply the tax to virgin raw materials, for example, which would be quite a good idea. I can come back to the reasons for that later on. You can apply the tax to specific downstream items, depending on how you want to control their disposal.

Q20 **David Simpson:** In relation to what you have said about pricing charge for the recycling and disposing of the raw material, are you referring to the pricing to the general public or to the companies that do the recycling? Are you saying that they might get paid enough or what are you getting at there?

Professor Boyd: It depends on the sector you are talking about. An immense amount of the waste that we produce in this country is not produced by the public. It is produced by commerce; it is produced by industry; it is produced by the building industry. The measures that will work in some sectors will not work in others. It is much easier to put regulation, for example, on to industry and to track whether it is being complied with than it would be with members of the public, because you are dealing with an awful lot more actors in the game, for example. It is a matter of tailoring the incentives, some of which can be positive, and some of which can be negative, to the situation.

Q21 **David Simpson:** Just to finish, to ask it another way, would you be in favour of a waste tax to the commercial industries and something different for the general public?

Professor Boyd: I cannot answer that question in a very general sense because it depends on the industry and on the materials they are using. I am not very in favour of the use of the word "waste," because we are dealing with materials here.

Chair: Some of which can be recycled.

Professor Boyd: If I were to use economist jargon, some materials have positive value and some have negative value. When they have negative value, we call them waste but they are still materials. With a bit of ingenuity, an injection of some innovation, we could maybe give them positive value. It is about how you incentivise people to do that. Simple taxation might work in some circumstances but, in many circumstances, it is about thinking of what the incentives are to change the value of those materials.

David Simpson: That is a good point.



HOUSE OF COMMONS

Q22 Chair: It is an interesting point you make. The Europeans have the end of life vehicles directive, and that is where you tax the new vehicle so that you have a certain amount of money to dispose of it. I do not know whether we do the same with fridges and the like, but we could. It is an interesting one. The consumer will actually pay it, but it is there. If you did that, you would have to make sure you, somehow or other, identified the sum of money that the consumer paid for it in the first place, so it did not just disappear.

Professor Boyd: I agree completely. You have hit the nail on the head there, because a lot of waste management is about identifying who owns the materials at any point in the supply chain. When I go to the supermarket and buy a packet of tomatoes that is wrapped in plastic, I am buying the plastic as well and it is my responsibility to dispose of that in a way that is environmentally appropriate. One problem that has been identified and that I identify on a regular basis as an individual citizen is that sometimes it is not very easy for me to do that.

A number of different factors build up to make it difficult. First of all, people like me need the information to understand how to deal with the packaging of the tomatoes. I also need to be operating in a social system where the norm is to be seen to be responsible. Then I also need the technical mechanisms around me in order to find a way of getting rid of it. There are these three elements, and they are made explicit within the Scottish plan.

Chair: You talked about the tomatoes being wrapped in plastic. There is an advantage if you tax that plastic going around the tomatoes, because it is a competitive world out there, so hopefully companies would put less plastic on there because they want to reduce costs. In a way we might be able to reduce the amount of plastics, because we need a certain amount wrapped in plastic but we probably do not need as much.

Q23 Julian Sturdy: Ian, I just wondered what you thought about deposit return schemes on plastic bottles, et cetera, and whether they might change behaviour going forward.

Professor Boyd: I have not looked at deposit return schemes in any great detail. I suspect that they could work. One would need to do a pilot study to find out whether they work. I know that in Norway they have a deposit return scheme. I am not very well informed about how well it works. They have reverse vending machines there that do this. Again, there, they are probably zooming in on something that might work because they are making it really easy for people.

It is a matter of measuring what the incentive is, against the cost and the trouble people have to take to do it. I am old enough to remember the deposit return schemes there were on glass lemonade bottles, a very, very long time ago. If you were close to where you could get your sixpence back, it was an easy thing to do, but if you were a long way away there just was no incentive to do it. It depends on the



HOUSE OF COMMONS

circumstances; it depends on the technical mechanisms that are put in place to make it easy for people to do it.

Just saying, "We are going to put a deposit return scheme on and you will get a certain amount back," will not give you the response that you would want. Unless they get a lot back for the bottle—and I am not sure we could afford to give them a lot—it is easier for them to lob it in the bin. It is quite difficult. It is this cost-benefit trade-off that people have in their minds all the time.

Q24 **Chair:** Going back 50 years or whatever, sixpence was quite a lot of money, was it not?

Professor Boyd: It was.

Q25 **Chair:** I do not know what it would be now. It could be 10p, or probably nearly 20p, I expect.

Professor Boyd: In absolute terms it was not a lot, but in relative terms, relative to people's incomes and what they spent on food, it was quite a lot of money. Nowadays, if you put 25p on a bottle, I am not sure it would have the same effect.

Chair: That is interesting.

Q26 **Mrs Murray:** This is related to food being wrapped in plastic and sold in plastic-covered containers. If you introduced a tax, might it incentivise the retailers, supermarkets and that sort of thing to start selling it loose, so that you avoided the plastic wrapping altogether?

Professor Boyd: It might do, but I will give you a social science view of it. There is the potential for a perverse outcome in these circumstances where, if the tax is not high enough, the incentives will not be high enough. I will tell you where the measures need to be put in place. That is taxing the raw materials, because we are extracting far too much raw material and we then put it into a system. Any tax would probably have to be derogated if materials were recycled, because you do not want to discourage recycling. With recycling, you then create waste marketplaces that require waste streams. It is incentivising the production of more raw materials. The circular economy is a great thing; I am not saying we should not have it, but there are some really perverse outcomes from the circular economy if we are not careful about how we manage its growth, because it could just suck in more raw material.

Chair: Taxing the raw material would be the easiest way of doing it. You would actually get the money.

Q27 **Alan Brown:** This follows on from Julian asking about the deposit return scheme. As you are probably aware, the Scottish Government are looking at introducing a deposit return scheme. I wonder whether there are possibly two aspects to it. You are trying to modify behaviour, and one aspect is that you are trying to prevent littering: you do not throw it away into the environment. Then you also have a controlled waste



stream, but I assume you still need the proper recycling infrastructure, and you are not collecting any more costs towards that infrastructure but you are controlling the behaviour. Would that be fair?

Professor Boyd: You are absolutely right. Both of those aspects are very important. Of course, with a deposit return scheme, many people may not bother to return a plastic item for a deposit, but there may be other people around who are quite willing to put in the effort to collect it up and go and get the money back for it. That could spawn a cottage industry around those sorts of things. It would drive recycling at a higher rate.

We still have the problem of what we do with the materials once we get them, because we can only reuse about a third of the plastics that come back. This is a matter of not just having deposit return schemes but having a whole end-to-end system that says, right from the manufacturing process, that we have to have in mind the fact that we are going to get this plastic back at some point or other, and going to remanufacture it. It is a matter of making sure you use the right kind of chemical constituents that will allow that to happen.

Q28 **Chair:** It has to be exactly the same. If you are going to get the reverse vending machine to work it has to be exactly the same bottle, exactly the same plastic. The moment you put anything else into that plastic, you contaminate it. That is the trouble.

Professor Boyd: You do, and this is partly driven by retailers wanting to have particular brands and to advertise their brands by having different types of plastics and that sort of thing. I am sure they could innovate their way out of it, if one was to say they could use this kind of plastic or pay a tax.

Chair: Alan, you realise we are going to take the bottles from England, go into Scotland and get the money out. You realise that we are just waiting to do that; we are poised on the border.

Alan Brown: In the stereotype, it is the Scots that are mean, so there you go.

Q29 **Sandy Martin:** Before I ask you about my main subject, Professor, you have mentioned a tax on raw materials. Do you agree with me that one of the problems we have is that we do not have a circular economy in waste—that we are incentivising it to get to a certain stage, but not beyond that? I make a particular effort to purchase things that are recycled, in particular recycled paper products. It is very difficult. I very often find it impossible to find any toilet paper or kitchen paper made out of recycled paper, products which one would have thought were absolutely ideal for the use of recycled paper.

We have a mountain, I believe, of various recyclates in Europe with no purpose, and we have been incentivising and persuading people to recycle without making sure that the recyclate has a good financial and sustainable future. Taxing the raw materials would incentivise the



companies that are manufacturing things to reuse recycled product rather than raw material.

Professor Boyd: It would. To answer your question about whether we have a circular economy, in some areas we do. In other areas, it is in its inception and it is developing. We have to be patient. We are travelling along a road here, and in some areas it is easier to get a circular economy. The construction industry, for example, has well over 70% and perhaps over 80% recycling of materials. It is relatively easy by mass there, because you have big amounts of material and you can reuse them in different sorts of ways. Household waste is probably one of the most difficult examples, and it is the one that we are exposed to mostly. It is only 14%. I say "only"; it is a significant amount of our total waste, but it is one we get worked up about, and rightly so.

Your point about making sure that materials have a function at the end of the day is important. Plastics are a classic case where, in most cases, it is cheaper to buy new raw materials than it is to recycle the plastics. A tax on raw materials would make recycling much more cost effective. There are a lot of innovative technologies out there about recycling plastics: pyrolysis, for example. There are several companies that want to put pyrolysis systems right next to every waste plant. These would take the plastics in and turn them into fuel oils—which is done relatively straightforwardly and easily—which can then be burned, usually in ships. They would turn it into quite high-grade marine fuel oil.

There are ways of making this happen more quickly, and it is a matter of deciding what the policy is and putting it in at the critical point. It is about knowing that critical point. It is also about knowing that you might get it wrong first time and, politically, being broadminded enough to say, "We got it wrong. We have to shift it to another place."

Chair: I am sure the Opposition will be kind to us about that.

Q30 **Sandy Martin:** How safe are municipal waste incinerators?

Professor Boyd: I cannot answer that question, because I have not really looked at safety in municipal waste incinerators.

Chair: Are we trying to drill down on the amount of pollution?

Sandy Martin: I have a series of questions here, Chair, and I am starting with the first one.

Professor Boyd: Is this a pollution question?

Q31 **Sandy Martin:** There is a lot of public concern about the potential health impacts from municipal waste incinerators. I wondered whether, as Defra's chief scientist, you had looked at this, whether you think this is part of your remit and whether you should be doing more to persuade people that they are safe.

Professor Boyd: I will give you a general answer to the question. Anything that adds particulate matter or toxic chemicals to the



HOUSE OF COMMONS

atmosphere in the urban area ought not to be encouraged. While municipal waste incinerators are probably not the main source of urban air pollution, they will add to it to some extent. There is also the possibility of putting scrubbers into them, and many of them will have scrubbers, so they will be relatively clean.

I want to make a more general point about incinerators. If there is one way of quickly extinguishing the value in a material, it is to stick it in an incinerator and burn it. It may give you energy out at the end of the day, but some of those materials, even if they are plastics, with a little ingenuity, can be given more positive value. One thing that worries me is that we are taking these materials, we are putting them in incinerators, we are losing them for ever and we are creating carbon dioxide out of them, which is not a great thing. We could be long-term storing them until we have the innovative technologies to reuse them and turn them into something that is more positively valued.

This brings me to a more general point about landfill. Quite rightly, we have had a policy of trying to eliminate landfill in this country, because it has been seen as a major source of greenhouse gas pollution and, to some extent, groundwater pollution. That is because we put biodegradable organics in—food waste, garden waste and things like that. Landfill is a very low-marginal-cost method for storing highly resistant materials like plastics and metals for long periods of time, if we cannot extract the value from them now.

This is one caveat I would put around the current direction of travel on landfill. We should not lose sight of the fact that, in a few decades' time, or maybe a bit longer, we might be mining our landfill sites for the resources they contain. Rather than putting some of those resources into incinerators and losing them for ever, we might want to think differently about the landfill sites.

Q32 Sandy Martin: You may not know the answer to this. In 2013, the Health Protection Agency, which is now Public Health England, said that modern incinerators emit only small amounts of chemicals to air in comparison with older incinerators. How old are the older incinerators that Public Health England was talking about? Are they still around and, if they are still around, how soon are we going to get rid of them?

Professor Boyd: I am afraid I cannot answer that question, because I do not have those facts to hand, but I am very happy to come back with an answer to those questions if you want one.

Q33 Sandy Martin: Okay. You have talked about landfill tax. Clearly, there was a massive incentive for local authorities and commerce to divert away from landfill in the shape of the landfill tax. That had an enormous incentive effect on the growth of recycling. In fact, I should declare that I was one of the main architects of the Suffolk joint municipal waste management strategy back in 2001.



HOUSE OF COMMONS

Chair: I knew you had a claim to fame.

Sandy Martin: Over a period of three years, we raised the recycling rate in Suffolk from 14% to 45%. There does not appear to be any financial incentive to divert away from incineration. What is your take on that?

Professor Boyd: I would agree with that. It is a personal view, but I think that incineration is not a good direction to go in. If you are investing many tens of millions, probably hundreds of millions, in urban waste incineration plants, and those plants are going to have a 30-year to 40-year lifespan, you have to have the waste streams to keep them supplied. That it is a market pull on waste. It encourages the production of waste. It encourages the production of residual waste. It encourages people to think that we can throw what could be valuable materials, if we were to think about them innovatively, into a furnace and burn them.

I am not saying that incineration should not happen at all; I am saying that we need to think about it a lot harder than, perhaps, we have done in the past. Sweden, for example, has invested a lot in waste incineration plants. I worry that it is just encouraging the production of residual waste, which could be used in other ways.

Q34 **Sandy Martin:** I had a whole series of questions, but you have answered most of them without even being prompted. Thank you very much, Professor Boyd. All I can say is that the arguments you have just made are arguments that I made very, very strongly in 2006 when the county council decided to change its policy away from recycling to incineration. I am afraid nobody listened to me then. I hope people will be listening to you now.

Professor Boyd: Let us hope the new strategy has a different view on this.

Chair: The world moves on as well. It is a bit like diesel particulates and so on.

Q35 **Julian Sturdy:** Following on from what Sandy was questioning you on, you made some really interesting points there. I would agree with what Sandy said in his concluding remarks. To follow up on the landfill side and the point about plastics and metals potentially being stored for future opportunities, do you feel then that Government policy—and this is consecutive Governments' policy—over incineration has been misplaced? The financial incentives for local authorities have been there to move away from landfill, to go into incineration, and they are tying themselves up for 25 or 30 years, as you said, on long PFI deals. Ultimately, if we deliver the recycling strategy that we want, we are going to dry up a lot of these waste streams coming forward. I have already heard stories about people having to go back and reopen landfill to feed incineration.

Professor Boyd: That is very worrying, yes.

Q36 **Julian Sturdy:** Are we going to end up going around in a circle? Ultimately, the financial incentives have been very misplaced in this



whole incineration policy.

Professor Boyd: It is possible they have been. We are beginning to see some perverse outcomes of what has been done in the past. I would go back to what I said earlier on. You have to see this as a whole system. You cannot just put a corrective factor in one place in the supply chain—that includes taxes in different places—and expect it to have an effect just in that place in the supply chain. It will have all sorts of knock-on effects. I am a scientist, so I think one can model these sorts of things, and we have to get much better at understanding how different parts of this chain work together and how they link up.

We could get to a position where we are designing a relatively complex set of interventions, which would include all the kinds of things that have been talked about, regulation, tax, incentivisation, but also, perhaps, investing in infrastructure in certain areas. Right now, the problem is that we are doing it in focused ways in certain parts of that supply chain, but not taking it all into account. We need a holistic view.

If I can add a bit about waste incinerations, I visited the Southwark waste reduction plant when producing this report. One of the most striking things I was told by the operators there is that that waste reduction plant, big though it is, would not be economical if it was not right in the middle of a highly populated area in Southwark with high-rise blocks around. It is sucking in a continuous waste stream.

That shows you how delicate the economics of waste recycling is. If that had been out of town it would not have been economical, because the costs of moving the waste out to it from the sources of waste would have been too high. The incineration is just as economically dodgy as the whole plant is. You will probably only be able to make incinerators really work in future if you have them close to the supply streams.

Q37 **Julian Sturdy:** Do we have to be braver in our policies? You talked about the potential for landfilling plastic, with the intention that there are going to be better ways of recycling that going forward. That is a brave decision for a Government of whatever colour to take. Ultimately, do we have to be much braver with our policies going forward?

Professor Boyd: We do. We also have to be clear about the investments we make in innovation. You would not landfill plastics without genuinely investing in the innovation processes that are eventually going to draw those plastics back out again. You would preferably start by saying, "We should not be producing plastics in the first place that we cannot reuse." You would always start at the beginning of the supply chain. You would say, "Let us design waste out. Let us have, potentially, extended producer responsibility that defines the ownership of the waste all the way through." If you cannot have that, you would have explicit transference of ownership of waste to people as it moves down the supply chain. If, at the end of the day, the sensible



HOUSE OF COMMONS

thing is to put plastic in landfill, that is fair enough, but one should also be planning for taking it out again and not just leaving it there for ever.

Q38 Alan Brown: This was almost answered there. I was going to make the point that, if we are talking about burying it for the future, it seems to me, in a similar way, and as we seem to agree round here, that an incineration process can discourage recycling, because it would hit the incinerator. Our storing policy must marry up with a whole raft of policies, or else there is no encouragement for recycling. It is true that 50 years down the line somebody might innovate.

Professor Boyd: Nobody should get me wrong here: I am not criticising the landfill policy. It has done a tremendous amount for reducing greenhouse gas production. The landfill tax has, as you have correctly said, driven up recycling. It is a textbook case of how taxation can drive behaviour change and system change. It has been really, really positive. We should not take the foot off the pedal with respect to any of these sorts of measures. It is just that saying we want to eliminate landfill completely seems a policy that is not terribly well based on the evidence that we have before us. Can we get rid of all residual waste in an incinerator? Probably not, so we need to put it somewhere, and it is potentially a very low-cost way of storing materials for a very long period of time until we get a way of reusing them.

Chair: That was an interesting point.

Q39 John Grogan: That was fascinating evidence. I do not have the expertise of being on that particular committee in 2001. My claim to fame is that I have read the report. I had a long air trip to Mongolia and it got me half way back to Moscow as well. I am fascinated by the stuff on designing out waste on page 11. I want to come back to incineration in a second. We have been talking a lot about financial incentives, but are municipal targets for recycling a better way of doing it? In Wales, they have gone down the lines of municipal targets for recycling. Is this something Ministers should look at for England?

Professor Boyd: It is. If you look at the evidence, Wales has the highest recycling rate of all the home nations, and it is probably about as high as it can get. We could probably never get beyond 65% to 80% municipal recycling. It is just not possible to go beyond about 80%. Wales is in the upper 70s or lower 80s. I cannot remember the exact details, but it is doing pretty well. On that evidence alone, you have to ask the question: what is Wales doing that we could do elsewhere and is it transferable?

One of the problems we have in England is that there are tiered authorities and there is a much more complex set of responsibilities, which I am sure you know much more about than I do, for waste collection and reprocessing. This makes it less efficient, although the direction of travel on this is probably the right direction overall.



In Scotland, a lot of the problems are around remoteness of areas. I have a family home in the Hebrides. We have wonderful waste recycling facilities, but it is a long way from any reprocessing plant, and the economics of that must be very, very difficult indeed. It will vary between different areas, and different local authorities will have different challenges. A central London local authority has a lot of high-rise buildings that were never designed to help people recycle. It goes back to my earlier point that you have to help people with this by making it easy for them. A lot of these buildings, most of our houses, were never designed to help people recycle.

That is going to be very different from a rural authority, where people are driving to supermarkets and places like that; they can put their recycling in the back of the car; there are collection points, and that sort of thing.

- Q40 **John Grogan:** Back to incineration, I find your argument about the importance of innovation very interesting. I took it to be characterising that the more we incinerate, the less we innovate, maybe. I do not know whether that would be fair. You talk about perverse outcomes. Eunomia brought out its report last summer, which said we have enough incinerators, because the more incinerators we build, the more we are feeding them with materials that would otherwise be recycled. I listened to you carefully. You said that there was a case for some incineration, but is there now a case for Ministers to look at a moratorium on incineration?

Professor Boyd: That would be going too far. With any system like this, and I am talking in very general terms, you have to evolve it. Trying to completely change a system by shutting one part of it down creates all sorts of problems in other parts of the system. The waste system is a classic complex system with lots of connecting parts. I would always caution against precipitate action in one part of the system, because it will produce all sorts of things that you had never anticipated. Something like that would be precipitate. It could be done in an experimental sense, in that you could say, "We are not going to build any more," see what that does to the waste streams and how it changes people's attitudes, the flows, the recycling rates and things like that; and monitor it through time.

- Q41 **John Grogan:** It is a time-limited moratorium.

Professor Boyd: I am not even going to agree with you about the moratorium.

- Q42 **John Grogan:** No, but a time-limited experiment.

Professor Boyd: You could do it at local authority scale. One of the interesting things about waste is that we have something like 440 local authorities in England—I cannot remember how many we have—and every one does it a bit differently. You can do quite a lot of analysis on that to understand what works in different circumstances.

- Q43 **John Grogan:** Perhaps you could suggest to the Ministers having the



HOUSE OF COMMONS

experiment in God's own county of Yorkshire. You talk about financial incentives. It seems odd that landfill has taxes and incineration does not. Would you be in favour of an equalisation or, at least, looking seriously at the financial incentives?

Professor Boyd: You are drawing me into trying to make policy.

Q44 **John Grogan:** I am thinking about what Ministers might consider. Would it be worth them considering it?

Professor Boyd: All these things are worth considering, but I am a scientist. I try to analyse problems. My policy colleagues try to come up with the solutions. I am not really willing to try to do their job for them.

Q45 **John Grogan:** My final question comes later down the list, but logically it comes in here. Some people who take a much more gung-ho attitude to incineration than you would say, "The China ban changes everything; that completely changes the picture. There is waste building up and so on." How would you respond to that?

Professor Boyd: The China ban is unfortunate because that had become part of the waste management system. We import a huge amount of material from China, much of which might be plastics, and sending it back to where it came from is not an unreasonable thing to suggest, but they do not want it. It is post-user plastic. There are other markets for it, but it has not done anything good to the price of plastic, so the idea of recycling becomes more and more difficult.

It is one of those things that put waste on the map again and asked some difficult questions about how we manage waste; but I would always say, as I always say to Ministers, that the best way is to stop it at the beginning rather than deal with it at the end. The more we can do in policy terms to stop production of it and to be cleverer about how we produce it, the better.

Q46 **Mrs Murray:** Very quickly on the Wales question, my mother-in-law lives in Anglesey, and she has about 10 different containers that she has to separate her waste into. To be successful, is there a dependency on buy-in from the house owner or the householder? If you keep separating it out at source, there is a storage problem in some houses, because they cannot store all the containers. That might deter people from really trying to buy in to recycling.

Professor Boyd: I agree with you that it becomes very difficult for people in certain circumstances. I mentioned high-rise flats in London, or anywhere. Wherever it is, it becomes very difficult because there is not the room for it. Ten sounds a lot but, on the other hand, when you look at the evidence from Wales, it is kind of working. It raises the issue in people's minds, and it might change their behaviour in other ways. They might want to generate less of the waste.



HOUSE OF COMMONS

The evidence tells us that separation by the householder of household waste is the most cost-effective and efficient way of producing high-quality waste that can then go into recycling. There is no doubt about that at all.

Chair: Paul, you have been very patient.

Q47 **Paul Flynn:** It is not “kind of” working in Wales; it is working. Almost 60% of household waste has been recycled, very successfully, and it has had a very warm reception and co-operation from most people and most families. Why is England so far behind? Why does England still not have a waste target?

Professor Boyd: Again, the waste and resource strategy that is coming out will probably solve that problem about targets and future aspirations. Again, my policy colleague can deal with that. Why is it behind? As I said before, everybody is on a journey here, and different countries are at different parts of that journey. England has a more complex set of problems. It has more complex governance overall.

Q48 **Paul Flynn:** That would not excuse the fact that it was so late in recycling plastic bags. That was introduced and it was a challenging and brave thing to do by the Welsh Government. That is nothing to do with the shape of England. It is a lack of will.

Professor Boyd: You can say that. I can say that the evidence from Wales was absolutely categorical about plastic bags and, subsequently, from Scotland as well. The English followed suit and it was a very good thing for them to do so.

Q49 **Paul Flynn:** You have inflamed the wrath of the children in Glasllwch School in my constituency, who have all written to me about neonicotinoids. They were informed by an article in the *Guardian* and they tend to accuse me of being responsible for the future destruction of insect life, of bees and butterflies. The main point they were making is that you are erring on the side of industry rather than natural life. What do you have to say to the children of Glasllwch School?

Professor Boyd: Let me get this right. You have some constituents who say that it is me, or the Government.

Q50 **Paul Flynn:** No, the Government; I am not blaming you personally. The suggestion is that the experiments were not comprehensive. There was a claim that the conclusions were based on one experiment in certain conditions rather than a whole host of experiments.

Professor Boyd: Let me summarise where the evidence sits on neonicotinoids. A number of experiments have taken place, which provide a certain amount of evidence of impact on some insect species, but they are not very conclusive. Most of those are field experiments, which have been properly designed with controls. There is another set of experiments, which are what you might call semi-field experiments or laboratory experiments, which have used or applied neonicotinoids



particularly to bumble bees, but also, to some extent, to honey bees. These show effects, and they are mainly sublethal effects that reduce the capacity of those insects to go out and do their normal business, to go and find food and that sort of thing.

The question in my mind has always been: do neonicotinoids, used at the scale they are used at, have effects on whole insect populations? Clearly, they will on the insects they are targeted at, because that is the whole function of neonicotinoids, but do they have secondary effects on other populations, like bees and other pollinators? The evidence for that has been, overall, quite mixed, but more recently it has become apparent that neonicotinoid use has been going up fairly consistently through time. It is used a lot on non-flowering plants, on cereal crops. The most important piece of evidence is that it is getting into soils and remaining in soils much longer than anybody ever realised. It is, therefore, getting into other plant species that are used a lot by pollinators.

Q51 Paul Flynn: I shall send that to them and I am sure they will be very grateful.

One of the things that bedevilled waste recycling when I was on a local authority 40 or 50 years ago was the fluctuation in the market. A system would be set up for collecting waste paper, for instance; there was a buoyant market and it made sense to buy all the equipment and so on; and, suddenly, it collapsed and became a liability for the local authority to store what was not wanted. Do you think that, to have a successful recycling policy, the Government have to intervene more and not rely on fluctuations in market forces, but avoid them as much as possible by providing a fixed market for the product?

Professor Boyd: I am not an economist, but, from what I know of these sorts of things, the record of government intervention in these issues is not particularly good and does not always produce the outcomes that Government seek. However, there is an issue about whether there is a true market there, and one of the biggest recommendations from the report was that we need to make data about waste much more available. We need to know where waste is, what it is, how much there is and the reliability of supply. We need to get that into a marketplace, so that people know where it is and can use it if they need it.

Some of the reasons for market failure in the past have probably been because of that lack of information as much as anything else. It is not the only reason by any means, but if we can get a better informed marketplace for waste—and I am talking here not just at national level but at international level—we will get better use of those materials. I will call them “materials” because they are materials. One of the disappointments about the China issue is that we saw an international marketplace developing there, where China was developing its own technologies for recycling plastics, and suddenly that market mechanism has not worked. To answer your question more directly, we need better market mechanisms, rather than to necessarily interfere in the market.



HOUSE OF COMMONS

Q52 Paul Flynn: In setting your horizon-scanner, can you set it to the past as well as the possible future, and have a look at the situation in the war? I find it shocking that the figure is £3.7 billion worth of waste every year when, if we went back to that time, there was very little waste and very strong household opinion about avoiding waste, because that was the way to win the war. We are seeing very strong fluctuations in public opinion in their enthusiasm to support schemes. What advice would you give to Ministers to get them, rightly, alarmed about what we are doing to our human habitat?

Professor Boyd: The general advice I would give to Ministers, and I have said it here already, is that we must not make decisions that cause us to suck more raw materials into the supply chain that end up as waste. That would be the worst thing to do, so, in a sense, we need to reduce demand for those raw materials. That is about using those materials efficiently and, once they are in the system, keeping them there as long as possible. That is about the circular economy.

Q53 Paul Flynn: Your Ministers, like other Ministers, are very rarely beneficiaries of scientific training and are under heavy pressure from lobbyists, particularly business lobbyists. How do you counteract that? Have you ever been in a situation where you feel that you have to issue a direction because a Minister is acting in his or her own political interest rather than in the interests of the environment?

Professor Boyd: I have the pleasure that one of my current Ministers, Thérèse Coffey, has a PhD in chemistry, which is just brilliant. I have never had an experience like you have just described. I have always found Ministers very interested and very willing to listen. Sometimes, yes, things happen and I will sometimes speak, in particular to the private offices about it and I know it will then be transmitted on. But I try to do it gently.

Q54 Paul Flynn: Next time you appear before us you will have a report to say that England has done better.

Professor Boyd: I hope so. I really hope so.

Chair: You really are making the most of this, Paul.

Paul Flynn: Well, you have to, do you not? There might be another election. The PM might not last the day.

Chair: Not for a day or two if we can help it.

Professor Boyd: Wales does as well as it can probably hope to do, so England should be aiming to do as well as Wales. I am not sure it can do better.

Chair: I think Paul liked that answer.

Q55 Sandy Martin: Can I just pick up on a point that Paul made? You said that people looked as if they were less enthusiastic about recycling. Do



HOUSE OF COMMONS

you think it is enthusiasm or would you say it was more likely that it is not being made easy enough for them? In my experience, when local authorities are able to make it easy for people to recycle, they do, and when they do not it is because they do not know what to do or it is not very easy for them to do it.

Professor Boyd: As I said before, it is three things. People must be incentivised individually to do it and they must find it easy, themselves, to do it, so they must have the information. The second one is the social context. If people are beginning to say, "I am not really very interested in recycling," it could be a socially led issue; it could be a social norm that is developing. That is quite difficult to counteract, but Government do have a role in that. The final thing is the technical issue, about providing them with the easy ways of getting rid of waste. All these things need to be in place simultaneously. You cannot just have one and not the others.

Q56 **Mrs Murray:** Very quickly, turning to food waste in particular, we have seen food waste reduction in households stall over the last few years. What needs to be done to change consumer behaviour? Would it just be education in what to do with leftover food, for instance? I hate waste, because it costs me money. Could people be educated?

Professor Boyd: It is a very good question. There is a whole range of things that need to be done, but they pretty much all need to be done simultaneously. Definitely education is one of them. There are very few people who think they waste food, but most of us do, and we do not realise it until it is pointed out to us how much we waste. I am talking about the big "we" here; of course, I do not do it—but I probably do, to be frank.

There is education there, but, to go back to the answer to my previous question, it is about making it relatively easy for people and, even if waste is being generated, being sure that there are proper food waste separation facilities for them. I am sure Wales does that; I know Scotland does it as well and 50% of local authorities in England now do food waste separation. That means that at least the negative effects of food waste, which would end up as greenhouse gases most of the time, can be counteracted, because you can put it through anaerobic digestion, develop energy from it and that sort of thing.

Again, there is not one solution here. Education is important, but retailers changing the way that food is presented to people is also very important. Packaging is very important. There is a huge potential perverse outcome here from taking plastics out of the system, because it could drive up food waste and we do not want that to happen. We need to do all this in what, in biological terms, we call a symmorphic way. In other words, for the morphogenesis of our waste management system one bit has to develop in tandem with other bits. You cannot just develop one bit without the other.

Q57 **Mrs Murray:** Thank you very much. What steps need to be taken by



HOUSE OF COMMONS

Government to ensure consistent waste and recycling collections and reduction across England? Do you think it can be done at a national level or should it be devolved to local authorities? In Cornwall, for instance, it would be much more difficult to collect some waste, with narrow streets and that sort of thing, than it would in an inner city where you have high-rise blocks. Ought it to be left to local authorities to decide?

Professor Boyd: Again, that is a policy-related question, but I would point out that local conditions are really important to making waste collection work. What governance process knows local conditions better than the local authorities? National Government can do a lot to help them, and that is partly about illustrating how different local authorities, which may be experiencing similar conditions, contrast with each other and use different solutions, and what the best in class is under those different circumstances. We have a massive sample size of over 400 local authorities, and some of them do it very well and some of them do not, so it is a matter of trying to show how the ones who do not do it well can do it.

Q58 **Chair:** If Kerry McCarthy was here, she would ask you about the waste hierarchy. When we did our report, one of the things we looked at was how to get as much food as we can to food banks, to be used as food. Kerry would complain, quite rightly in many ways, that Defra and the Government do not do enough to make sure that food that can be eaten, and is within its use-by date, reaches the consumer or charities in one shape or another, rather than going into a bio-digester. Sometimes it is cheaper for a company to take all that food along to the bio-digester and leave it, rather than getting it to FareShare and all these people who are out there helping.

Professor Boyd: A lot more could be done with all forms of waste to raise them up the waste hierarchy, to re-incentivise their use in constructive ways, and food waste is part of that story. Your question was whether Government can do more and, of course, Government can always do more. The question, in my mind, is: how is it best for Government to apply their limited resources to get the maximum outcome? I cannot answer that question. That is a policy-related question.

Q59 **Chair:** You see, we found things like: where supermarkets have waste food, can that be collected or can they deliver it to food banks and to people who are providing food for people who cannot get or cannot afford their own food? We just did not feel there is enough being done to stimulate that. That is where we would like to see more.

Professor Boyd: That is a very fair comment. With the new strategy coming out, that will go for consultation, and there is a significant opportunity to input and make sure that those points are made very strongly. But I would agree entirely with what you are saying about the objectives there.

Q60 **Chair:** As another small point, there are biodegradable plastics that can



HOUSE OF COMMONS

break down relatively quickly. One of the issues we saw with a biodegester was trying to get all the food waste out of the plastic bag. You could have a plastic bag that broke down at the right rate, so that it did not break down as you had your food waste in it before you got it to be disposed of. You can see where I am coming from. They were spending a lot of time and effort getting the food out of the plastic bags and trying to separate the plastic bags away from the organic material. Is there any work being done on that?

Professor Boyd: Not really. I would like to correct you slightly. There is not really a biodegradable plastic bag. There are plastic bags that break down into smaller bits of plastic, fundamentally, and they then can become a problem in certain types of recycling systems, particularly in composting systems and that sort of thing. If we had a biodegradable plastic bag it would be wonderful, but we need new chemistry for that. The best biodegradable plastic bag is a paper bag. It is made of a polymer.

Q61 **Chair:** That is right, but naturally, when you take waste food, you cannot necessarily take it in a paper bag. I understand that, but it is an interesting point you make, because you get people who come and tell you they have a particularly biodegradable plastic, but they are not really truly biodegradable, in your scientific view.

Professor Boyd: That is correct, and the perverse outcome from that is that we invent something we think is biodegradable, we push it into the supply chain and we simply push up the demand there is for plastics. We have to go to the production end and say, "We need to produce less of this, not more of it."

Q62 **Angela Smith:** I do apologise for being late. I just wanted to ask, Professor Boyd, about your resignation last year and your change of heart. Can you explain to us your current intentions?

Professor Boyd: First, it was not a resignation. I was coming to the end of a five-year term at the end of August last year and I had decided, about January, that I would leave at the end of August. However, the election came, and we had a new Secretary of State and a lot of turnover. Obviously, Defra is one of the departments that are most affected by EU exit, the preparations for that and the consequences of it. In discussion with the Permanent Secretary and the Secretary of State, I agreed to stay on longer. I have said initially I will stay for at least a year; that is from August last year. It is a bit open-ended, where I am at the moment, but that is the reason. Also it is an interesting job; it really is.

Q63 **Chair:** You seem to still have great enthusiasm.

Professor Boyd: I have great enthusiasm for it. Of course, these are very interesting times to be in government, and for you in Parliament as well, I am sure.



HOUSE OF COMMONS

Q64 Angela Smith: Obviously, staying in post means that you will be embracing some fairly big challenges, and you seem to relish that idea. I wonder if one of the challenges will be ensuring that you can continue to secure sufficient funding for scientific research, given our exit from the European Union.

Professor Boyd: There are two aspects to that. There is the EU aspect to it, and there is the aspect about funding for research in Defra, which has been in decline for quite a number of years. But funding in government generally for research has increased, so it is about how Defra accesses the value from the funding that is already within government. That is a whole other story that I could take you down the road of, but I will not. I will jump back to EU exit, which I think is the focus of your question.

Angela Smith: It is, yes.

Professor Boyd: There is no doubt that the departure from the EU is causing a lot of uncertainty in the scientific community about what the future funding profile is going to look like. The UK, of all European countries, was the most successful at getting money back for science, because we have an excellent science base in the UK; we have some excellent scientists here. While the Government have said they will guarantee the funding until 2020, the problem that is faced right now is that a lot of my scientific colleagues are already planning the science for beyond that. There is a two to three-year lead time on planning major international collaborations, so there is quite a lot of uncertainty there.

Colleagues in Europe, because of their uncertainties, are probably not including my colleagues in the UK quite as much as they would have in the past. The European Commission has taken a hard line on this and said that is not what should be happening, but you cannot change individuals' behaviour. If they choose to have collaborations from somewhere else in Europe and not the UK, that is their choice.

Q65 Angela Smith: Is it possible to quantify that trend at this point?

Professor Boyd: I am afraid I cannot. It is quite anecdotal, but it definitely is happening, because I hear it all the time from my scientific colleagues. They feel that it is becoming more difficult for them to become partners with other scientists in Europe as a result of the uncertainty.

Q66 Angela Smith: Finally, because I have to go over to Millbank briefly, is there any way of resolving this potentially very negative impact on our scientific status in this field?

Professor Boyd: I can see ways of resolving it, but I would probably be getting into areas of high politics about how the EU exit is going to go on. Nothing is resolved until everything is resolved, but there are things, and science is one of them, that I would call low-hanging fruit that we should be picking at a fairly early stage. Europe is up for this. It sees us as



HOUSE OF COMMONS

strong collaborators, and the scientific community would want to continue its collaboration with European colleagues, because Europe, as a collection of nations, is very strong in science. The sooner we can get this resolved, the better. That is all I can really say, but you know the constraints as well as I do.

Q67 Alan Brown: We have touched on the fact that you have decided to stay. We have seen a supportive tweet from the Secretary of State, so it is clearly good that you are one of the experts that he wants to listen to. You must be respected. Without being facetious, how are you and your team's preparations going for Brexit? Do you have enough resources to look at the impact of Brexit and the wider implications going forward?

Professor Boyd: There are ongoing discussions with Treasury about making sure that resources are available. Specifically with my team, we have responsibility for a relatively small portfolio of areas that are relevant to Defra. As I said before, Defra is one of the departments that are most affected by Brexit, but the science in Defra, despite what I said, is not one of the most pressing areas. We have a couple of projects ongoing about data, and another one about satellite systems, because we rely on the European Copernicus programme to give us observation data.

We also have our eye on the science issues, particularly the access of Defra's agencies to science funding. I feel that there are resources—if we do not have them now, we will have them—in order to make sure that we are analysing the issues around those, making representations within government and, possibly, being involved to some extent in the negotiation process when it really gets going.

Q68 Alan Brown: You have already touched on the UK Government's guaranteed funding until 2020, but you have concerns about what is going to happen beyond that and the collaboration. Collaboration comes from working together and joint funding arrangements. Have you been asked to do any impact assessments on the possible effect on the science sector and then feed that into Government?

Professor Boyd: We have definitely done impact assessments on Defra itself and the direct funding that it gets from the EU. It is much more difficult to do impact assessments on the broader impacts or the broader effects, because funding comes to various scientists in the UK who study subjects that are of relevance to Defra. Right now, we are really not very sure what the impact is going to be of losing that funding in the future. It very much depends on what is put in to replace it as well. I could see a scenario where there is replacement funding; it maybe is not exactly the same as we have had before, but it could be better than we have at the moment. That is a potential scenario, but right now we cannot quantify what the impact will be.

Q69 Alan Brown: In terms of Defra impact assessments, do you know if they are impact assessment that are now in the public domain? This is clearly the topic of the day and was subject to debate in the House of Commons



HOUSE OF COMMONS

earlier on. Is that information there within the Government, which politicians in here have still to see?

Professor Boyd: Any assessments we have done are internal assessments to inform our position with respect to negotiation. As far as I know, none are what I would call formal impact assessments, which we can then publish. I would assure you that we have a pretty good idea of what the effects would be on science in Defra, and the direct science in Defra, of not getting access to Horizon 2020 funding, which is the funding stream that the EU has.

Q70 **Alan Brown:** Linking the funding stream and collaboration, some of the scientists you work with will be non-UK scientists. Taking all these factors together, is there a concern over brain drain, with people moving towards the EU?

Professor Boyd: There was an early concern, because we employ a lot of EU nationals within Defra, both as scientists and a lot of our vets are from the EU. However, the agreements that have been reached so far about EU citizens probably provide quite a lot of comfort to these people. We have not seen a quantifiable change in the numbers of people employed by us who come from the EU. That may change through time, I do not know, but so far there is nothing measurable that we can see.

Q71 **Alan Brown:** It is obviously good if there is nothing tangible, but you are the first witness I have heard say that the EU nationals feel quite comfortable with the Government's statements. It is the first time I have heard that.

Professor Boyd: I will qualify that by saying that, in my visits to various parts of Defra, it was a concern that was being expressed six or 12 months ago. I hear it less now, but it is quite difficult to quantify. You would need to ask those individuals themselves how they are feeling about it, because some of them may be feeling a bit uncomfortable.

Q72 **Alan Brown:** This question links the earlier topic of recycling and talking about the EU. A leaked memo suggests that the United Kingdom is opposing strong new waste recycling targets that other EU countries are willing to sign up to. That is a binding target of 65% municipal waste to be recycled by 2035. I am not sure if you are aware of that or if you have any concerns that coming out of the EU could drive the wrong behaviour and wrong legislation by the UK Government.

Professor Boyd: I do not know what the position is on the recycling targets and why the UK might not want to do that. There might be a set of complex reasons for that. All I would say is that I see no lack of ambition on the part of Ministers or officials to reach that level of recycling. We have had a very illuminating discussion here around recycling in Wales, for example, and I see no reason why we should not manage to achieve those objectives. Whether it needs an EU target to do that or not is another matter.



HOUSE OF COMMONS

Q73 Julian Sturdy: How would you assess the 25-year environment plan Defra has just come out with, and do you think it goes far enough to tackle waste?

Professor Boyd: To be frank, waste could have had a higher profile within it, but in Defra we are seeing that this is a living document. It is one that can evolve a bigger section on waste. There are ambitious targets about trying to reduce plastics waste in particular. Overall, we could have looked at waste in more detail within the plan, but it really is focusing on the strategy that is going to come out later this year, so, rather than putting it in the 25-year environment plan, it is referencing the strategy. The strategy will probably have most of the ambition within it. I have not seen any drafts of the strategy yet, but I hope it will.

Q74 Julian Sturdy: The next question ties into it a little. How much advice and analysis did you give or were you asked for in the development of that 25-year environment plan?

Professor Boyd: The 25-year environment plan has been around about two and a half years in the making and I have not seen every draft, thank goodness, because that would have taken up most of my time. At every major stage I have had input to it. My main input has been to advise on what I will call the evidence annexe. I think it has a slightly different name, but there is quite a substantial document that sits alongside it, which provides much of the underpinning evidence and articulates how the implementation of the plan is going to be evaluated and measured into the future. That is the bit I have focused on. The plan itself is a policy-related document and, as I have said before, I try not to get too involved in the policy side of things. But I feel as if I have had a reasonably significant influence, certainly on the evidence side of things.

Q75 Julian Sturdy: You have touched on this already, about the plastic waste, but is zero avoidable plastic waste by the end of 2042 ambitious enough, or would you have liked to see them go a bit further on that?

Professor Boyd: It depends on how you define "avoidable."

Q76 Julian Sturdy: Okay, so I will change the question a little. Do you think it needed more definition in the plan?

Professor Boyd: In terms of the plastic waste specifically?

Julian Sturdy: Yes.

Professor Boyd: Again, it would have been nice to have seen that there. But I have always known that, because of the waste report that we produced, there is an intention to produce the waste strategy, so for the plan to point to the waste strategy is a very reasonable thing to do. The discussion we have had today has illustrated that there are all sorts of things you can get wrong with waste. To point to particular activities, and even the idea of having zero avoidable plastic waste, is almost too



HOUSE OF COMMONS

specific for a generalised plan, because there could be perverse outcomes from just zeroing in on plastics. Zero avoidable waste generally is a good thing.

By the way, the “avoidable” word is something that I was partly responsible for, because you cannot have zero waste. Zero waste is impossible; it is against the second law of thermodynamics, so what do you do if you want to have an ambitious statement? Well, “zero avoidable waste” is the nearest you can get, but it depends how ambitious you are about that word “avoidable.”

- Q77 **Sandy Martin:** Going back to your previous point about reducing or taxing the use of the raw materials, if you were not producing plastic there would be no plastic to waste. There was no plastic waste around 100 years ago, was there?

Professor Boyd: I would agree with that, obviously, but plastics are a pretty good thing for society overall. They are very durable. They are not used because we do not need them. They are used because society has benefited hugely from them.

- Q78 **Chair:** But we have overused them.

Professor Boyd: I would agree with that. We overuse them and we do not use them in the right ways. “Overuse” is maybe not quite the right word, but we do not use them in the right ways. We do not use the right plastic materials, so that we maintain the plastics within the economy for much longer. But the idea of having zero waste of any type is really not tenable.

- Q79 **Chair:** The last question I will ask you, and you have probably answered this slightly along the way, is: when has your advice not been taken on board by Government and do you ever feel you have to provide particular evidence to support a policy line?

Professor Boyd: When advice has been sought, it has been actively looked for, so therefore there is an audience for it. It is quite difficult to see events or circumstances where my advice has been sought and it has then been ignored, because by definition when it is sought there is an audience and it is used. It maybe is not acted on in quite the way I would always expect or wish for, but I am realistic enough to know that making policy is not about just taking the scientific evidence and turning it into something. It is about taking the evidence and pulling it with other factors, which are all very important, some of which could be economic, social or political, and coming up with a rounded policy outcome. I am skirting around your question because I do not have a really good example.

- Q80 **Chair:** Going back to one of the points that Paul made, I suppose the challenge comes when the political desire to do something may be moving away from the scientific base. I suspect that is when it is most challenging.



Professor Boyd: I can give you a historical example, which does not apply now, and that is on climate change. Under the coalition, it was quite difficult on climate change, when there was a lot less interest in how we were going to tackle climate change, particularly in Defra, under the adaptation agenda. That is the one area I would focus on particularly.

Q81 **Julian Sturdy:** I just wanted to come back on something you discussed in the questions that Paul put on neonicotinoids. I suppose I need to put on the record that we had a conversation about this some months ago and I thank you for your time on that. You discussed the issue of potential build-up in the soil from continuous cropping with crops and seed using neonicotinoids on an annual basis. There are a number of more specialist crops, like carrots, parsnips and sugar beet, which are grown on a lot longer rotation, which use neonicotinoids and are used on a much lower seed rate, so less seed per soil.

Do you think there needs to be more scientific evidence put forward before we consider a blanket ban on neonicotinoids over crops like carrots, parsnips and sugar beet, which are grown on a longer rotation, with less seed going on, so basically not continuous use of neonicotinoids in the soil?

Professor Boyd: I would always, of course, support the idea of having more evidence, but I have been around the issue of neonicotinoids for long enough to know that asking for evidence does not necessarily mean that, when it comes along, it really helps resolve the problem that you have. The problem that we have is of highly dispersed pollution within the countryside from neonicotinoids.

With respect to the specialist crops that you are talking about, the evidence will come from implementing different policies. I often see policy as part of an experimental procedure, and I would love policy to be part of the scientific process, because you try something, you find it works or it does not. If it does not work, you try something else, and that is the same as hypothesis-generating and doing experiments.

What we need to do with carrots and parsnips is use the derogation procedures we have in order to start to understand the vulnerability of those specialist crops to any withdrawal of neonicotinoids there might be, in order to minimise the use of neonicotinoids, but to make sure that it does not risk those high-value specialist crops at the same time. It is what I would call a risk-based process.

We need to develop a much more nuanced way of managing pesticides generally. Neonicotinoids is just the tip of the iceberg in terms of an example. We need them for the agricultural system we have, but to use a term that you used, Chairman, we overuse them. We push them down the supply chain and farmers will use them based on their best judgment, but they will probably overuse them and have these dispersed impacts on the countryside. In those specialist crops, which tend to only be grown in



HOUSE OF COMMONS

specific areas, there is a much stronger case for saying that we should continue to use them to some extent.

Chair: Thank you, Professor Boyd. You have been very frank and open with us. We have had a really good session and it is very thought-provoking. This is what we intended. Thank you for some very good answers. You have given us something to really think about.

Professor Boyd: Thank you very much. I have enjoyed the questions.

Chair: I wish you well and suggest you think about a further extension.

Professor Boyd: That is very kind of you, thank you.