

Environmental Audit Committee

Oral evidence: [Planetary Health](#), HC 1803

Tuesday 12 February 2019

Ordered by the House of Commons to be published on 12 February 2019.

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Members present: Mary Creagh (Chair); Geraint Davies; Mr Philip Dunne; Zac Goldsmith; Mr Robert Goodwill; Caroline Lucas; Kerry McCarthy; John McNally; Dr Matthew Offord; and Alex Sobel.

Questions 131 to 239

Witnesses

I: Professor Georgina Mace, Professor of Biodiversity and Ecosystems, University College London; Dr Mark Mulligan, Head of the Department of Geography, King's College London; and Professor Peter Cox, Professor of Climate System Dynamics, University of Exeter.

II: Dr Richard Horton, Editor-in-Chief, The Lancet; Sonia Roschnik, Director, Sustainable Development Unit; and Matt Shardlow, Chief Executive Officer, BugLife—the Invertebrate Conservation Trust.

Examination of Witnesses

Witnesses: Professor Georgina Mace, Dr Mark Mulligan and Professor Peter Cox

Q131 **Chair:** Welcome to our very distinguished panel of guests. This is the third session of our inquiry into planetary health. We are inquiring into the impact of climate change and environmental damage on us as human beings, but also on biodiversity, ecosystems, water and healthcare. Can I ask the panel to introduce themselves, starting on my left, please?

Professor Cox: I am Peter Cox from the University of Exeter. I am a climate scientist.

Professor Mace: I am Georgina Mace; I am Professor of Biodiversity and Ecosystems at University College London.

Dr Mulligan: I am Mark Mulligan, Head of the Department at King's College London, and I focus on ecosystem services, the benefits we get from nature.

Q132 **Chair:** Brilliant. Thank you all very much indeed. Professor Mace, can I start with you? We seem to have tapped into a bit of a zeitgeist at the moment, in that there have been several reports into the collapse of insect populations. What do you consider to be the most likely changes in the UK over the next 50 years in terms of biodiversity and what impacts will those changes bring?

Professor Mace: We have seen a couple of reports about insect decline recently that have focused on the fact that there is a massive depletion of insects and biomass, or abundance. One of the ways that we notice this is that instead of their being a snowstorm of moths that hit the windscreen when you drive at night, or there being endless wasps in the garden whenever you have a picnic, there is a strongly marked loss of abundance of wildlife. There are many studies that indicate that is a real effect. We are losing numbers of insects, we are losing biomass of insects, and to a degree, we are losing variety.

I want to distinguish those three, because they have different effects. We need abundance and biomass for many of the ecosystem services they provide, and we need variety because variety provides some of the insurance—new strains resistant to incoming diseases, new varieties that may be able to cope with climate change, and so on. The thing that has been documented most clearly is this loss of abundance and biomass. If we project forward in the UK and we understand something about the causes of those declines, which is mostly land-use change for agriculture, intensification of agriculture, and the application of pesticides, and herbicides, and novel chemicals in the environment, there is a choice.

If we go down more intensive agricultural pathways, we can expect that decline to continue until all the vulnerable groups of invertebrates are



HOUSE OF COMMONS

depleted so that they can just persist in areas where those threats aren't. If we were able to somehow modify the environment to have an environment in which invertebrates and insects could thrive and the pollinators have refuges in which they can find secure places then I think we could stabilise and maybe even recover some of our problem.

Q133 **Chair:** Over the next 50 years, what do you think will be most likely?

Professor Mace: I am afraid the way it is going is that we do not have in place the plans that would stabilise or recover, but it is perfectly within our capability to do that.

Q134 **Chair:** What is the impact if that decline continues?

Professor Mace: I need to move beyond insects to talk about some of the impacts. The immediate impact of insect decline is mainly documented through loss of pollination services. We lose pollinators, we lose some of the production of some crops, and particularly the production of the crops that are best for people's health and wellbeing.

Crops pollinated by insects are mainly the fruits and vegetables. Things such as wheat and maize do not need insect pollinators so they are not affected by it. When we look at fruit, a lot of vegetables, the fresh food that we would like people to be eating more of, those are definitely affected by pollinator loss. We will have to find some way of compensating for the loss of pollinators. We already have commercial honeybee colonies that are produced especially for that pollination service.

Moving more broadly, the loss of invertebrates and the loss of species generally means that we do not have a lot of other kinds of services, natural pest control, natural decomposition of pollutants, natural nutrient cycling, and without those, we are increasingly going to have to intervene in ecosystems to provide those services. The fact that we are talking about artificial means of drawing carbon down from the atmosphere is a really good example. Trees do this really well, and they have done it forever, but because we have lost the part of the ecosystem that does that, we are now talking about engineering carbon drawdown.

If you project these trends forward, we end up solving problems caused by the loss of natural systems one by one, which is a much less efficient way to solve those problems than treating the root cause of the problem, which is the depletion and degradation of the natural environment.

Q135 **Chair:** Thank you. Professor Cox, what is the impact on climate over the next 50 years? Obviously, it is within a certain set of parameters.

Professor Cox: Yes. Given the rate of warming we have globally, which is about 0.2 degrees a decade, and taking the slightly pessimistic view that that does not change, we are looking at probably 3-degree warming here in the UK, relative to pre-industrial. That is quite a big change. That is partly because if you think about the global targets, they are always



HOUSE OF COMMONS

global averages, and it just so happens that we do not live over the ocean where it warms less quickly. Even when we are talking about global targets, you need to modify by 1.5 or possibly 2 to work out what people are exposed to. We are committed to some further climate change we will have to adapt to, and associated with that warming are ecological extremes, more extreme rainfall, and a tendency to have longer droughts.

Q136 **Chair:** This 3 degrees, are you saying that is in a 2-degree world? We will be warmed by 3 degrees?

Professor Cox: Yes. Roughly speaking, yes. Because the land warms more than the ocean, and more quickly. That is partly an inertial thing. The ocean contains lots of water; it takes longer to heat up. Also, we have these feedbacks that if you warm up the land you tend to dry it, and if it dries it gets hotter still. If you warm up the land you also tend to melt snow and ice where it is, which warms up the land still further.

Generally speaking, we understate the problem when we talk about global averages anyway. That is not what people are exposed to. We have something to adapt to in the minimum. If there was no action on climate change we are talking about a lot more than that, certainly by the end of the century, and it gets a much harder, of course, the further away you go. Sometimes I think it is slightly misleading to think of the thresholds. They are quite useful to motivate, but in actual fact the risk goes up continuously the further you push the system away from—

Q137 **Chair:** Does it go up exponentially?

Professor Cox: No, not necessarily, but I think faster than linear. Sometimes I feel these things where we have hard targets are useful as a motivator, but they are not really the way this operates. If we were to pass 1.5, and I fear we will, if we were to pass 2—we might—it is not as if it is game over, but the difference between 2 and 3 is huge.

Some of these boundaries and targets are useful as motivators, but they also lead you to believe it is all or nothing, that it is either no impact or a huge amount that you cannot do anything about. That is not quite the way it is. Just to summarise, I think we are on for a warmer UK and changing hydrological conditions, and a consequence of that for the natural world and for what we have to adapt to.

Q138 **Chair:** Okay. Thank you. Dr Mulligan, what are the consequences for water over the next 50 years in a 2 or 3-degree hotter Britain?

Dr Mulligan: The challenge for the UK is that a lot of the water that we use is embedded in our food. It is the water that is consumed in the production of food, a lot of which, of course, is overseas. We cannot just look within the UK at the impact of climate change on UK water; we have to look at the impact on water at the ends of all our supply chains, because that is of course where water is evaporated into the atmosphere in order to produce plant matter that we then consume. Certainly in



HOUSE OF COMMONS

areas of the world that now use irrigation on the boundaries of dry lands, we are expecting to see some parts of the world become dryer, particularly around the equator and the tropics, and other parts of the world become wetter.

Overall, a warmer climate should generate a more rapid recycling of rainfall between the land and the atmosphere, and so there will be an overall increase in rainfall, but it is the special distribution relative to where cropping patterns are that is important. If we look at the UK in terms of our water resources, of course our key issues are to do with seasonality of those resources, but also with water quality. We will see under climate change impacts both on the supply side of water and also, of course, in demand for water.

We have to distinguish the fact that most of what we are talking about when we are talking about not having enough water is not the water itself, but the cost in energy and in material terms of treating that water, because water is a renewable resource. It cycles between the atmosphere and the land. You do not waste it when it leaks from pipes: it goes to the groundwater, and flows into the sea, and goes back into the atmosphere. What you waste is the energy and all the material that was required to pump and clean that water, and that is very expensive.

Q139 Caroline Lucas: I want to pick up the concept of planetary boundaries, particularly after what Professor Cox was saying about whether or not targets and threshold are useful or not, and whether they are slightly misleading. Maybe to Professor Mace first, do you think it is a useful tool scientifically, or is it more as a communications tool that it comes into its own, do you think, this concept of the planetary boundaries and the Rockström modelling, and so forth?

Professor Mace: I think it is a useful tool in that it defines, not a threshold—I agree with what Peter says about thresholds—but what they call the “safe operating space”. It is saying, “You really need to try to occupy above a certain amount, and you do not have to go beyond a certain amount. There is a safe area in which to operate”. That safe area is defined in multiple ways by the impacts on environment, on human change, on human societies, and their ability to continue to thrive and develop.

The thing I like about it is that it is not prescriptive. It is not saying, “You have to get to 2 degrees”, or, “You have you to get to so much water available to every person”. It is saying, “You have to somehow navigate environmental changes that are brought about by increasing human population and demand so that nothing falls outside that area, nothing is in the danger area, and not take too seriously single quantitative targets around that”. In a way it can be liberating, if properly applied, rather than constraining, if it is applied within sectors around a particular target.

Professor Cox: Yes. I would agree: it has been a really powerful concept, and that is very useful. I think it is really useful in the sense that



HOUSE OF COMMONS

it is not a single-faceted thing. You can get obsessed with one environmental problem and come up with ways to resolve it that lead to other environmental problems in different sectors.

The good thing about planetary boundaries is it is everything. That is great. I think the concept of boundaries is, as I said, useful as a motivating thing, until you think you are going to miss one, and then it is demotivating. Embedded in this has to be this idea that there are places you might want to remain, but when you go beyond, this goes up the further away you go, but as we were saying before, more than lineally. As long as you see it in that way, and you see it in the context of sustainable development in general then it is very powerful and very useful.

Q140 Caroline Lucas: In terms of using that model to think about boundaries and, therefore, how we try to adapt before we go beyond them, if we are thinking about climate change how possible is it to pull back once we have seen that we have exceeded it?

Professor Cox: Do you mean in terms of overshooting targets, for example?

Q141 Caroline Lucas: Yes, exactly.

Professor Cox: That would happen naturally. The issue would be how far you can overshoot. I often think that with the sorts of systems we are worried about, such as ecosystems and economies, it really comes down to how fast you change the system. Adaptive systems will adapt, but only at a certain rate. Overshoot is likely for something like 1.5; it is quite possible for 2. The issue will be whether we can work out how much you might do safely, and safety is always a risk thing anyway.

The thing about a planetary boundaries that is useful is that if you looked at the planetary boundaries and said, "All right, we will avoid 1.5 at all costs, but we are going to put biofuels everywhere, demand energy and carbon capture storage", if you were just thinking about the climate problem you say, "Done deal", but if you then looked at other planetary boundaries, such as biodiversity or nutrient cycling, you would say, "No, that is not a good solution".

One of the things that we need to begin to do is to connect these things together in a systemic way, and planetary boundaries are a part of that. That is where it is most useful. It is not to have just one issue, a big hammer that hits here and produces a shock wave over there.

Q142 Caroline Lucas: Moving to Dr Mulligan and looking at that question through the lens of water, how far can water systems adapt to acidification of water or water scarcity?

Dr Mulligan: I think the interesting thing about planetary boundaries and water is that water crosses many of them. I echo the point on timescale here, that adaptability of water systems really depends on



HOUSE OF COMMONS

whether we have gradual change in water supply and demand or whether we have change that is either seasonal or intermittent shock, because we can adapt quite well to the former but not the latter. That is one aspect.

Other aspects are our ingenuity, to what extent we can come up with technological solutions to water problems, the extent to which we can match what we call these grey infrastructure solutions, the concrete solutions, with maintaining green infrastructure that can also improve our water resources in terms of quality, quantity and timing. There is also the matter of our ability to, in an unbiased way, judge solutions for their long-term sustainability.

A problem that we have always had is that we will come up with a solution that often generates another problem because we are not looking carefully enough across all these planetary boundaries at how that solution affects others. That is certainly true for water.

Q143 Caroline Lucas: Thank you. Finally, I will come back to Professor Mace about how far ecosystems can adapt to biodiversity loss.

Professor Mace: Individual parts of ecosystems are very good at adapting. That is the nature of ecosystem change. As you add nutrients or remove water, the component species reorganise themselves. You might end up with a smelly bacterial swamp, which is also an ecosystem. It is still a functioning system, it is just not one that is particularly desirable for people. The dynamic nature of ecosystems is a really important thing that we can work with rather than trying to hold it back. There are ways that we can adapt species' ability to adapt, and evolve, and reorganise themselves in our own interests, and there are ways that if we try to over-force the system it will not work out.

The timescales for recovery can be very short, can be over a few years, particularly if it is a threat that you can remove, such as a pollutant or something that you can simply remove and the system will recover, but can be hundreds of years if the component species have generation times of the orders of hundreds of years. Restoring woodland, for example, is a centuries-long endeavour, so we should not take that too seriously that we can do that.

Q144 Caroline Lucas: Do you think there is a risk that this kind of approach, the boundaries approach and the modelling, does not really capture the issue of timescales and you do not really get that sense that an overshoot in one area at one particular time is massively more significant in terms of the amount you would have to do to rein that back in?

Professor Mace: Yes. One logical thing to do might be to act first on the really hard-to-solve, long-term problems. I think ocean acidification is probably the longest-term one. That is one that will be hundreds of years that you are stuck into this acidification of the ocean. The trouble is that we need to act on the short-term things as well, and in many ways the



short-term ones are the ones that will respond very quickly. You need a systems approach to addressing the problem.

Q145 **Kerry McCarthy:** We are going to return to insects. It has been said that it is very much in the news at the moment. My first question is: is it as bad as the report suggests? The words “ecological apocalypse” have been used, or an “insect Armageddon”. Should we be worried?

Professor Mace: I think you have Matt Shardlow coming in the next session. He is more expert on this than I am. I do not know if he is here already. I will give you my view on it. The paper that was widely reported yesterday, which is a review of multiple studies of insect populations, I think the substance of that is exactly right: there is massive loss of abundance biomass and massive changes to insect populations worldwide. I do not think they are correct that extinctions will necessarily follow, the idea that—I think it was said to be by the end of the century—most insect populations will be extinct, I do not think is true.

What tends to happen is that these persistent threats deplete populations, so you lose a lot of the biomass and abundance. There are some extinctions, there are some local extinctions, but insects are pretty good at going somewhere else and becoming pests somewhere else. They do not necessarily go extinct, they just go elsewhere. We will see a number of insects that exploit this homogenised world that we are creating, such as the locust and the cockroach. Invasive pest problem is the other side of the coin, if you like, where we have some superabundant ones that are damaging in a different way.

Dr Mulligan: I would just add that I think one real challenge of losing abundance in species populations is that you then start to lose the services that they provide, so nutrient cycling, the soil organic-matter production, pest control and pollination are often associated with abundance as much as diversity. Of course, that abundance also sustains amphibians, and reptiles, and birds, and insectivores in general. I think there are real challenges with that progressive loss of abundance throughout not just the living world, but also things such as soil and water as well.

Professor Cox: Yes. This one is quite surprising to me as a climate scientist, because I would have imagined—we spoke about this, Georgina, before, did we not—that shorter-lived species would be more able to adapt through changing ecosystem composition and through evolution, basically, than the longer-lived species. I would be surprised if climate change was a major player in this. It might be what is called a threat multiplier.

Recent studies for the IPCC 1.5 report suggest that the ranges of insects are surprisingly sensitive to climate, which did surprise me. It looks as if it is the things that Georgina spoke about that are more likely, and I guess we will come back to the whole issue of how we manage our land for environmental good. With climate change, it is possibly a threat, but I



doubt it is the predominant reason why this is happening. It is just too fast for that to be the case.

Professor Mace: I can add one thing to that. There are some interesting studies on insects facing climate change, which is that temperate insects do rather well under climate change. It turns out they would like the climate to be a bit warmer than it is now, and I think we would probably agree with them. But tropical insects really have a hard time, because they are close to their thermal limits already. In the tropics you do get climate-driven extinctions of insects, but in temperate areas they tend to be pretty comfortable with a warmer climate.

Q146 **Kerry McCarthy:** I suppose if you have land use that is associated with climate change, or I suppose man-made deforestation and so on, that is a fairly significant factor?

Professor Cox: Yes. To date, of course, we have had these combinations of things, such as land-use change, deforestation associated with climate change, and maybe additional nutrients in the environment, and hydrological changes. In the future if we start to get to grips with environmental problems such as climate change we will need to be mindful of what those consequences are for these other parts of the system, if you like. Some of the things that are being proposed are largescale changes in the conditions that plants and animals will deal with.

Q147 **Kerry McCarthy:** In terms of a strategy to try to reverse this decline, how does one begin to go about that? Everyone knows that if the tiger is about to become extinct that is something you can focus on. If it is an obscure type of beetle people think, "There are plenty of other beetles and does it matter that that one exists?" Do you start from it being a bit of an add-on to things such as improving soil health, and stopping deforestation, and protecting certain sorts of biodiversity, or do you focus on the insects themselves? I might not have put that very well, but if you see what I am saying. Do the insects come along as a consequence and it is something that we see as a sign that our natural habitats are recovering, or do we need to start with the insects?

Professor Mace: I think the answer to that is very clear. Acting only on insects themselves is not going to be sufficient to solve the problem. We have been doing this for the last 50 years or so. We have a fairly robust system for protecting important habitat areas, national parks, SSSIs and so on. They are not in great shape, but none of direct conservation actions are turning that decline curve around.

Indirect conservation actions on their own are not enough. It is a more systemic problem about how we use the landscape, how we prioritise wild species versus agricultural systems, versus urban areas, versus built infrastructure, and so on. It is a much more systemic problem than is going to be addressed by single actions around species.



Q148 **Kerry McCarthy:** Do the others agree with that?

Dr Mulligan: Yes, absolutely. I think achieving the right balance between agriculture, and the landscape, and natural areas so that you have both the goods being produced by agriculture and the ecosystem services being produced by natural areas is critical, not just for insect pollutions, but across water and all the other ecosystem services we depend upon.

Q149 **Kerry McCarthy:** Are you talking either rewilding or perhaps a more agri-ecological approach to farming?

Dr Mulligan: Yes, much more precise agriculture, with lower inputs for the same gain, using technology better, having more expensive inputs so that they are more carefully applied—all these sorts of things make a difference in some parts of the world. We are probably behind the curve in some of those areas on sustainable intensification in our own agriculture, but also in agriculture at some of the ends of our supply chains.

Q150 **Kerry McCarthy:** Can I just ask quickly my last question? Pollination is a real problem. I have heard in China they are having to hand-pollinate crops because the pollinators declined. I think it may have been Matt Shardlow on the radio yesterday talking about the declining soil health if the insects are not there. Are there other danger signs that we ought to be looking out for? What does it matter if we do not have moths flying around?

Professor Mace: Pollination has received a lot of attention. I am not sure it is the most important of the problems. I think many things to do with maintaining the nutrient cycle, maintaining the decomposition of organic material in soils so that nitrogen and phosphorus cycle through the system, and natural clean-up of fresh water, which is in part underpinned by whole interacting systems of invertebrates, not just insects, are just as important.

The pollinator one is very easy to see: it is in the real world, it affects crops, but I suspect there are more that are potentially harder to reverse and cut across bigger areas of environmental change than the pollinator one.

Q151 **Geraint Davies:** It seems to me that there are some changes about to occur, in particular in Brazil: the possible destruction of the Amazon forest by the new President for agriculture. In Germany, the destruction of forest to coal mining, and so on. It makes one think some of these problems with insects will get worse.

You have mentioned pollination and the like, but obviously it impacts on, as has been mentioned, birds, reptiles, and the whole ecosystem. What do you think more specifically the policy recommendations should be? This has been quite sudden. What can we do in Britain to take a lead that might be followed elsewhere? Sustainable intensification was mentioned, whatever that means. Dr Mulligan mentioned it. I was wondering what



HOUSE OF COMMONS

quick steps we could take to solve what has been a very quick escalation in this problem.

Professor Mace: Do you mean specifically about the insects?

Q152 **Geraint Davies:** I am thinking generally of insects, but I appreciate what you said about systems.

Professor Mace: Yes. When you start looking at these big international drivers, loss of the tropical rainforest, huge areas of ecosystem change due to mining and so on, you are dealing with drivers of change there that are much more about economic development. The pressures in countries such as Brazil, South Africa, India, and so on, to develop mean that they inevitably have to look at means in which they can increase cashflows. Cashflow is what is going to drive destruction of the rainforest, the building of new roads, mining, and so forth. If you want a solution to that problem, you need something that is much more fundamental about how we value the services that the natural environment provides. If the Amazon rainforest is not only underpinning the health and wellbeing of the wildlife that is in it but also drawdown of massive amounts of carbon and, in fact, playing a major role in the global climate system, then we should be valuing the Amazon rainforest that much more than the value that you can get by clearing it for soy production.

Q153 **Geraint Davies:** By paying, those in carbon offset, for instance, or something like that.

Professor Mace: I would say it is even more fundamental than that, to be honest. I think the carbon offset would probably undervalue the public good that the rainforest would be providing to people generally and to future generations.

Q154 **John McNally:** If I could move you on to the principles and governance of the, I will go on to the environmental 25 Year Plan, Professor Cox. I notice you have a bottle of water there. A very good choice. Could I ask you what topics you think should be covered in the second part of the Environment Bill to ensure that planetary health is effectively monitored and contained?

Professor Cox: Yes. First of all, I think the 25-year environment plan is a great initiative and that we are beginning to lay out at least an aspiration of what we want the UK environment to be like. It is important to include in their metrics things we can measure and that we will be held to account on. Also, things that people can see, especially in this day and age.

I find that if I have a step count on my phone it makes me do more steps. Why would that be? It is a ridiculous thing. I am a grown man. Why would I do an extra few steps because they are being measured? One of the things about these metrics is that, first, they need to be measurable, and secondly, they need to be widely publicised, because it



has an impact on the way people view what they should be doing in general.

In terms of the planetary-health thing, the Environment Plan covers many of these things. One of the things about the planetary-health concept, a bit like the planetary-boundaries concept, is it is about looking at that whole thing in a systemic way, so not separating out this metric from this metric that might be connected by one policy.

The interconnections of the systems are what make scientists such as us really excited about it. It leads to trade off that you do not want sometimes, but it also leads to potential co-benefits. In terms of the Environment Plan and planetary health, it is all good, except you would want policies to be seen in the context of many metrics for the Environment Plan. In the context of the global planetary health, you need to make sure that what you do locally does not just export the problem.

In some ways, you need to be looking at the boundaries of what the UK policy can effect. We have an example like that where we have done really well in reducing emissions from CO₂ production, but we have probably imported a lot of goods that have embedded emissions in them. Embedding this with the global push to looking at planetary health and environmental sustainability is really key, but I think it is a great start.

Professor Mace: Yes, I agree. I think the 25 Year Plan is wonderful in terms of its ambition. The 25-year timescale is really great to see, because these things take a while to change. I agree completely that it needs to be more integrated. The other thing it needs is some hard targets. I know we talked about not having thresholds, but the problem at the moment is that most of the metrics just tell you a direction of travel. "We should have more of this and less of that, better water quality and better air quality". The problem is that unless you have a quantitative target that you are aiming at it is very easy just to have small marginal changes but miss completely what you were trying to achieve.

The second problem I have with the implementation side is that the actions that are laid out in the 25 Year Plan are nearly all within sectors. This is exactly the problem Peter was talking about. We will clean up the water, we will stop emissions of particulars into the air, but it is not addressing the systemic problem that these things are all linked together.

It is very clear that a more efficient way to solve multiple problems is to invest in the natural infrastructure that underpins these things. We did some work in the Natural Capital Committee a couple of years ago that looked at the benefits of just restoring woodland, restoring whole wetlands, which would give you many of the outcomes of the 25 Year Plan but from an across-infrastructure basis, not just solving one problem at a time within different sectors of the economy.



HOUSE OF COMMONS

Dr Mulligan: I will just add that in many cases we know what to do; the challenge is that we need to make the sustainable option cheaper, and then it will happen. The economics and markets do not currently do that, and as a result, although we know what to do, it is just not happening. The Environment Plan is a great step in that direction with the distinction between private goods, and public services, and public money for public services, but I kept asking, "How?" to those targets as we went through them. "How are we going to do that? What will be the mechanism?" I would like to see a bit more on that.

Q155 **John McNally:** Some businesses are saying, to use the well-known word of the moment, that things are quite nebulous. There is not a lot of clarity around where they need to go. They need that clarity of direction for investment in businesses. Should the Bill contain carrot or stick approaches to boost the protection of the environment where people have definite targets to go to? Do you think the proposed Office of Environmental Protection will have the independence that it needs to hold the Government to account, Dr Mulligan?

Dr Mulligan: I am not sure about that. I guess it depends how it works out in practice. I think you need both the carrot and the stick. We used to go just with the stick, and now it seems that we are going mostly with carrots around the world, thinking about payments for ecosystem services instead of the polluter-pays principle. I think we need both. We need incentivisation so that people do the right thing and it is cheaper for them to do the right thing, but there also needs to be a stick for those that continue to pollute.

Professor Mace: Yes, I think that is right. You need to do both. The public money for public goods is a big carrot, and if you get that right it could make a big difference, but you still have to have regulation, and polluter-pays is a stick.

Professor Cox: I think we should be quite proud nationally of the Climate Change Committee, which is an independent body that oversees what the target should be for carbon production and monitors it. It feels as if you need something similar to that if you are going to have metrics with real teeth in Environment Plan. That would be a good thing to do; I have no problems with that.

That Committee would also hopefully oversee that these things are connected, so policy change here has ramifications across metrics. You need someone to oversee that or else you do get this siloed activity that can sometimes be counterproductive.

Professor Mace: On that, I think as it is currently proposed it reports entirely into DEFRA, whereas the Climate Change Committee is reporting to Parliament, because that would be a problem.

Chair: Yes. They are doing that separately, and we have made that point in our previous report and we will be making it in our next one.



Q156 **John McNally:** My last question: are there any examples from other countries that the UK might use as blueprints for effective environmental protection? Can you name some that are good models?

Professor Cox: Parts of it. There are these things where you get co-benefits from actions. For example, Holland is a classic example of cycle routes. Everyone cycles in Holland, people are healthier, there are low CO2 emissions, and there is less traffic on the roads. It is one of these co-benefit things where you have a change that affects human health directly and also affects the environment, which then feeds back into human health.

In Norway, of course, they have done a brilliant job of getting electric car numbers up. Now, nearly half of new cars registered in Norway are electric cars. That is a case in point. The UK has done pretty well on reducing its CO2 emissions, which it should be proud of—more than one-third since 1990. We have probably brought in a lot, but we have still done well on that. There are some examples around, and some of them are obvious. It is not rocket science, a lot of this.

Q157 **Mr Philip Dunne:** Professor Cox, you touched on environmental land management systems in the UK and what we could be doing domestically to help. We have the Agriculture Bill going through the House in a moment, I sat on the Committee, and it is obviously shifting support payments from producing food to public good. Do you think there is enough in there to promote biodiversity?

Professor Cox: I do not know. On the biodiversity side, Georgina may be able to answer that question in a minute side, but it is clear to me that the frontline of a lot of the things we want to do, for example in the 25-year environment plan, is land management.

The number of things we want the land to do now, not just about food provision, but conservation of biodiversity, recreational space—which is unbelievably important for mental and physical health—carbon sequestration, renewable energy; the whole thing is really about how you manage the land. Where the Agriculture Bill connects to that, that seems to be a very good thing to do. Somehow we have to get better at using that resource, which is our major resource for a lot of these things. On the biodiversity side, I will let Georgina speak.

Professor Mace: Yes. In first principles it is a bit strange to have a 25 Year Plan for the natural environment and an agriculture plan sitting alongside each other. They are so interconnected, as we discussed. In many ways the Agriculture Bill is more explicit about some of the environment outcomes than the natural environment plan is. It may have stronger ways of imposing change, because there is a lot of money coming out of the CAP bucket. I think the problem here is a structural one. DEFRA is divided into natural environment, food and farming, and animal health. Planetary health recognises that those cannot be



separated from each other, and they should not be treated as separate problems requiring separate solutions.

Then we have the climate issue, which is the Climate Change Committee. The mitigation side comes through a different Government Department; it is in BEIS. Many of the actions that you need to do better land use, and to do food production, and to do better biodiversity, fall on local government. That is another Government Department that would be MHCLG or Department for Transport. The challenge here is beyond what a single Government Department could do, and maybe beyond what any one of these plans can do. It needs some higher-level co-ordination across the Government.

Q158 Mr Philip Dunne: We have a unique opportunity as a result of the changes to our positioning in Europe to change both the agricultural support system that we have at the moment and this opportunity presented by the 25 Year Plan to try to align. This is a unique opportunity in terms of the balance between food production—which is also an important objective, as the population expands we have to be able to feed ourselves—and environmental protection. Dr Mulligan, you may have some thoughts about what else we can be doing in the Agriculture Bill to strike the right balance.

Dr Mulligan: I think the challenge is the monitoring. It is relatively straightforward to measure production and provide incentives on the basis of production, but to measure public good, ecosystem services being provided by farmland, biodiversity, water and so on, is a bit difficult to measure and to make parametric so that you pay on the basis of those measurements. There is an opportunity there for the internet of things, and UK tech that it is very ahead in that kind of game, in monitoring the landscape remotely and for remote sensing, where we are also strong. There are also challenges, I think, in implementation.

Q159 Mr Philip Dunne: Do you have any specific recommendations as to what we should be looking to do while the Agriculture Bill remains in the House? We have one more stage to go before it goes to the House of Lords. Are there any amendments that you think are missing or should be supported?

Professor Mace: I think anything that could improve its synergistic actions with the 25-year environment plan would be really good, to look at ways in which those could be delivered in parallel rather than as two separate plans. As you say, there is resource there, because CAP funding is available to incentivise actions that are for the good of both food protection and the natural environment services.

Q160 Mr Philip Dunne: Professor Cox, do you have any specific things that you would like to see in the Bill?

Professor Cox: Nothing specific. I think this issue about how you value the relative uses of land is really key. Georgina spoke about this earlier,



HOUSE OF COMMONS

the valuation of ecosystem services, for example, and recreational spaces, and impact on health.

It is a very hard thing to do, but the problem we often have is we monetise the things we can and not the things we cannot, and we end up losing the things that are not monetised that are really important. A lot of this will come down to how land managers are incentivised to do different things. That will come down to the detail of how you value these things relative to one another.

Q161 Caroline Lucas: I was disappointed that you did not give a rallying cry saying that we should be amending it to massively reduce pesticide use. I am speaking with a particular agenda given I have an amendment down to precisely do that. Given that we have been talking about the impact of intensive agriculture on our insect life and so forth, surely greater steps, more urgent steps, away from that would be something.

Professor Mace: Yes, absolutely. I guess I sort of assumed that that was already—

Q162 Caroline Lucas: It is nice to have it on the record.

Professor Mace: No, definitely. Anything that can be done to reduce pesticide use, reduce herbicide use, but also to think about what the landscape-scale configuration of the farming system is. How that is put in place so we have enough food production, but it also enables the wildlife, the insect life, the fresh water, and the carbon drawdown mitigation. That is a landscape-scale problem rather than a field management problem. I guess anything in the Bill that could address that intervention would be good. Yes, certainly, all the obvious things about pesticides and additives.

Q163 Caroline Lucas: We are going to move on to global governance, but you talked about the lack of governance inside Government on this and the crosscutting nature. We have often had two or three, sometimes four, Ministers sitting there in front of us literally passing the parcel between each other, whether it is on hunger or whether it is on air pollution.

Is a Cabinet Committee the right way to go on this, or is it the new Office for Environmental Protection? We said that should be an audit office that would be counting and measuring those targets, and accountable to Parliament, not to DEFRA. We have shut down more environmental watchdogs than we have set up. We got rid of the Royal Commission on Environmental Pollution and the Sustainable Development Commission in 2011. What is the governance gap in the UK that needs to be filled?

Professor Mace: I am not an expert on governance, but I certainly think it cannot just be within DEFRA, for all the reasons we have talked about. It could be a Cabinet Office responsibility of some kind where somebody has responsibility, but then you have to have a plan or commitment to which you are holding Government to account. We have that with the Climate Change Act. We have a very clear commitment. It is not clear



HOUSE OF COMMONS

that the Environment Bill is going to have a sufficiently clear set of targets to hold the Government to account.

Q164 **Chair:** We do have that in the Sustainable Development Goals that we have signed up to as a country, which Cabinet Office is responsible for.

Professor Mace: Yes. So that is a Cabinet Office responsibility. I honestly do not know what the answer to it is. I like the idea of having some sort of ombudsman who takes responsibility across Departments, can call on Government Departments as and when they should act within particular areas, and can take a system-level view of it. But I do not know how that can be implemented.

Q165 **Chair:** Does anyone have anything to add before we move on?

Professor Cox: Not anything particularly tangible, except to say that there are huge benefits to joining up these things because of the co-benefits. For example, the air quality and health link and the air quality and climate-change link mean that you can do certain things that ring three bells. I do not know what the mechanism is, but it is pretty clear we need to be more joined up than we are to take the systemic approach we are proposing here.

Q166 **Zac Goldsmith:** I want to almost ask the same question, but globally on global governance. How do you think global environmental-governance arrangements would need to change to accommodate the gigantic pressures and challenges that we are facing?

Professor Mace: There is not really any effective global governance of the environment at the moment. With the UN climate change conventions and the forest convention, the climate-change one is probably the strongest of them and increasingly is taking responsibility in other areas, for example, trying to look at oceans or trying to get involved in land use.

Then there are little other areas of responsibility that fall outside of the climate convention. There are moves for the United Nations to have a stronger environmental push to bring together all the environmental conventions under a UN E type thing that would give it a higher level of priority.

Q167 **Zac Goldsmith:** That body does not exist yet, does it?

Professor Mace: No. I think UN E does exist, it meets, but it does not have any authority from the governments.

Q168 **Chair:** UN E is what?

Professor Mace: United Nations Environment.

Q169 **Chair:** There is the United Nations Environment Programme?

Professor Mace: Yes. It is UNEP but with a higher level of authority. I forget how it goes—sorry.



HOUSE OF COMMONS

Q170 **Zac Goldsmith:** UNEP is about individual programmes. UN E would be more like the climate-convention business.

Professor Mace: Yes. It would sit above the climate convention.

Q171 **Zac Goldsmith:** The climate convention is or would be part of it?

Professor Mace: I honestly do not know. I am sorry.

Q172 **Zac Goldsmith:** Does anyone else know the answer to that?

Dr Mulligan: I do not know, but I think this is a key challenge. You have IPCC, the Convention on Desertification, and so on, those bodies are siloed, and there needs to be something above them that ensures that if we are going in a particular direction, green energy, for example, that that does not cause problems in other areas.

The large-scale adoption of solar panels will have huge impacts on water quality around the world, and resource use for the metal and so on that is required. There needs to be something connecting those to make sure that we do not create more problems.

Q173 **Zac Goldsmith:** Sorry, I do not know much about UN E. I do not know if anyone else does on the panel, or on the Committee. UN E exists, but it does not yet exist as the umbrella body beneath which the CBD, IPCC and so on would sit. Is that right?

Dr Mulligan: Not as far as I am aware. My impression of it is that it was not a major change from what we have now.

Q174 [Click or tap here to enter text.](#) **Zac Goldsmith:** Would that be your recommendation as a panel? Is this something we should be pushing for?

Professor Mace: I am not sure. I think it needs a bit more thinking through. I am also not totally convinced that all of these problems need international governance. We can do an awful lot with better national governance of local environmental problems. A lot of the things we have talked about—biodiversity, insect declines, water quality and air quality—can be managed nationally. The unique thing about the climate is that it is properly an interconnected global system, which is why the UNFCCC has been such an important force.

Q175 **Zac Goldsmith:** It still requires domestic legislation. None of it is possible without actions nationally or even locally. The same would be true then on biodiversity, logically, if there are no Paris-style targets that exist in relation to biodiversity in the same way they exist in relation to climate change.

Professor Mace: There are the CBD's Aichi targets.

Q176 **Zac Goldsmith:** They are not legally binding, and they are meaningless.

Professor Mace: They are not binding. That is true. You do not need to have other countries acting on biodiversity for us to improve our local biodiversity, whereas with the climate system you do need a concerted



HOUSE OF COMMONS

effort. I think the oceans, particularly the open oceans, badly need international governance, and there is nothing at the moment.

Q177 **Zac Goldsmith:** Who would be the body that would oversee oceans?

Professor Mace: That should be UN E.

Q178 **Zac Goldsmith:** There is an organisation already, theoretically, UN E?

Professor Mace: There is not an organisation for the oceans as a whole. There are various multilateral and bilateral agreements, but there is not an oceans convention, as such.

Q179 **Zac Goldsmith:** Does anyone want to come in on anything that has already been discussed in this question? If not, if you had Government Ministers here, Foreign Office, and so on, what would your message be to them in relation to trying to fill some of these international global-governance gaps? What should Britain be doing? A question for anyone.

Professor Cox: Yes. I think the SDGs, Sustainable Development Goals, are a good overarching framework to fit all these things in. I would like us and other developed countries to take them a bit more seriously. For example, the 25-year environment plan, which is great, is a line to some extent, but not as much as it might be with Sustainable Development Goals. Then you start to see it in the bigger picture. There is still an issue about how you do the governance, but the fact you connect things up through the SDGs is invaluable.

Certainly in the way we think about our environmental research now, we are mapping on to the SDGs because the research is always saying to us, "These things are connected. If you want a good world in all these ways you have to think about how this connects and where things break down in the system". I do not know how the governance works, that is certainly not my expertise, but I would like to see the SDGs slightly higher-profile in the way we think about how we manage our environment.

Dr Mulligan: I think we are good at metrics and targets, and I think the SDGs are out there, but countries have relatively little support in how to measure their progress against them, particularly at the level of granularity that is required. Supporting countries by developing the technology required, and the tools required for them to be able to do that, for first-use buyers, of course, but also then for using around the world so that those underperforming can be held to account, is very important.

Q180 **Chair:** Thank you. Can you explain why solar panels affect water use?

Dr Mulligan: Of course, people think that solar panels are carbon neutral, but they are not, because they have to be manufactured, and transported, and decommissioned, and destroyed. Because there are electronic components a lot of rather nasty chemicals are used in their manufacture, particularly to clean the components, and they end up, if you are not careful, in the waterways.



Nothing is benign environmentally, and so there is always a danger again of solving the problem and creating another one, particularly if the solution to the problem is very different to what you do now and requires, for example, entire new distribution networks for power that do not currently exist because you are sourcing it from different spaces. There is work increasingly on life-cycle assessment, and that is getting better and better. I think we need to do more of that. What is the long-term cost of these things, not just the short-term?

Q181 Geraint Davies: I want to catch up on this issue of sticks and carrots. People talked about the need nationally for an overarching approach, multi-departmental, but first would you agree that should include Treasury so there are the right commercial incentives to make it happen? On the global scale, it is true that we can do what we can do locally, and if there are big levers, as we were talking about before, whether it is Amazon, or Donald Trump, or whatever it is, should some sort of collaborative approach also have some sort of financial system to incentivise green prosperity instead of the opposite? Do you have any tips on this?

Dr Mulligan: I think there are examples around the world that are very clear on some of the more tangible benefits we get from nature, such as clean water. There are payments for ecosystem services or watershed services, schemes around the world, where farmers are incentivised to manage the land in a better way by being provided payments by a dam operator downstream, for example, who is gaining income from lower sedimentation rates of that reservoir, and so on.

Direct recognition of a water company's infrastructure is not just its pipes, but also the entire watershed, and all the farms on that watershed, and the transfer of funds that allow the maintenance of that landscape as well as the pipe network is the kind of thing that is important. It is more difficult for less tangible services, but I think we are getting there.

Professor Mace: Yes. I think that the fundamental shift that will make a big difference is around the financial sector, because that is what is driving most of the pressures that are causing the unintended effects that we are talking about. You can get a certain way of solving that problem by tweaking the market, by paying for ecosystem services, by polluter-pays, by paying for public good, and so on.

Some of the green economy moves are heading in that direction. I think those things will make a difference, but the substantial shift would be to change the financial basis of how we value environmental goods and services completely. We should not have to justify maintaining the Amazon on the basis of its economic value. We should not only worry about pollinators because of the loss to GDP that pollinator declines impose. Those are always vast underestimates of their real value to societal wellbeing.



Somehow you have to tweak the financial system to say there are some things that are beyond valuation. You have to maintain them, you have to pay the costs of maintaining and restoring them—the Amazon, soils, fresh water systems. We know that it will more than pay for itself, we just cannot do the sums that show it. Tweaking the finances in a way that some of the green economy movements are trying to push towards is, I think, the right thing. It is about maintaining natural assets rather than putting an economic value on the flows of goods and services.

Chair: Great. Thank you very much indeed. That has been an absolutely fascinating panel. We are going to take a short break now and switch to our second panel. Thank you all very much indeed for coming and sharing your wisdom with us.

Examination of Witnesses

Dr Richard Horton, Sonia Roschnik and Matt Shardlow.

Q182 **Chair:** Welcome to our second panel. I have seen you sitting through the first panel so you will have observed the weighty ideas and concepts that we have been grappling with. Can I ask you once more to introduce yourselves from left to right, starting with Dr Horton?

Dr Horton: My name is Richard Horton, I am Editor of *The Lancet* and we have been responsible for some of the commissions that you may have seen.

Sonia Roschnik: I am Sonia Roschnik. I am Director of the Sustainable Development Unit and that covers the NHS, public health and social care.

Matt Shardlow: I am Matt Shardlow. I am Chief Executive of BugLife, the Invertebrate Conservation Trust.

Q183 **Chair:** Thank you very much indeed. You represent a diverse set of groups interested in population health and planetary health. What do you think are the major challenges for the UK from the environmental changes that we have just heard about, starting with Sonia, please?

Sonia Roschnik: Clearly the environment has a direct link to health and there will be a lot of population health challenges. We know from the reports that have been contributed to the Government that those will be around vector-borne diseases, possibly around mental health, and air pollution. Heatwaves and flooding will clearly impact on the way services are delivered.

For the health sector, certainly one of our greatest challenges is how we continue to deliver quality health and health care with minimum impact on the environment and while reducing health inequalities. We think that



HOUSE OF COMMONS

with the long-term plan that has just been published, we are well set to do that.

Q184 **Chair:** One of our previous reports looked at F-gases. One of the nine planetary boundaries is on aerosol pollution. F-gas is heavily regulated internationally and yet in this country we do not seem to have a plan for phasing out their use in asthma inhalers. What steps are you taking on that as a result of our previous report?

Sonia Roschnik: In the long-term plan we have committed to reduce the impact of the carbon emissions of inhalers and we are building up the plans as to how we are going to do that. We have committed to contributing 4% of the reductions required from the health sector.

Q185 **Chair:** Sorry, could you speak up? We have had a lot of backwards and forwards.

Sonia Roschnik: Yes. Regarding the reduction in carbon emissions that the health sector needs to contribute to meeting the Climate Change Act targets the Government has set, we have identified that 4% will come from a shift in our inhaler use.

Q186 **Chair:** By when?

Sonia Roschnik: By 2028. We have the cross-sector committee in place and we are identifying the actions that are required to do that. It will take a bit of time and there are a lot of different elements to it which relate to patient choice, clinical choices and also what the industry might need to do around that. We are confident that we have the right plans in place and some of that will start translating in the implementation framework that is coming out later this year.

Q187 **Chair:** I am asking you this because I went through the UN Sustainable Development Goals plans and they have asked exactly the same of the American Thoracic Association. We have the health people always talking about the disasters, what a nightmare it is and the impact, and then as soon as we say internationally, "Reducing fluorinated gases in asthma inhalers", everyone comes back and says it is about patient choice. It seems to be too hard for the health sector to implement something that will have a direct benefit on patients. Why is that?

Sonia Roschnik: I do not think it is too hard; I think it is just complex because we do not want to impact adversely on clinical—

Q188 **Chair:** Sweden has done it two years ago. They have just decided they are going to do it and off they go. Is it not just inertia?

Sonia Roschnik: We are putting in place plans. We have recognised it as part of the long-term plan, which is already huge. It is not something that is central to the long-term plan because we recognise it impacts on respiratory disease and we also recognise that it is not just a matter of switching inhalers; it is also about diagnosing asthma correctly. We need



HOUSE OF COMMONS

to, in the first place, not over-diagnose and do some of our clinical practices well.

Then it is about influencing the choices. Some of that is about raising awareness and we are beginning to do that. The previous Committee that looked at this has highlighted the problem, it has been recognised and it is part of the long-term plan. I would say that is a huge first step and we are committed to do our bit on that.

Q189 **Chair:** When are we going to see the recycling programme? We recommended it should be in place by 2022 for all asthma inhalers with a little bit of F-gas, which is a valuable resource and a tradable commodity. Is this not a win-win for the NHS to save money?

Sonia Roschnik: It is not necessarily a win-win to save money. It is definitely a win-win to make sure that we are contributing to the environment, and certainly the recycling of the last bits of the F-gases and of the plastic is part of the plan going forward.

Q190 **Chair:** It is a win-win because you can sell it. Why would the NHS, which we are always told is cash-strapped, not want to take in something that they can then monetise and resell?

Sonia Roschnik: Yes, certainly the recycling piece can bring in money. However, there are some interesting cost calculations around the like-for-like replacement of different inhaler gases and we need to be very careful that we are doing that on at least a cost-neutral basis. That is the commitment that we have made so far.

Q191 **Chair:** Are you saying that a dry powder inhaler costs more?

Sonia Roschnik: It is very difficult to compare them directly. We have commissioned a study so that we know exactly how the cost comparator works. There are some dry powder inhalers that cost more than the equivalent multidose inhalers but it is not as simple as that because we also need to take into account the clinical effects. NICE are producing a decision around inhalers that will help indicate the environmental impacts of different inhaler choices alongside the clinical implications and the cost implications.

Q192 **Chair:** When are we going to see the NHS target and plan? You said it is in the long-term plan. When do you think the NHS is going to set out its target on reducing F-gas and what do you think a reasonable target is? Reduce it by 20%, 50%, 80%?

Sonia Roschnik: The numbers that are in the long-term plan are premised on reducing it by 50% by 2028.

Q193 **Chair:** Right. Sweden has reached 80% in three or four years. Why are we less ambitious than Sweden?

Sonia Roschnik: We are being as ambitious as we feel we can deliver. We are also taking with us our clinical colleagues, who feel there are



HOUSE OF COMMONS

clinical implications of this. We are being very cognisant that we need to make sure we are taking forward quality of care first. It would be fair to say that in Sweden and Scandinavia, we understand that the colder climate has led to more DPI use than NDI use and it is true that in the UK we have a higher use than anywhere else in Europe. We are doing our best to address that.

Q194 **Chair:** Okay. Dr Horton, what do you think?

Dr Horton: I am not an expert on inhalers and F-gases.

Q195 **Chair:** No, take us back to the original question about population health.

Dr Horton: First of all, you cannot isolate the UK from the rest of the world. What happens in the rest of the world will affect the UK. If you look on a global scale, the biggest impact of climate and planetary health threats is going to be on nutrition. The disruption of food production through crop failures, droughts and floods is going to lead to global increase in food insecurity. It will lead to famines and it will exacerbate undernutrition. That will have an impact on the global food system and that will ultimately affect the United Kingdom.

I agree with Sonia about some of the risks that she has mentioned on infectious disease, non-communicable disease and mental health, but there is another aspect to this too, which is highly political, of course, in this country at the moment, and that is migration. The planetary threats that we see are going to lead to massive increases in internal and external migration in countries. There is a projection, a bold projection, that by the end of the century, if we have the sea level rises that are expected with the current trajectory of temperature increase, we could have as many as 1 billion climate refugees in the world.

This idea that dealing with migration is a simple political choice for a country is complete nonsense. There has to be a global solution to the threat of climate change and the impact it is going to have on human populations and we have not really begun to discuss that. Add in to that—and again, there are many uncertainties around this—that climate change and planetary threats are going to increase the potential determinants for conflict within societies, which would also drive migration.

I know that perhaps one tends to think about planetary health as environmental health 2.0 but it is not. Planetary health—and I know Andy Haines said this in one of your sessions—is about the health of civilisations. It is the health of our societies. It is applying the concept of health to the political, the economic and the social determinants that govern the world we live in.

Unless we lift our gaze and not just think about the NHS, not just think about public health, as important as those are, but ask questions about, “What is the health of our democracy? What is the health of our economic system? Do we have the right economic system to protect and strengthen our societies for the future?” That is the gap that planetary health is



trying to fill, which global health does not fill and public health does not fill. Planetary health is trying to answer those questions.

Q196 **Chair:** As we are about to head off to the eighth Brexit statement in eight weeks, what is the answer to the health of our democracy and the economic system?

Dr Horton: The point is that we need to ask some tough questions about what the health of our democracies are. There is interesting social science and political science research that has come out of the US, for example, that has looked at the history of democracies and democracies that have collapsed and looked at the determinants of why those democracies have collapsed. It is to do with the way we speak with each other, allegations about truth in society, the way we address the media or curb the media, and then of course we have the situation in our own country at the moment.

We do not ask those questions because we do not think of health in that way but if I take economics as an example, we live in a highly consumptive society. Our high and unsustainable consumption is driving the very thing that we have called a global syndemic around climate change, undernutrition and obesity. Unless we address that high and unsustainable consumption by asking some pretty fundamental questions about our economy—this life that we have created for our societies is not sustainable.

Now, is the answer a circular economy where we reuse and recycle? It is a big jump from where we are now to a circular economy. These are the kinds of questions that we have to be asking ourselves and planetary health is inviting us to ask these questions?

Q197 **Chair:** We have not looked at the fake news side of things. A BBC cameraman was assaulted at a Trump rally last night just for doing his job. Matt, perhaps you could bring us back to the birds and the bees, or the bees and the butterflies?

Matt Shardlow: Thank you. Unsurprisingly, I am not going to talk about inhalers. I will talk about biodiversity decline, insects and indeed invertebrate declines, which are more up my street. You will all have seen yesterday—I heard you talking about it earlier—the new paper that came out looking at a review of data from around the globe showing 40% of species at risk of extinction in the next few decades.

The 100% thing, I should clarify, was a comment made by one of the authors in an article in the papers; I do not think he was saying that was a forecast. We should not pay too much attention to that. It was a headline-grabber but the actual paper says that 40% of species are at risk over the next few decades, and also that there has been a 2.5% decline in biomass. The volume of animal life and animal material out there is declining by 2.5% a year. That is fairly serious.



In terms of impacts on health, I will start by highlighting something that has not really been talked about, which is recreation, mental health and exercise. People love biodiversity. They love species. They get out there and they look at birds, they look at butterflies, they go and visit the countryside, they get out there and enjoy that. Without biodiversity that process does not work in the same way. The cost of physical inactivity to the NHS is estimated to be £20 billion a year. There are plenty of potential benefits there in improving our environment, restoring our natural history and making sure that we stop these declines.

Of course, we have also talked about ecosystem services. I will not go into detail at the moment but these things affect pollination, soil and water, and you should know that the declines they are talking about are not just pollinators, which we know a bit about—we have heard about the bees—but also a massive decline in fresh water life, massive declines in dung beetles and all sorts of things like that.

The nature of the decline is really important to consider. For instance, for bumblebees we know there are several factors, pesticides but also climate change. In the northern hemisphere there is clear evidence of the southern parts of the ranges of the bumblebee shifting north but the northern edges of their ranges are not moving. They are getting compressed, and of course if thousands of species are all doing that what you end up with is species going extinct over large parts of their range. Global climate change is definitely an issue in the Northern Hemisphere as well. Although there are some winners there are also clear losers and I suspect there will be more losers than winners in the long term.

Q198 **Chair:** Are the locusts and the cockroaches the winners?

Matt Shardlow: Temporarily, maybe. Locusts do very well sometimes, do they not? I do not think they are all going to go extinct. We are not going to end up with nothing. I will come back to that.

Q199 **Mr Robert Goodwill:** If I can just interject on bumblebees, on my farm the biggest problem is that the badgers seem to be digging out all the bumblebee nests. We have probably 10 times as many badgers as we have ever had. You protect one species but then another one, such as badgers and hedgehogs, can become predatory.

Matt Shardlow: Fortunately, badgers tend to attack the bees' nests at the end of the season, after the queens and the males have been produced. The impact of predation at that level has been shown not to be a significant factor on bumblebees. It is much more the health of the wider countryside and the fact that we have fragmented their habitats, where there is flower-rich grassland left, into small blocks so they are not able to move.

This is something that we have not really come to grips with, the dispersal of species in response to climate change. We have assumed that they will just move around but sometimes we have been looking at



birds, butterflies and dragonflies, things with big wings that are highly mobile. Sometimes the smaller things we have overlooked. Climate change represents a really big risk for those and it is one of the key reasons why we are seeing these big declines.

Insect decline is a multifactorial issue, but it is a threat as well. If we lose our insects, we then start to lose our ecosystem services. We have heard about pollination, water management, soil and so on. The fact that we are seeing an eight times faster decline in insect populations as we are in invertebrates means that it is clear that they are in the front line of the extinction crisis that we are suffering at the moment.

We must remember that those are indicators—canaries in the mine, if you like—but human beings are just another species out on that battlefield. While the insects are on the front line, we can see what is going on and we understand what is happening with the biodiversity and the extinctions we are seeing.

The difference is that your average moth cannot predict that its habitat is going to be too dry because of climate change and it cannot respond to that. The little bumblebee flying around does not know the farmer is about to spray his crops with insecticide and he gets affected by that. They cannot see their extinction coming, invertebrates. The difference with humans is we can see what is happening out there, we can see what is going on. Extinction approaches on silent wings for the little thing. We can see what is going on. The question is: how do we respond to that?

We have heard Georgina talking earlier about the potential for some technical fixes, long-term hypotheticals, “Maybe we can find ways around the problem of destroying the environment”. Personally I think it is folly to go down that route. We have something that is delivering for free at the moment and we should do everything we can to make sure we look after that. I think that will turn out to be vastly more cost-effective.

We need to look at halting climate change, making sure that the landscape can adapt so that habitats are more connected together, creating space for nature, giving consideration to Edward O Wilson’s call for 50% for nature and 50% for us, the idea that for a healthy planet you have to create space for other species to live. Otherwise you are not going to cohabit very long.

Q200 Zac Goldsmith: I was going to look at the reports that we have been reading over the last couple of days about this apocalyptic decline in entomofauna. Is that the correct term, entomofauna? I am not 100% sure. It is a new term to me. You have addressed the question I was going to ask, which was your take on those reports, but can I ask you to try to help us understand what the implications are beyond the decline itself? In other words, could this catastrophic decline, as *The Guardian* suggests in its reporting of the study, itself lead to a catastrophic decline in ecosystems and therefore ultimately in human populations? Is this the canary in the mine?



HOUSE OF COMMONS

Matt Shardlow: I think it is. Invertebrates appear to be the soft underbelly of biodiversity. It is 70% of species and so much of them are in decline at the moment. The implications in the long term if we lose all of those species is an incredibly depauperate planet that is not robust to change. If we look back in time, for instance, we were growing different crops in this country even 40 years ago, let alone 100 years ago. In 100 or 150 years, we are going to have to grow different crops. We are going to need all of those species at some time to help us out. The robustness and the way those ecosystems function effectively is going to be incredibly impacted if we lose those.

Q201 **Zac Goldsmith:** Common sense would tell us that it is pretty bad news, what is happening, and that it is likely to have all kinds of unforeseen consequences, but how good is the science on this? How well can we map out what the implications might be?

Matt Shardlow: We are not there yet. I was going to talk a little more about science later potentially, about how science is a way of increasing knowledge and engaging the public. When you get to a certain level of awareness, which I think we have now, about insect declines, new knowledge is a really good way of increasing awareness and getting more momentum going.

There are lots of things that we do not understand at all. We did a bit of work with Eclipse, which is an EU-funded science mechanism, last year looking at electromagnetic radiation. Electromagnetic radiation covers a whole range of things from mobile phones to radar. There is hardly any science done on the impacts of that on wildlife. It is clear that there are effects. Invertebrates are sensitive to electromagnetic radiation. When it has been studied they have found effects and interactions between the two, but whether it is a driver, whether electromagnetic radiation is causing declines in insects, we do not know. We should start looking at those issues.

Q202 **Zac Goldsmith:** That is a main concern. In your preamble—I am sure I will miss things out—you talked about climate change as a cause and therefore a target if we are going to get serious about solving the problem, you talked about creating more space for ecosystems and for nature—the implication being that we need to create more space and protect more space—and you talked about pesticides, chemicals.

Then you hear reports of catastrophic declines in insect numbers in relatively stable, pristine, healthy forests in Germany, forests that have been managed the same way for many generations and suddenly have this collapse. There may be a climate change link but I suspect at this stage there probably is not, it is unlikely to be chemicals and it is not space for nature, so it must therefore be something else. It just seems to expose our ignorance on this issue, which is hugely worrying.

Matt Shardlow: Yes. I have a theory myself, which I will share with you, but absolutely we do not know the absolute answers for those declines or



similarly the declines we have seen in Puerto Rico in rainforests on a mountain. It is very difficult to fully explain those. In Germany, what they are looking at is nature reserves and a long-term decline, a 76% decline in abundance of flying things on those nature reserves over a long period of time.

My theory is that this is linked with climate change and dispersal again because if you reduce the size of your bit of land—there is a great deal of English research on this looking at the swallowtail butterfly, which found that as the fenland habitats decreased in size slowly the swallowtail went extinct, but before it went extinct it shrunk because there was no point flying away from where you were because you would die. Evolution drives fragmented habitats to become less good at dispersal because if you disperse you end up somewhere where your genes do not go into the next generation.

I think in Germany one of the things we are seeing there is what is called an extinction overhang. We have created these little fragments that are not really big enough to support the species that we want to see continue in those areas. Over a period of time they just pop their clogs and they do not come back again. That is the thing. It is not that they are lost, it is that they are not coming back again.

Also, we need to think about the fact that it was biomass flying that they were measuring. With the 76% decline in biomass that they are measuring, if they are 50% less likely to fly that is only a 35% decline in abundance. There are some interesting things from that German study. Similarly the Puerto Rican study, where they point the finger very much at climate change because they do not have intensive agriculture nearby.

Q203 Zac Goldsmith: This is the last point from me. For the megafauna, the thing that is catching on is the idea of corridors linking up the great parks and trying to create livelihoods for people who live in those corridors to remove that conflict between people and nature. That is true in southern African countries, it is true of India and it is true in Ukraine. There are some really interesting things that are happening. Would you say that is also true then for the entomofauna?

Matt Shardlow: Absolutely.

Q204 Zac Goldsmith: Corridors?

Matt Shardlow: We have to think about connectivity. We have to redesign our landscape so that species can move through them again. BugLife recently received £60,000 worth of funding from Defra to complete a national map of bee lines. This is an opportunity map looking at where the remaining insect-rich resources of wildflowers and bees are and looking at how we can join those together thorough the countryside.

We need agri-environment schemes to kick in to secure that long-term so that we start to restore some of that mixed farming, some of that



HOUSE OF COMMONS

wildflower habitat back into the countryside to join them back together so that we undo that fragmentation of the past. It is not just big stuff.

We should be looking at things such as road bridges. They do this all over Europe. I have no idea why the UK is suddenly a country that does not look after its wildlife. In Europe, they will put bridges over new roads. We are not even having that conversation. HS2—why is that not getting covered over so that species can move from one bit of habitat to another? We need to think much more about how things connect together. We are talking a lot about systems and how interconnected everything is, and it really is. We have to think not just about what the cost is to this one Department or this one agency but what the benefits are to society long-term by investing in these various measures to make the countryside more robust and help stop the big declines that we are seeing.

Zac Goldsmith: Thank you very much.

Q205 **Geraint Davies:** We have heard quite a lot about environmental Armageddon. That being said, a lot of the public are distracted by other issues. It might be Brexit, it might be football.

Chair: Rugby!

Geraint Davies: Unfortunately, yes. Can I just ask what your organisations are doing to engage the public, in particular in relation to climate change, the environment and human health, whether you are doing enough or what more you could do?

Dr Horton: Yes. We are a medical journal and we are published every week. We have, in the last 10 years, produced two commissions on health and climate change trying to bring all the knowledge together to bear on these issues, including the Commission on Planetary Health, which kind of invented the notion of planetary health.

Then after those three pieces of work, we have now—and this is funded by Howie Frumkin, who I know came and gave evidence from Wellcome—an accountability mechanism that is monitoring, on an annual basis, progress towards a series of 40-odd targets on climate and health. The purpose of that accountability mechanism, which was done by academics around the country—we have a big launch every year—is to keep this issue in the public domain as a research-led exercise, again trying to bring the best knowledge to bear on the public debate. That is the part that we are playing, strengthening the accountability, convening scientists together, making sure we have annual updates on the science and trying to reach out and communicate as best we can with the public. I am sure we could do more.

Q206 **Geraint Davies:** Does the media cover what you do?

Dr Horton: It does. If I take the two commissions we published in January this year, one of them you have heard about, the EAT-Lancet Commission, which recommended what was called a planetary health



HOUSE OF COMMONS

diet—more fruit and vegetables, less animal protein, more plant-based protein—and connected that diet on your plate with six Earth systems that are under threat. That got massive global coverage. The team that produced that report are launching it in 40 different countries.

A week ago we launched the second report on nutrition, on the global syndemic of undernutrition, obesity and climate change. We launched that in Thailand. That similarly got enormous coverage. We are doing the very best we can to leverage the science in the public domain by working with organisations such as the Science Media Centre and journalists who we know have a strong interest in climate and global health and development issues.

Sonia Roschnik: Across the health sector, obviously we should be in contact with the public all the time. We know from some Ipsos MORI surveys recently that 92% of the public believe this is really important for the health sector to address and 98% of our staff think it is really important.

I see it as one of the ways of engaging with our communities and doing our piece for the environment and for communities. The NHS has been recognised as doing a lot by other countries. We have reduced our absolute carbon footprint significantly. It covers a lot of different areas and we are attacking it by looking at different hotspots. That means engaging with the public, patients, GPs and a lot of our different communities in order to do so.

A lot of the NHS organisations are engaging naturally with their membership through foundation trusts and also through their communities to help raise awareness and there are a number of NHS organisations that have done fantastic things. Bart's painted their CHP plant pink as a means of raising awareness and money for cancer. The guys at St Tommy's have made theirs visible through open glass doors so that people walking along the street can see it. We have a role to make this visible as well.

Matt Shardlow: One thing we are really pleased with is the public's awareness of bees and pollinators because that has really gone up in the last 10 or 20 years. I could not tell you all of the reasons why. I know that we at BugLife have been quite active on this, and Butterfly Conservation and the Bumblebee Conservation Trust as well. There have been organisations out there that are putting together information and making that public. We have seen that 75% of the public saying that pollination risk is something they are really concerned about as an environmental thing. That is really great.

There are other areas like, for instance, fresh water, where there is a lot lower level of awareness. Out of sight, out of mind. If it is under the water, unless you happen to be a fly fisherman going out there trying to catch a trout, you may not be paying so much attention to what is going on with the insect life.



HOUSE OF COMMONS

What can we do about this? We have had a big £1 million Biffa-funded landfill tax project called Urban Buzz across eight cities in the UK—a few more, actually—that has been working with literally thousands of people. Eight hundred sites we have created and managed for pollinators. That is getting people directly engaged with what they can do in their local community for the pollinators and for the wildlife. That is one thing we can do, directly engage people.

Monitoring is also important. Defra have a pollinator-monitoring scheme. It is one of the things we have got out of that 75% of the public being very concerned about pollinator abundance. There is now a pollinator-monitoring scheme. There is only funding for a short period of time. We are hoping that we can persuade Defra to extend the period of monitoring because it is very important. Now, some of that is technical and scientific but some of that is also public engagement. There is a thing called the POMS, which is the Pollinator Managing Strategy, with an outside component where you can get the public involved to go out and monitor stuff themselves, looking at what is flying around and monitoring the bees and other pollinators.

We have also done lots of work with anglers, getting them out looking at what is in their rivers and starting to look at river health. There have been at least three successful prosecutions for pollution as a result of data gathered by volunteers going out and looking at the health of their rivers. Engaging people with monitoring, understanding and developing their knowledge is a great way to get more and more people engaged and understanding some of the detail of these things, the people who are going to push for future action in terms of fixing the declines in biodiversity.

Q207 Geraint Davies: Can I ask just very briefly how well you think the Government is doing in raising concerns about the threats to human and environmental health from environmental change? I guess the average person seems to switch the TV on or whatever and all they get is Brexit as opposed to, "This is an environmental imperative. We need to act. This is what you need to do. This is what we are doing. This is what you need to pay", or whatever. What do you feel? Do you think the Government is doing enough?

Dr Horton: Speaking on the side that I know best, on health, I am very disappointed by the response of both the Department and indeed the health professions to these issues. I do not think we have seen strong leadership. I do not think we have seen strong leadership from Public Health England, from the Chief Medical Officer, from NHS England or from the Department overall. There is an opportunity to lead, to advocate, to educate and to co-ordinate across Departments.

This is partly embedded in the cultures. If I take Public health England, when you walk into Public Health England in Wellington House just near Waterloo Station they have a big celebration of 100 years of public health in the UK.



HOUSE OF COMMONS

One of the statements it says there is, "For 100 years we have been working hard to achieve our goal", and 'our goal' as they define it is, "To change our lifestyles". If we think that the whole of public health is going to be determined just by our lifestyles, if everything boils down to smoking, alcohol, diet and so on, as important as those are, we will miss the much bigger determinants of human health, whether they be political, economic, environmental or whatever. Public Health England does not own these broader determinants of health and that is a catastrophic failure in our health system.

Q208 **Chair:** How would you like to respond to that, Ms Roschnik? You are in charge of the Sustainable Development part of the NHS.

Sonia Roschnik: I would say that we have a cross-system group with all the arm's-length bodies and that we are taking our responsibilities in that respect seriously. Some of that has translated into the long-term plan, where for the first time we have said that we are committing to meet our responsibilities under the Climate Change Act. We are also going to be ahead of a 25-year environmental plan for air pollution and start moving our fleet to low-emission vehicles.

Q209 **Chair:** What is taking so long on that? Government is the biggest provider of goods and services in the country. We talked about electric vehicles in 2016 in this Committee. It is amazing that you have healthcare professionals going out into the community in polluting vehicles treating the sick. Is there not something absolutely absurd about that?

Sonia Roschnik: Our priority is treating the sick first, certainly in the NHS, and we need to do that as well as we can.

Q210 **Chair:** So you just buy cheap fleet vehicles because it is easier and cheaper?

Sonia Roschnik: No, that is not what I am saying. I am saying that we are now looking very seriously at how we can change the entire fleet over and we are going to try to do that ahead of what the Government targets are suggesting. That is what is committed in the long-term plan.

Q211 **Chair:** The Government targets suggest that we should be on a cost-effective path and we should have 9% electric vehicles. What is the percentage of electric vehicles by 2020 in the NHS?

Sonia Roschnik: The way we are saying is that we want 90% of the vehicles to be low-emission vehicles—

Q212 **Chair:** By 2028?

Sonia Roschnik: Yes, and 25% will be ultra-low-emission vehicles.

Q213 **Chair:** By 2028?

Sonia Roschnik: Yes.



Q214 **Chair:** What is the current number?

Sonia Roschnik: The current number right now is what we are working through. I do not know how many are electric. We are making a difference between electric vehicles and low-emission vehicles because it is a trajectory that we need to be working on.

Q215 **Chair:** You do not even know your baseline measurements?

Sonia Roschnik: I am sure I can come back to you with them. We have them in the planning that we are doing for the long-term plan because we have worked through all the numbers.

Q216 **Chair:** Okay. If you have those numbers, we would be keen to see them. Again, we are hearing from the medics about air pollution but it is, "Do not do as I do, do as I say". That is very strongly coming across in your evidence here today.

Sonia Roschnik: I am sorry if that is the way you see it.

Q217 **Chair:** A £110 billion system that cannot get to grips with this issue.

Sonia Roschnik: The NHS is getting to grips with this issue, and we have committed for the first time—integral to our strategic plan, a 10-year plan—that we will be doing these things. We have the numbers. We know, for instance, that only 0.3% of parking spaces have access to EV charging points and we are committed to changing that significantly. We are working up the plans. It is going to come out in the implementation framework during the course of this year. All I can assure you is that we are working in order to do that.

The Sustainable Development Unit has spent a lot of time on this. We have published a Carbon Reduction Strategy and then a Sustainable Development Strategy. The big step forward that we have taken with the long-term plan is that this is integral to the NHS's core plans. It recognises the inhalers issue, it recognises that we have a huge commitment to make, that we can reduce anaesthetic gases, and that is what we are committing to do. That is ahead of a lot of other health sector organisations around the world.

Q218 **Chair:** Okay, we are better than other people around the world, but are you going to meet your carbon targets for 2020?

Sonia Roschnik: We will meet the carbon targets for 2020 based on buildings but our aspiration is to also meet as much as we can around travel and procurement, because the biggest part of our carbon footprint is in the things that we buy. We feel that we need to go beyond just the buildings. We have a lot of buildings and we have a huge programme of work to make sure that we meet our target on the buildings. We are committed to do that.

Q219 **Mr Robert Goodwill:** I think we have already discussed how almost all environments and habitats in this country are managed by man, whether



HOUSE OF COMMONS

it be farmers or, on the uplands, the heather moorland would not be the way it is if it were not being constantly managed. We talked about international comparisons but maybe starting with Mr Shardlow, how does the UK compare on an international league table in terms of the work we are doing? What have been the successes or maybe failures that you would identify?

Matt Shardlow: If I may, I would just say something very briefly about education, which was the previous point. I am not sure Defra is really in the business of educating the public about biodiversity declines. They have done bits and pieces around invasive species, which is quite good. There have been some changes recently with the management of Natural England. Hopefully, they will start talking again and engaging with the public more about biodiversity decline but I do not think they are really there.

One point I would just make is that I would rather the UK Government occasionally did frame things in terms of the UN SDGs, the Sustainable Development Goals. They are very quiet. It would be great if the public were a bit more involved with that and one way that would be easy for Government to do that is to talk about things and refer back to the Sustainable Development Goals so that people can see our role.

Q220 **Chair:** We have a voluntary national review this year that nobody seems to be talking about or engaged in at all. We have been very critical on that. On Natural England, do you think that it has been effectively neutered and absorbed into Defra and what are your hopes for the new Chair?

Matt Shardlow: It was very much told it could not campaign and it could not speak out about things, so that has definitely been the case. It has suffered 40% or so cuts. It is in a very bad place. That is on the record. Hopefully that can be turned around. Certainly the proposed Chair and the Interim Chief Executive would carry much more confidence in terms of their knowledge and experience on biodiversity issues. There is hope there.

How do we compare? There is a ranking of how altered our environment is. This is part of the State of Nature report that was produced by the NGOs a few years ago. I cannot remember the exact figure—you can find it in the State of Nature report—but we come up very high, basically, in terms of having an environment that has been heavily conditioned and manipulated by humans. We have a relatively small area that we would say were natural wildlife areas and nothing that you would call a proper wilderness at all. In that context we have a highly modified and highly manipulated environment. In terms of pesticide use, again we come out high compared with a lot of other countries and that has impacts as well. Those are the downsides.

We have a fantastic natural history heritage in this country of people who are interested and engaged with wildlife and we do not make enough of



that, I do not think. We do not engage those people adequately with civil society through to Government to get full power. One of the things we really want to see is proper partnership from Defra going forward. I think the health people do this better than we do. Across the various sectors within the health sector, there is much better cross-working. They are laughing. The grass is always greener. Trust me on this. They do better work at engaging cross-sector, whereas—

- Q221 **Mr Robert Goodwill:** There are organisations such as the RSPB and the Wildlife Trusts. It has 2 million members, the RSPB. They probably feel that they are better placed to speak up for their section of wildlife, maybe, or is it maybe not joined up because it is specifically birds or—certainly invertebrates have not as many champions as foxes and polecats or whatever.

Matt Shardlow: Yes, I think that is all true.

- Q222 **Mr Robert Goodwill:** What are the major failures, would you say? You say we are doing internationally reasonably well.

Matt Shardlow: We have underinvested. Despite all the knowledge and information we have, we have not used them to reverse the declines we have seen. We have spent a lot of time and effort looking at three neonicotinoid chemicals and taking 10 years to get them taken off the use books. That is not an effective use of our time. We should be much quicker and able to use knowledge to get in and make environmental change quickly. That is something we could definitely improve on going forward.

- Q223 **Mr Robert Goodwill:** Do the other two witnesses want to comment on that?

Dr Horton: I could add health and where we sit internationally because I was just looking it up. It is a paper we published late last year. For the health-related Sustainable Development Goals, there is an annual index again and the UK does pretty well. The top five countries in terms of progress on the health-related SDGs for 2030 are Singapore, Norway, Sweden, Israel and the UK comes in at five.

The areas where we are relatively weak are, not surprisingly, childhood overweight; HIV incidence, interestingly; alcohol use we are very bad at; on suicide mortality we are relatively not in a good place; adolescent birth rates; and smoking prevalence. Those are the main areas of weakness in relation to the SDGs, but we are in the top five out of 190-odd countries, so that is a pretty impressive performance.

- Q224 **Chair:** What about childhood mortality? When the ONS came in to see us on the SDGs they mentioned specifically the way we had fallen down in a European table on childhood mortality.

Dr Horton: You are absolutely right. That does not show here because it is a global table but in terms of child mortality we are one of the worst



performing countries in Europe. Child health in this country is one of the biggest neglected priorities that we should be paying attention to. It is a huge problem.

Q225 **Chair:** What is your analysis of that?

Dr Horton: My analysis of that unfortunately is that the system we have of general practice and secondary care is a broken system. We have GPs who are doing their very best to work in the community but most GPs do not have specialist training in child health and the result of that is you have children who present often with complex diseases and even straightforward conditions such as asthma that are misdiagnosed or not diagnosed, putting them at risk.

Unless we break this primary/secondary care system, it is a rigid system driven by professionally-driven boundaries that prevent creative solutions where you are getting specialists coming out of their hospital palaces, working in the community and GPs being open to the fact that they need to work with specialists because they do not have the necessary specialist knowledge. We need to completely redesign an archaic health system designed in the late 1940s for the 21st century. It does not work for child health and that is why we have some of the worst mortality.

Q226 **Mr Robert Goodwill:** We also have a situation of expert patients where if you are suffering from a condition you can probably become as knowledgeable about that condition, maybe not as your consultant but certainly more than your GP. Patients get frustrated when they go to see their GP and talk about alternative treatments that the GP is not even aware of so it is a new scenario with information being available as well.

Sonia Roschnik: The long-term plan does try to address a number of these things and I would comment to you that there is a huge investment in trying to move to a more digitalised approach that will also reduce air pollution and some of the other problems we have been talking about that is trying to shift and work much more collaboratively towards a better future.

I think it is commendable and the implementation framework will come out later this year and I hope we will start addressing those things because that is part of its aim. It has prevention at its core and with childhood mortality prevention as one of the key messages.

Dr Horton: I do not want to disagree but if you go to Public Health England and ask them what they think of their input into the long-term plan this is what they will say, and they said this directly face-to-face to me. I will not say who said it but somebody quite senior. Their great success was getting in two things; first, incentives for smoking cessation and secondly, on alcohol. That was the limit of their vision.

That is coming from Public Health England. They have had their funding cut. They feel they are so under pressure, that it is such a struggle to deliver services in the NHS that their vision is just on smoking and



HOUSE OF COMMONS

alcohol and we are talking about planetary health, we are talking about the environment and we are talking about these border determinants. They are nowhere and they will admit they are nowhere when you ask them about that. That limited vision is a huge constraint on the future of public health in our country. Until they lift their gaze and embrace that broader vision, we are nowhere.

Sonia Roschnik: They have had a great impact on air pollution in the long-term plan and I think it will be one of the five strands of their future strategy.

Q227 **Mr Robert Goodwill:** Can I drive us back to the farmed environment and certainly as a farmer myself I can remember 40 years ago being paid by the CAP to bulldoze hedges to make fields bigger and I am now being paid by the same European system to replant hedges. But obviously we will have more freedom outside the EU. We have the Agriculture Bill that is a framework there. Will the Agriculture Bill allow us to be more effective managers of our rural environment and will there be the incentives for farmers to continue to deliver what Government wants?

Matt Shardlow: I certainly hope so. The wording is there in the draft bill. Obviously it can be improved. There are bits we would like to see added to it but in fundamental principles the concept that we want to invest in public good and put the money into improving the environment, reversing some of those bad things that have happened in the past and also creating new assets and new resources for the public to engage with and to deliver that biodiversity is absolutely right.

On pesticides, I think it is a little bit more complex. We have talked about how some of these problems are difficult to fix at a national level. Pesticides are one because you are dealing with multinational industry. The United Nations Human Rights Council did a report on pesticides in 2017 that concluded the international trade in pesticides was a human rights abuse. This is because 25% of developing countries have no pesticide regulation whatsoever. We sell them the chemicals we ban here because they damage human health and the environment and they use them in those countries that have no regulations.

Q228 **Chair:** What are the worst ones?

Matt Shardlow: What are the worst ones in terms of the companies or in terms of the pesticides?

Chair: Let us have both.

Q229 **Mr Robert Goodwill:** Some of the insecticides used for malaria control in a country where people are dying you may put the risk to the ecosystem from that pesticide as being less maybe than in a country such as this where people are not dying.

Matt Shardlow: There is some of that but there is also just very unregulated use of pesticides without proper training, with agriculture



HOUSE OF COMMONS

taking off in parts of Africa, for instance, and not being followed up with regulation and proper controls. Then being sold chemicals that we no longer use because they are harmful to human health in ways that we would not allow them here.

The pesticide marketplace is broken and we need to look at how we get a marketplace, a system for pesticides that develops the sort of chemicals we want because the chemicals we want are exactly not what we are producing at the moment. We want chemicals that are highly specific, that you only have to use in small quantities that will not cause massive environmental impacts and will not be harmful to human health.

At the moment, we have a patent system that encourages companies to produce large amounts of chemicals very quickly and selling them to everyone to do everything. That is not the sort of pesticides we want. They are not targeted and are not environmentally friendly. Looking at and potentially joining with the United Nations Human Rights Committee and their call for a global convention on pesticides so we can start to get global control of this issue would be a very sensible move for the UK to take.

Q230 Mr Robert Goodwill: One way the UK is being held back is, say, in a crop such as sugar beet that is notoriously difficult to keep clean in terms of weed control. Other countries are using GM sugar beet that can be very easily and cheaply and sustainably, I would argue, have weeds controlled there. Do you think we can look at more GM alternatives to pesticides and herbicides as a way of reducing pesticide reliance or is GM something the Government would not want to get involved in?

Matt Shardlow: We should certainly look at those things. The jury is out in terms of whether the GMs that have been used to date have been effective in reducing pesticide use. We still hear the odd horror story of harm and loss of crops, for instance, from some of the GM use. Yes, we need to look at all the options out there but we should be careful not to hold up easy solutions and add the caveat that every GMO needs to be properly tested, assessed and appraised to make sure that GMO will not result in an increase in environmental harm or pesticide use that are also potential outcomes.

Q231 Mr Robert Goodwill: Are we sometimes in danger of the law of unintended consequences? For example, we banned neonicotinoid seed dressing for oilseed rape and then farmers such as myself find themselves using three or four sprays even during the autumn with cypermethrin that we know will kill bees because we cannot control the cabbage stem flea beetle that the seed dressing did effectively for that critical six or seven weeks at the start of growth.

Matt Shardlow: The worst time to spray crops for bees is springtime rather than autumn time and fortunately since banning neonicotinoids the use of springtime pyrethroids on oilseed rape crop has declined by 30%. The other thing to note is just before we banned neonicotinoids our



cabbage stem flea beetle population developed pyrethroid resistance so I suggest any farmers spraying their flea beetles four or five times and finding they are not dying is probably encountering pyrethroid resistance and pyrethroid resistance is one of the problems we must try to tackle. If we can reduce pesticide use, we reduce the risk of resistance and there are more tools available when they are really needed.

Q232 Caroline Lucas: There are two things for Matt Shardlow. One is on pesticides. I understand there is some kind of review it was hoped the Government would do in a public consultative way on pesticides as part of the EU directive on the sustainable use of pesticides and they have not done that. Do you know about that and have any comment?

Matt Shardlow: I am not particularly aware of that. That is a very interesting point. The sustainable use directive has not been adequately implemented in the UK. That is common across the EU unfortunately and the NGOs were not at all happy with the direction of travel. It was just not strong enough in terms of setting out a clear sustainable issue.

We talked a bit about governance earlier. I will just strike out with pesticides one really important governance issue about the principle that you have risk assessment and risk management. This is a principle we find throughout European structures. You have EFSA, an independent body in Italy who are doing risk assessment on pesticides that then goes over to the politics in Brussels.

In the UK we do not have division between risk assessment and risk management. It is not just pesticides. There are other areas we could look at. We were talking about how you hold people to account. When you hold people to account at the Audit Committee you need to know who is responsible for assessing this risk and who is responsible for dealing with this risk.

If you look at pesticides in the UK at the moment we have Defra, we have CRD, the Chemicals Regulations Directorate, we have HSC, the Health and Safety Executive and we have the Advisory Committee on Pesticides, a panel of scientist who do not have a very clear remit at all in the process. There is no clear division between those organisations in terms of who is assessing the risk and who is dealing with the risk.

I mentioned the Brexit word. As we look at Brexit and coming out, those are some of the structural issues we must contend with. You need to know where the science is happening and who is making the assessment that something needs to happen and then who has the job of resolving and dealing with that issue. Otherwise you have a responsibility issue.

Q233 Caroline Lucas: I put a PQ down to ask why the Government have not yet submitted their report to the Convention on Biological Diversity. It was due at the end of December and I received a rather fluffy answer saying we will try to do it sometime in the next quarter of this year. Have you heard what has caused the delay on that?



HOUSE OF COMMONS

Matt Shardlow: I have not heard about the cause of that. I am also concerned they may be slow on reporting on the article 17 reporting under the habitats directive. We must see how that is progressing as well. There seem to be some other things Government's minds at the moment, do there not?

Chair: Absolutely. We are conscious of the clock winding down. There are two very quick questions from Alex and then Matthew.

Q234 **Alex Sobel:** You touched on this, Richard, but what do you consider to be the key threats to health and healthcare from environmental change? What should the NHS be focussing on?

Dr Horton: The biggest threat to public health in terms of disease threats is non-communicable diseases and the drivers of non-communicable diseases. One of the most important environmental drivers of NCDs is clearly air pollution so paying more attention to air pollution should be a major priority.

With NCDs, this is where the complexity comes in. If I was sitting where you are sitting, I would want some fairly clear, simple, actionable, concrete things I could do. The problem with some of these issues is that the intersections are very complex.

Obesity is driving the NCD epidemic in this country and around the world. What are we doing to seriously address that? If you look at ischemic heart disease, the rates are going down. Stroke rates are going down. Liver disease and liver mortality are going up. Why are they going up? It is because they are being driven by obesity and alcohol use.

We do not have enough doctors in the NHS to address liver mortality. We do not have enough liver specialists. We do not have a public health strategy that is working on obesity. We do not have a public health strategy that is working on alcohol. Unless we address the health system components and the public health components together then many of these environmental-determined or influenced diseases we will not be able to contain or control.

Q235 **Alex Sobel:** There are obviously environmental factors in that around exercise and getting people out of their cars.

Dr Horton: Physical activity, indeed.

Q236 **Alex Sobel:** Should that not be top of the public health agenda? Diet, exercise, changing us from high levels of meat intake to plant-based diets?

Dr Horton: It should be and to be fair to Public Health England they have issued guidelines on diet that are quite challenging in terms of the type of diet we should be taking and the calories we should think about, the 400/600/600 recommendation.



HOUSE OF COMMONS

In terms of the vision across our health infrastructure just think about it. We have a dozen or so royal colleges. We have the British Medical Association. We have a CMO. We have Public Health England. Are they working together in a coordinated fashion? The answer is "no". The Chief Medical Officer does fantastic work but she is utterly disconnected from the work of Public Health England. Our colleges are utterly disconnected from public health. This is no way to run the health system.

Chair, you rightly said health people often say what Government are not doing wrong. It is right to say to these health bodies, "What are you doing?" We all have our voice but we fail to work together and that is what I think one of your recommendations might be. You should expect more from the health system.

Q237 **Alex Sobel:** We know what we need to do. We just need to ensure the medical community is working together to pursue that plan.

Dr Horton: All the health community; nurses, every part of the health community, because we are not currently doing so.

Q238 **Dr Matthew Offord:** We have already touched upon the effects that environmental concerns undermine the sustainability of the NHS. I was particularly thinking about the F-Gases report we produced. I want to ask the panel in what areas do you think environmental outcomes could be improved and would that mean compromising some of the work of the NHS and the practices, Ms Roschnik?

Sonia Roschnik: There are a number of areas and the long-term plan I keep going back to refers to them. We need to address our responsibilities under the Climate Change Act. We can do an awful lot on air pollution and air pollution is not just about the fleet. It is about encouraging active travel and alternative travel routes. There are some great examples where hospitals are working with local government and their communities to move bus stations so people can access their facilities by alternative means. I would agree with Richard that we need to have a holistic, systems-orientated approach and that is what we are trying to do.

Going back to the sustainable development goals, Public Health England has a structure around sustainable development goals and producing a report as to how we can contribute to that. In terms of use of resources, the way we use water, all the resources we use, how we manage waste, all those are included in the long-term plan and I think we can do a lot to help contribute to that. We are also committed to reducing our use of single-use plastics. Those are four big areas and if we do them well it will contribute to preventing ill health in others.

Q239 **Dr Matthew Offord:** That is quite an aerial view, though, of the NHS. What about something specific? What could the Government do?

Dr Horton: I do not want to interrupt, sorry. I was going to say one particular group that we have learned in the last decade has become so



HOUSE OF COMMONS

important for determining the trajectory of health is the adolescent age group, the age of 10 to 24. They are the future of our country. They are the next generation. They will be the most economically productive. If we do not get their health right from that early age of 10 onwards then that is what determines the risk factors for all disease.

Adolescent health as a specialty within is absolutely crucial to determining the next 30 or 40 years for the UK. When I talk about adolescent health I am not only talking about the health system. Again this is where the silos do not work. You cannot deliver adolescent health unless you think about the education system in combination with the health system. If you think of those two systems interlocking, focussing on the young person, that is something tangible. Greater attention, greater investment, services for young people and the benefit will come in two generations and be fantastic.

Chair: On that optimistic note, we will have to leave it there—we have nine minutes to run across to the Palace. Thank you all very much indeed for coming. It has been an absolutely fascinating morning and lots of food for thought for all of us.