



House of Commons  
Science and Technology  
Committee

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**Water quality: priority  
substances**

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**First Report of Session 2013–14**

***Volume II***

*Oral and written evidence*

*Additional written evidence is contained in  
Volume III, available on the Committee website  
at [www.parliament.uk/science](http://www.parliament.uk/science)*

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## Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science and associated public bodies.

### Current membership

Andrew Miller (*Labour, Ellesmere Port and Neston*) (*Chair*)  
Jim Dowd (*Labour, Lewisham West and Penge*)  
Stephen Metcalfe (*Conservative, South Basildon and East Thurrock*)  
David Morris (*Conservative, Morecambe and Lunesdale*)  
Stephen Mosley (*Conservative, City of Chester*)  
Pamela Nash (*Labour, Airdrie and Shotts*)  
Sarah Newton (*Conservative, Truro and Falmouth*)  
Graham Stringer (*Labour, Blackley and Broughton*)  
David Tredinnick (*Conservative, Bosworth*)  
Hywel Williams (*Plaid Cymru, Arfon*)  
Roger Williams (*Liberal Democrat, Brecon and Radnorshire*)

The following members were also members of the committee during the parliament:

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Caroline Dinenage (*Conservative, Gosport*)  
Gareth Johnson (*Conservative, Dartford*)  
Gregg McClymont (*Labour, Cumbernauld, Kilsyth and Kirkintilloch East*)  
Stephen McPartland (*Conservative, Stevenage*)  
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### Powers

The Committee is one of the departmental Select Committees, the powers of which are set out in House of Commons Standing Orders, principally in SO No.152. These are available on the Internet via [www.parliament.uk](http://www.parliament.uk)

### Publications

The Reports and evidence of the Committee are published by The Stationery Office by Order of the House. All publications of the Committee (including press notices) are on the Internet at <http://www.parliament.uk/science>. A list of reports from the Committee in this Parliament is included at the back of this volume.

The Reports of the Committee, the formal minutes relating to that report, oral evidence taken and some or all written evidence are available in printed volume(s). Additional written evidence may be published on the internet only.

### Committee staff

The current staff of the Committee are: Dr Stephen McGinness (Clerk); Jessica Montgomery (Second Clerk); Xameerah Malik (Senior Committee Specialist); Victoria Charlton (Committee Specialist); Darren Hackett (Senior Committee Assistant); Julie Storey (Committee Assistant); Henry Ayi-Hyde (Committee Office Assistant); and Nick Davies (Media Officer).

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# Oral evidence

## Taken before the Science and Technology Committee on Wednesday 27 February 2013

Members present:

Andrew Miller (Chair)

Stephen Metcalfe  
David Morris  
Stephen Mosley

Graham Stringer  
David Tredinnick  
Roger Williams

### Examination of Witnesses

*Witnesses:* **Richard Aylard CVO**, External Affairs and Sustainability Director, Thames Water, **Marco Lattughi**, Senior Operations Manager, RPS Group, on behalf of the Environmental Industries Commission, and **Mike Murray**, Technical Affairs Manager, Association of the British Pharmaceutical Industry, gave evidence.

**Q1 Chair:** Good morning, gentlemen. Thank you very much for coming in. This is the beginning of a new inquiry for us. There has been a fair amount of press comment recently and a number of statements from companies about different aspects of water quality. Certainly we, as constituency Members of Parliament, do from time to time have issues raised with us from the public. So we thought it was an appropriate area for us to examine, particularly in terms of what is happening at an EU level as well. For the record, I would be grateful if the three of you would introduce yourselves.

**Richard Aylard:** I am Richard Aylard. I am the external affairs and sustainability director at Thames Water.

**Marco Lattughi:** I am Marco Lattughi. I am the senior operations manager for RPS, acting on behalf of the Environmental Industries Commission.

**Mike Murray:** I am Mike Murray. I am technical affairs manager for the Association of the British Pharmaceutical Industry.

**Q2 Chair:** Thank you very much. First of all, should the 15 chemicals proposed by the Commission be added to the priority substances list? Who should pay for controlling these chemicals?

**Richard Aylard:** Shall I start? We would say that they should not be added to the list—at least not yet. The reasons for that are, first of all, that the evidence for this is weak. Secondly, the costs of dealing with these substances to the levels suggested would be enormous, and I don't use that word lightly. We are running into many billions of pounds for customers. Thirdly, the carbon costs have not been factored into the equation. If we apply the additional treatment that is being talked about, then we are going to be emitting an awful lot more carbon in treating waste water. Certainly we would not want to see these substances listed yet. There is clearly a case for more research, but the evidence does not support it at the moment.

As for who should pay, in this country, as the Committee will know, all water and wastewater expenditure is paid for by customers, provided it is efficiently incurred on their behalf by water companies. Ofwat are the guardians of whether we are doing our job efficiently or not. If these substances

had to be controlled, it would then become a legal requirement on us. That would then be funded, to the extent that we needed to do it, by the regulator, and that would be reflected in customers' bills, which could go up by as much as £100 a year. Again, I don't use that figure lightly and am very happy to provide a written explanation of how that calculation has been arrived at. We would be talking about applying the same sorts of treatment that we currently use for drinking water to be applied to our sewage effluent going back into rivers. In Thames Water alone, we treat 4.5 billion litres of waste water every day, so you would be talking about treating that volume to near drinking water standards to put it back in the environment. There may be an environmental benefit that justifies that—we haven't seen it yet—but what it will not do is change drinking water quality because drinking water is already treated to a very high standard.

**Q3 Chair:** Do you also concur with that?

**Marco Lattughi:** Yes and no. At the minute it is good to look at other substances that are present. From a European level it is a welcome addition in looking at new substances. The lack of evidence at the minute to warrant their inclusion is pretty low. We need more studies and investigation into understanding whether they are effectively toxic at these levels. The main issue we have as an industry is that the levels at which we have to monitor these substances are so low that there is no technology available to monitor the levels in the water system. So we would be spending a lot of money treating something that we cannot actually measure. What we propose is more funded studies into the toxicology of these chemicals at these low doses prior to an inclusion in the scope for treatment, because the costs of treatment could exceed £27 billion and above alone.

**Mike Murray:** Certainly in relation to the three pharmaceuticals, we would agree that they should not be included in the proposed list of priority substances. We are not aware of any evidence of any population effect in the environment that is attributable to the very low levels of pharmaceutical residues that are found in the aquatic environment due to the use of medicinal products.

In relation to drinking water there are a number of published reports, including those from the Drinking Water Inspectorate in England and Wales and, more recently, the World Health Organisation, which have all come to the same or essentially the same conclusion, that, at the very low levels at which pharmaceutical residues are found in drinking water, it is extremely unlikely that they would have any significant adverse effect on human health.

**Q4 Chair:** You are saying essentially—correct me if I am wrong—that the Commission’s proposals are not evidence-based. Is that right?

**Marco Lattughi:** Yes.

**Q5 Chair:** Should they not take a precautionary approach with something as important as drinking water?

**Richard Aylard:** We are not, with respect, talking about drinking water. We are talking about what goes into the environment. What we take from the environment is already treated to exceptionally high standards in this country, overseen by the Drinking Water Inspectorate. There are no concerns about human health.

**Q6 Chair:** Okay. What about the broader aquatic environment then?

**Richard Aylard:** As to the broader aquatic environment, I absolutely understand the precautionary approach, but, if it is then going to be turned into regulation, it needs to be done in a proportionate way. That is where we need to look very carefully at the cost and the benefit. We are talking about very significant costs to water customers over a sustained period. We think there should be more evidence that there is a real problem and then we can decide what we need to do to tackle it. At the moment we are talking about very high levels of expenditure. Our customers—your constituents—can only cope with paying for a certain amount of things in their water bills. We are suggesting at the moment that we want to do more to reduce things like sewer flooding of people’s homes and combined sewer overflow discharges to rivers. We cannot spend their money more than once. If we are going to spend a huge amount of money on dealing with this problem, it is potentially going to drive out investment on problems that are of a much higher and more obvious concern to constituents, as I say, such as sewer flooding and combined sewer overflow discharges of raw sewage to rivers, which are happening still far too often in this country and require additional expenditure. So it is a question of being proportionate and getting the priorities sorted out. At the moment, we do not think there is anything like enough evidence to show that this is a priority for spending customers’ money, particularly in the current economic climate.

**Marco Lattughi:** I agree with your points. There has to be proportionate spending in terms of putting in treatment technology that would remove a very small amount of these contaminants—if at all in certain cases—to give a benefit to the public. We need to think, maybe, about what the pathways are of these chemicals entering the actual water treatment works

and what their toxicological effects are. At the minute these EQSs that have been derived—these limits that we need to monitor to—have been derived from very conservative safety factors and a lot of the time are not coming from true tox data. So they are just applying a factor of a thousand, times’ing it by a thousand and coming out with a magical number that is really not achievable.

**Mike Murray:** We would concur with those opinions as well. We believe that the precautionary principles should only be used with great caution, particularly when there are significant potential societal impacts from its application—and, in particular, in this case, in relation to the pharmaceutical compounds and their proposed control, the costs and potential societal impacts that this may have.

**Q7 Roger Williams:** As far as monitoring potential priority substances is concerned, at the moment this is done by a watch-list approach. What are the strengths and weaknesses of that approach?

**Mike Murray:** In terms of the watch list, that is a part of the proposal that has come forward from the Commission in the proposed amendment to the Water Framework Directive. In our view, it may have some merit because it would give you the opportunity to take a much more balanced approach to monitoring. As has been said by my colleague, for the two pharmaceutical substances and ethinyloestradiol in particular, there are issues about monitoring and being able to monitor accurately, and, also, because the proposed EQS is so low, it is way below the actual limits of detection at the moment. So there are issues around the validity of the data that the Commission has on monitoring at the moment; by its own admission, those are quite incomplete. There are only three member states, I think, that have reported on ethinyloestradiol and two on oestradiol, and they themselves are of limited value because of the limit of detection issue. We believe the watch list would give an opportunity, as I say, for a more considered approach to monitoring and also give much more robust data, potentially, on the true occurrence of these compounds in the environment. I have to say that we do not actually know the details of the proposed mechanism for using the watch list or setting it up, how compounds would go on the watch list, and, equally importantly, how they may be taken off the watch list if monitoring shows up that they do not warrant any further attention. Also, there are issues around the analytical activities in terms of sampling, the reproducibility of analytical methods and so on, which would have to be looked at before one could come to a definitive opinion on the value or otherwise of that watch list.

**Q8 Roger Williams:** Would anyone like to add anything? Are there any other better ways of achieving this?

**Marco Lattughi:** The watch list is a good idea. We need to understand how, as my colleague said, to include or dis-include substances from the watch list and who is going to police it and monitor the effectiveness of the research.

**Richard Aylard:** We are very happy with the watch list in principle. It does make sense, provided we have a very clear process, an understanding of how exactly it is going to work and what is going to be looked at, by whom, over what period, and then what happens afterwards. Provided all that is spelled out, then, yes, of course, a watch list is a very sensible step to take—to be looking at substances that are of potential concern and establishing just how big the concern is, what can be done about it, what the levels should be and what further work might be required.

**Q9 Roger Williams:** Richard and Marco, in your written evidence you say that some chemicals are being monitored or regulated below a level at which they can be detected. Can you give us some examples of that?

**Marco Lattughi:** Yes. We have been undertaking quite a bit of work on behalf of the water companies looking at the chemicals investigation programme currently. To take an example, if we look at brominated fire retardants, we are probably hitting a detection limit of 0.0005 micrograms per litre. The proposed change to some of these similar compounds is now 4.99 times 10 to the minus 8, which takes us into 10,000 times below that level. The worry from my point of view is that, if we are struggling to see the current level, how we are going to reach those detection limits.

**Q10 Roger Williams:** Could you use more concentrated samples, though, for instance?

**Marco Lattughi:** Because we are looking at waste water in the treatment processes, there is a lot of background from dirt and matrix there, so by concentrating the substances we are concentrating the matrix already. So we do not gain much by concentration factors. There is a lot of clean-up involved.

**Richard Aylard:** I would agree with Marco. It is his members who do this work on our behalf, so I defer to his expertise.

**Q11 Roger Williams:** On the general point, I am told by some people I meet in the agrochemical industry, for instance, that the number of compounds they can take forward is very limited because they have to demonstrate that they have below a certain amount in an Olympic-sized swimming pool, for instance. Is this part of a culture that we are building up—that we are taking too much interest in these chemicals that appear at very low levels?

**Marco Lattughi:** There is definitely a public concern about eating and drinking certain chemicals, which is perhaps a bit skewed in the press as well. Yes, we need to take it in context and back it up with scientific data. If we can prove that there is not an issue, why regulate? But I think, at the minute, as we are all agreeing, there is very little evidence at these kinds of levels that there is an effect.

**Q12 Stephen Metcalfe:** Mr Aylard, you said that there were huge costs involved in potentially imposing this new level of treatment. Could you expand on that and tell us what you think those costs would be? I

know you have told us that it would be £100 a year, but for how long and would that be indefinitely? What would actually be involved? What would the money be used to do?

**Richard Aylard:** We have looked in detail at what would be required to deal with the two oestrogens—the naturally-occurring E2 and the artificial EE2. The cost there would be between £27 billion and £31 billion over 20 years. That would translate into a bill impact of something like £100 a year on people's wastewater bills, so it would virtually be a doubling of the current wastewater bill. That does not include financing costs, nor does it include energy. That is a conservative estimate of the cost. It is based on removing those products from waste water, bearing it in mind that they are already being taken out by the drinking water treatment process. To take them out of waste water—when they go into the environment rather than when they come out—you would have to use processes that you normally use for treating drinking water on your sewage effluent.

There are two processes in particular. One is ozonation, which is an advanced oxidation process. The other one would be the use of granular activated carbon, which adsorbs these substances on to the carbon, which then gets regenerated periodically. You would have to be filtering your effluent through this granular activated carbon and also applying ozone. Both of those are energy-intensive processes, take a lot of space and would add very significantly to the costs of treating the waste water. You would treat the waste water to its normal standard and then, basically, put it through virtually a full drinking water standard process, other than adding a dash of chlorine, which, of course, we do to keep water safe while it is going through the pipes. Doing that would not reduce your drinking water treatment costs because there are other substances that get into the environment from agricultural run-off, for instance, which require the same processes when you get to drinking water treatment. You would be applying your granular activated carbon and your ozonation twice—once at the sewage works, when we put it into the environment, and then again, when we take it out, to treat for drinking water. So you are adding this huge additional cost to your sewage treatment.

At Thames Water we run 350 sewage works. I do not know what the total number across the UK industry is, but it would be well over a thousand. Each of those works is going to have to have this level of treatment, bearing in mind that these oestrogens are being produced by everybody as they use the toilet. Every sewage works is going to have to have removal facilities to take this stuff out. Yet, at the moment, we do not even know it is causing a particular problem. We want to find out whether that is justified, because it is a huge change to the way we operate, a huge cost to customers and it also would produce very much greater carbon emissions. It would increase our carbon emissions from wastewater treatment by a third. Bearing it in mind that we have been working hard to get our carbon emissions down, the last thing we want to be doing is putting in that additional environmental disbenefit to achieve a questionable requirement.

**Q13 Stephen Metcalfe:** Thank you. We have had some evidence submitted to us from a Swiss study that says that the additional costs could be only in the range of 5% to 10% over and above traditional, conventional treatment. Why is the cost so much greater here in the UK?

**Richard Aylard:** In Switzerland they have a great deal more water and far fewer people, so the dilution factor is much greater. We do not think those costs are right, but, as I say, the situation is different in Switzerland. The other thing is that the Swiss study talked about getting levels down by 80%. What is being talked about by the EU is getting them down by approximately 99.999%. So we are not comparing apples with apples here. These are very different situations. They have not been looking at the situation from the point of view of what we would be required to do under these new directives in the UK with our very concentrated population.

**Q14 Stephen Metcalfe:** It is not that our current treatment works are behind the times.

**Richard Aylard:** Not at all, no.

**Q15 Stephen Metcalfe:** It is totally different. We are not comparing like for like.

**Richard Aylard:** We are not, either in the situation in terms of population and dilution factor or in the levels to which we would be required to reduce these substances.

**Q16 Stephen Metcalfe:** If this were to be done over a longer period of time, and presumably you have a programme of upgrading works—

**Richard Aylard:** Absolutely.

**Stephen Metcalfe:**—is there an interim or a less stringent regime that you could introduce as you were upgrading these works that would balance the cost against the environmental benefits?

**Richard Aylard:** Sewage works, by their nature, do not require upgrading very often. It is a very basic biological process. You apply oxygen and bacteria, and the process takes its course. If you are going to upgrade a works, it would tend to be about reducing the footprint, reducing the energy requirement or improving the quality of the effluent coming out. But to do what is being talked about now would still require a very large additional process on the end of the works. Clearly, if you could do it as works were upgraded, that would have some reduction in costs because you would be doing work on the site anyway, but most of the expenditure would still be required; it would not be a very significant saving.

**Marco Lattughi:** From my chemical background, I would be concerned that we are now targeting maybe another five chemicals, in particular the oestrogens and one or two chemicals. There is still a lot of research ongoing into what other chemicals are there. We could be putting a lot of money into a treatment process that will catch maybe one or two of the chemicals, but, in future, you may find that you have problems with other chemicals going through the system. We are very much at the early stage of understanding what is going through the water treatment process. I do not think we are in a position

to spend a lot of money just on one chemical. We should really be thinking about research, seeing what other chemicals are there and what future technologies could trap or destroy most of these chemicals going through the process rather than just one or two.

**Richard Aylard:** I agree.

**Mike Murray:** I would concur with those views. To target two specific compounds, particularly as we do not believe the evidence is there to justify their inclusion, is invidious at this point in time. We believe that a much more holistic approach needs to be taken to control rather than doing it through targeting individual compounds on incomplete and, we believe, inadequate evidence.

**Q17 David Morris:** People tend to dispose of pharmaceuticals through the system. How much of an impact would better labelling of pharmaceutical products, for example with clearer disposal instructions, have on controlling these substances at source? Where should the balance between source control and end-of-pipe treatment lie?

**Mike Murray:** In terms of unused medicines, we support the concept of take-back schemes for medicines to pharmacies or, in other member states, having other disposal schemes for unused medicines. But one has to be realistic in that the contribution of unused medicines to the overall environmental load of pharmaceutical compounds is, we believe, not very high. It is very difficult to get an absolute figure because there is a lot of confusion or lack of evidence about the actual true wastage of medicines, whether it is 5%, 10% or whatever. People have been trying to make accurate estimates of the wastage rate of medicines in general. Of that, only a proportion will actually go into the environment through improper disposal and so on.

In terms of overall impact, we do not believe it would make a significant contribution to reducing the overall burden of pharmaceuticals in the environment. That is not to say we do not support the concept of the schemes, and member states are required to have some kind of disposal scheme for medicines under the medicines legislation. Through our European Federation of Pharmaceutical Industries we did a survey in 2007 of the current schemes in operation. They were quite variable in whether they were there in individual member states and some of them had not actually implemented them at that stage. Also, they were variable in the approaches taken and the level of application. We are intending to do a review of that study maybe sometime later on this year to try and see how things have changed in the interim five or six years. By far the biggest contributor of pharmaceuticals in the environment is via the patient and medicinal use.

**Q18 David Tredinnick:** What role does innovation play in helping to meet the environmental quality standards set by the priority substances directives?

**Marco Lattughi:** I would say over the last five to 10 years we have come on in leaps and bounds as far as detection limits and technology are concerned. We are getting an ever-diminishing return now at the levels we are looking at, so, without some incredible



discovery in new technology, we would be struggling to hit these EQSs. Typically, we are improving sensitivities over two to three years maybe fivefold or tenfold, but we are talking ten-thousandfold here.

**Q19 David Tredinnick:** Is that because of better technology?

**Marco Lattughi:** The technology has improved a lot, but we are still way off hitting some of these limits that have been or are proposed to be set. In terms of capacity within the industry, there is a distinct lack of instrumentation out there to do the work, on a large scale as well.

**Q20 David Tredinnick:** That is something that is a major issue for you, is it?

**Marco Lattughi:** Yes.

**Q21 David Tredinnick:** It is something the Government should consider.

**Marco Lattughi:** Potentially.

**Q22 David Tredinnick:** Moving on, unless any of your colleagues want to add anything, we have heard that the Scottish water industry has a “more pro-innovation culture”—I am not sure about the grammar there—partly due to its different ownership model. Are you putting profits before technological development?

**Richard Aylard:** I had better answer that one, hadn't I? I thought Marco was going to. No, we are not putting profits ahead of technological innovation. The regulatory system gives us lots of incentive to innovate. If we can achieve the regulatory outcomes that we sign up to more cheaply, then we get to keep the benefit for the first five years. Afterwards, that gets recognised in price limits, so customers benefit. The system does have lots of incentive there for us to innovate.

For instance, we built the UK's first blackwater treatment plant on the Olympic park, taking sewage from the Northern Outfall Sewer and treating it to a standard that was sufficient to water the Olympic park. In the distant days, when it looked as though we were going to have a drought summer last year, that made a big difference to the prospects for the Olympic park. We have just built and opened the world's first advanced four-stage desalination plant to provide water for London in the event of a drought, and there are lots more examples of situations where the company is innovating to achieve the outcomes in the most efficient way. Indeed, the regulatory system is set up to encourage us to do that for our and our customers' benefits.

**Q23 David Tredinnick:** That would include developing innovative solutions to challenges such as the priority substances list, would it?

**Richard Aylard:** Yes, it would. When we know what standards we are required to achieve, if any, if the evidence is sufficient to justify it, and if this gets passed into law, then we will be working very closely with the environmental industries in this country to find the cheapest and most efficient way of achieving the required standards. As Marco was pointing out, if

you cannot even detect the substances at the standards you are trying to achieve, it makes life very difficult.

**Q24 David Tredinnick:** I have a couple of questions about the quality of water itself. You talked about your work at the Olympic park and the black water there. In fact, that was one of the most polluted sites in Europe—I think I am right in saying—with all the canals there that had to be cleansed before the park could be developed. Do you ever look at the mineral content in water? We have a fortune spent on bottled water now—some would say unnecessarily. Do you actually look at the mineral content of your sources and put any value on them?

**Richard Aylard:** We certainly look at the mineral content of our sources, because in some cases we need to blend the water to get the best outcome for customers in terms of taste and hardness and so on. So, yes, we do look at the mineral content. There are some people who would like to see us provide softer water to customers, and it is technically possible that we could invest in providing soft water. But soft water is less good for the human body than hard water and many people also think hard water tastes better, so it is not something we are proposing to do because customers, if they want to, can soften water in their own homes.

**Q25 David Tredinnick:** I was not thinking so much of the softening but of the actual quality because of the mineral traces that are in the water. I have one other question building on that. I recall seeing some Japanese research a few years ago about the molecular structure of water itself if you look at it under a microscope. If the water comes from a source that is questionable, although clean, the structure appears to be like little circles, little balls, but if it is of a very high quality—perhaps from a very pure source—then it looks like snowflakes. Have you, as part of your innovative work, had a chance to look at any of that research?

**Richard Aylard:** I have looked at that research and it is very interesting. I have also talked to the technical experts and nobody is able to explain why those results come out the way they do. What we do is comply with the very high standards set by the Drinking Water Inspectorate. I am unable to explain the Japanese research and I do not think anybody else has been able to either.

**Q26 David Tredinnick:** It is interesting, though isn't it—

**Richard Aylard:** It is interesting.

**David Tredinnick:**—that one slide will show water that you instinctively know does not look very nice, whereas the other has these beautiful patterns of snowflakes? There must be something there, don't you think?

**Richard Aylard:** I am a biologist and not a chemist, but I have read that research, looked at the photographs, like you, and it is impressive—but I do not understand and nor, I think, does anybody else.

**Marco Lattughi:** I do not understand either at the present time, so I cannot comment on that.

**Q27 David Tredinnick:** Very often science does not understand things one moment and then a few years later discovers a solution.

**Marco Lattughi:** Absolutely.

**Q28 Stephen Mosley:** I was interested in the answer you gave to Stephen Metcalfe about the Swiss experiment that has been done. Is it easier to treat water in some areas than others? Is it easier to produce cleaner water, and what are the factors behind that?

**Richard Aylard:** If we are talking about drinking water, we will provide the same standard of drinking water to all our customers, but how much it costs us and how complicated it is to achieve that outcome depends very much on where the water is abstracted from. If we are taking water out of a chalk aquifer somewhere out in the Kennett valley, for instance, we are getting very high quality, naturally-filtered water. It is almost the same as bottled water, except it is fresher. All we have to do is give it a bit of a tidy-up, put a dash of chlorine in and it is ready to go to the customers' taps. That is a relatively cheap source of water. If we are abstracting water from the River Thames when it has been in flood, it will have some agrochemicals in it, so that requires more treatment. If we are abstracting ground water from under London, where it has been filtering through fairly contaminated soil for many years, it requires a lot more cleaning up. But in each case we achieve the same standard at the end, which is good quality, potable drinking water.

**Q29 Stephen Mosley:** What about in terms of sewage?

**Richard Aylard:** In terms of sewage, the same factors apply. If you have a very small rural sewage treatment works, which has perhaps quite a lot of groundwater infiltration into it, what is coming into the works is relatively dilute and your problem there is dealing with volume. If you are dealing with a very concentrated catchment—lots of people living very close together—and we are talking about a hot dry summer and there is not much water in the system, then you have a much more concentrated effluent to treat. But it is the same principle. You have to give it bugs, oxygen and time, and you get the same output. The sewage works is configured to cope with the population size that it is built for.

**Q30 Stephen Mosley:** We have seen some evidence that England and, I think, Belgium as well would be the most exposed to the problems that we face in terms of cleaning the sewage water. Is there any truth in that, and, if so, why would that be?

**Richard Aylard:** I cannot comment on Belgium. As far as the UK is concerned, we have—I would say this, wouldn't I?—a pretty advanced wastewater industry. We only have 10 wastewater companies across the whole country, whereas across Europe it is often left to individual municipalities to apply their own standards. So they are not working at the same kind of scale that we are working at. The other issue for the UK is that we have a high density population, and that means that, if we are talking about substances like E2, which are excreted in urine, then we get a lot

of it to deal with and in a relatively small area, as opposed to, for instance, Switzerland, where, as I was saying, they have much more water and far fewer people. Those are the factors that I can pick up on. I do not know if Marco has any other suggestions.

**Marco Lattughi:** It all depends on the industry, the sources, which will vary from country to country, and the actual climate, which plays a big part in it as far as the dilution and concentration effects are concerned. So there is a whole host of different parameters that influence that.

**Q31 Stephen Mosley:** Okay. We have seen that EUREAU—which is the European trade body, essentially—has welcomed the proposals. Do the water industries across Europe have the same objections as the UK?

**Richard Aylard:** I would have to write to you about that. I need to find out.

**Marco Lattughi:** I cannot comment on that.

**Q32 Roger Williams:** I hope you can speak freely on this matter and tell us how effective the Government have been in looking after the interests of the UK citizens and industry as far as the priority substance directive is concerned.

**Richard Aylard:** I think they have been very effective. We will wait and see. The proof of the pudding will be what the final outcome is, but certainly the Minister has been making very clear what the concerns are, using evidence that we and other companies have supplied. The Hazardous Substances Advisory Committee has made it clear that it is not convinced by the arguments, and we have also been talking to MEPs, trying to get the message across that at the moment there is not justification for doing this and that the costs are going to be too high for customers. But, yes, it looks to us as though the Government have been pushing this effectively. I do not know if anybody wants to add to that.

**Marco Lattughi:** I agree with that; I concur.

**Mike Murray:** I totally agree. We believe that the UK Government have taken a scientific and rational approach to this and perhaps have, more than anybody else, recognised that there are significant implications of these proposals, which are, in our view, as we have said before, based on insufficient evidence at this point in time.

**Q33 Roger Williams:** I remember some years ago meeting Welsh Water, who were then telling me about the great work they were doing getting manganese and the peaty colour out of their water to meet their customers' requirements and probably the regulatory requirements. Are we just chasing our tails all the time by going after yet another thing to take out of water when in fact we have a very good product anyway?

**Marco Lattughi:** In terms of the chemistry, over the years we have produced a lot of products using various amounts of chemicals and we still do not understand what is going into the water supply. As more products are developed, there is more potential for unwanted chemicals to enter the water supply. So things have changed slightly in terms of the number of chemicals entering our water, and we are lacking

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in research needed to keep up to speed with some of the stuff that enters our water system. But, until we understand what is happening, it is difficult for us to treat it.

**Q34 Chair:** Going back to your comments about the different structures in other countries, do I imply from that that you believe the system we have with 10 large organisations operating in the UK is producing a better product for the customer?

**Richard Aylard:** I would be wary of saying that because I have not personally made a detailed study of the standards being achieved across Europe, but certainly in the UK we have a very coherent regulatory system, with the Environment Agency overseeing the standard of what goes into rivers. We have Ofwat looking very hard at the economic costs and making sure that companies can finance the functions that they need to do to deliver the environmental standards. Because you have 10 companies, you have efficiencies of scale. Particularly when you are dealing with large conurbations like London, Manchester and so on, it makes sense to have it all done by one company. Also, if you look at the Thames valley, for instance, we are operating both the rural sewage treatment works upstream and then abstracting that water again to treat for drinking water downstream, so we are very joined up and organised on a catchment basis, which must be the right way to do things so that you have the whole catchment within the control of one company. So, yes, I think that the 10 water and sewerage companies in this country is an efficient structure.

**Q35 Chair:** The purpose of my asking that is to try and tease out of you whether there is, in your judgment, a need for more rigorous controls in other

countries. One still goes to other countries inside the EU where one is recommended not to drink the tap water, for example. I am not aware of anywhere in the UK where that prevails. Isn't it clear that there is a need for a more rigorous set of standards?

**Richard Aylard:** We have very high standards in this country. That is what I know about and I don't think I should be giving you evidence on things I do not know about.

**Chair:** That is fair enough.

**Marco Lattughi:** In terms of—just taking as an example—the chemicals investigation programme, we suffer from the fact that we implement the legislation very effectively in this country compared maybe with other member states. Looking at the amount of money that has been spent and some of these priority substances, we probably have done more than the rest of Europe purely from the fact that they don't actually implement some of the technical aspects of the legislation. That is historical. So, yes, there is a—

**Mike Murray:** I do not feel sufficiently qualified to comment over and above what my colleagues have said, to be honest.

**Q36 Chair:** Yes, but, with your hat on for the organisation you represent, there are other areas where you would argue that, in keeping with what Mr Lattughi said, we overly interpret regulations coming out of Europe,

**Mike Murray:** I would agree that certainly we are probably as assiduous as any other member state, if not better than most, in implementing EU legislation. I would agree with that, yes.

**Chair:** Okay. Thank you very much, gentlemen, for your contribution this morning. That has been extremely helpful to start us thinking. Thank you very much indeed.

### Examination of Witnesses

*Witnesses:* **Neil Runnalls**, Centre for Ecology and Hydrology Business Development Manager, Natural Environment Research Council, **Professor Andrew Johnson**, Centre for Ecology and Hydrology, and **Dr Rob Collins**, Head of Policy, Rivers Trust, on behalf of the Blueprint for Water Coalition, gave evidence.

**Q37 Chair:** Good morning, gentlemen. Thank you very much for coming this morning. For the record, I would be grateful if you would introduce yourselves.

**Neil Runnalls:** My name is Neil Runnalls. I work for the Centre for Ecology and Hydrology, which is part of NERC. I am here representing Research Councils UK and their submissions, so that is both NERC and EPSRC, who have put some stuff together for you. My role has been, over the last 20 years or so, particularly to interface CEH with European activities on research in water. I am involved in representing the Research Councils on various EU bodies, where we are trying to increase co-ordination of European research, increase the effectiveness with which science is communicated into policy and where policy developments come back to influence what research is done. I describe myself as somebody who knows nothing about everything. So, on very detailed issues, I am going to turn to my colleague Andrew, who is a research scientist within CEH.

**Professor Johnson:** Good morning. My name is Professor Andrew Johnson. I also work at the Centre for Ecology and Hydrology. Our parent body is the Natural Environment Research Council, and the topic of chemicals in water has been one of my particular areas of research for over 15 years now.

**Dr Collins:** Good morning. I am Dr Rob Collins. I work for the Rivers Trust, but I am here representing the Blueprint for Water, a coalition of environmental organisations. I am a former employee of the Centre for Ecology and Hydrology—many years ago.

**Q38 Chair:** Thank you very much. Can I start off where I started with the previous panel? Should the 15 chemicals proposed by the EU be added to the priority substances list?

**Professor Johnson:** Shall I start by responding to that? The formula with trying to assess whether chemicals are a hazard to our aquatic environment is quite well understood and normally follows a

procedure of whether the chemical is persistent, will it linger in the environment, will it bioaccumulate, and is it toxic. This is a procedure that is well understood. Then there is also a review of whether the concentrations that might occur in the environment could be reached and, therefore, that chemical would come to the top of the list. What is new, as you have obviously recognised, is the addition of three pharmaceutical-type compounds, which have different properties. Particularly the issue is around the consensus, or lack of it, of their toxicity to wildlife. That is where the area is somewhat more controversial.

**Dr Collins:** We do support the listing of these chemicals. We believe it will give greater protection to the health of our freshwater and coastal ecosystems. We also see it as driving a more sustainable management of our water resources and use of chemicals. It is not uncommon, for example, for chemicals to be discharged into a river from a wastewater treatment plant and at some point downstream those chemicals to be polluting a raw drinking water source and requiring treatment before that water can be supplied to our tap. We feel this legislation would help to drive a more efficient and perhaps intelligent way of managing the whole system.

**Q39 Chair:** Professor Johnson, you did not quite answer the question: should those substances be added to the list?

**Professor Johnson:** I would say that the majority of those chemicals—the pesticides, the biocidal products and the combustion products—are all very reasonable chemicals to add on to the list. The three pharmaceutical-based chemicals, I think, have perhaps caught us out a little bit flat-footed because the degree of evidence of effects that those chemicals might have is still not as complete as we would like. As a scientist, I welcome the focus that these chemicals are getting, but the weight of evidence that we have is not yet sufficient perhaps, for many people, to put them top of the list. As a scientist, I would say it is an area where more research is needed; that is perhaps my best answer on those three.

**Dr Collins:** We would also support that comment. Clearly, there is controversy around these three particular substances and we would certainly push for more research there in order to reduce the uncertainty around their quality standards.

**Q40 Chair:** In that sense, you agree with the previous panel, who was saying that the scientific evidence from the European Commission is not sufficiently robust yet. They are saying, on the one hand, that the substances should not be added to the list and you are saying they should. You are taking a more precautionary approach.

**Dr Collins:** I think we are. I suppose our concern is that, if they disappear from the list, there is a strong potential for no action to be taken and the whole process stops here and now. We would like to see further research undertaken. It appears to be necessary with some of the ecotoxicological evidence—it is

limited—and we want to see that process taken forward.

**Professor Johnson:** Would you like me to add a little on the evidence for why these chemicals are considered harmful?

**Chair:** Yes, please.

**Professor Johnson:** As to the ethinyloestradiol, the oestradiol is undoubtedly having effects on wildlife—on fish. The question is to what degree we consider those effects particularly harmful. The issue with the oestrogens is reducing the fertility of male fish. There is no argument that these chemicals at the sort of concentrations one might find in the environment will be having that effect. The more difficult question is: are these effects which are not toxic? That is why this issue is a difficult one to deal with. Are these effects sufficiently grievous to imperil the populations of fish?

We have been discharging these sorts of chemicals into our rivers for decades, and the fish populations are still largely there. So we are in a difficult situation. The effects that we see in wildlife in fish are something we would not certainly accept in humans. These are genuine effects that are happening. The question is: is it going to cause a very significant disaster for the fish populations? This is where the jury is a little bit out. It is not fair to say that the chemicals are not having an effect on wildlife, but it is difficult to judge on what the severity of that effect is.

**Chair:** Thank you. That is very helpful.

**Q41 David Tredinnick:** What risk is there that the Commission's proposals will restrict the access of patients to pharmaceuticals on the priority substances list?

**Professor Johnson:** I do not believe there is a risk. It has been viewed—and I am sure it will continue to be viewed—that societal benefit of pharmaceuticals trumps other considerations. Of course, ideally, we would like, if we could, to choose other pharmaceuticals that may be less harmful for our natural environment, but usually we do not have that option. If we were to be forced to deal with chemicals such as pharmaceuticals, I am sure the approach would be to deal with treatment at wastewater treatment plants rather than restricting access to patients.

**Q42 David Tredinnick:** Can better drug disposal initiatives achieve similar results to improve wastewater treatment technology?

**Professor Johnson:** Regarding the sensible use of drugs in the home, I am sure everything would help, but we are in a spot where the overwhelming discharge to the environment is just from the excretion from the patients. That would be the largest source. We do not have that much room for manoeuvre in terms of the problem we are facing with chemicals such as pharmaceuticals arriving in our rivers.

**Q43 David Tredinnick:** Where should the balance be between source control and end-of-pipe treatment?

**Professor Johnson:** It would be lovely if we had a plethora of pharmaceuticals we could choose from to

reduce our dependence on pharmaceuticals that we may consider harmful, but we are not in that position for reasons I am sure you know, with the difficulty in developing sensible pharmaceuticals that do not harm us. The balance with these three chemicals almost certainly will be focused largely on improving our wastewater treatment.

**Q44 David Tredinnick:** Are there other low-carbon ways of improving water quality?

**Professor Johnson:** As you have heard from the previous speakers, currently we rely largely on biological treatment of our waste water in which we are encouraging bacteria, with lots of oxygen, to break down these compounds, and they largely do this. Most of the pharmaceuticals are largely broken down already in wastewater treatment. If your questions are, “Could we improve biological treatment? Is there room for manoeuvre to develop lower-cost ways of removing these compounds?”, I suspect there is some room for further development of biological treatment—low carbon, if you like. But, if you were to say we need to remove these chemicals tomorrow, we would have to go straight to these very expensive, highly energy-consuming approaches.

**Dr Collins:** We do not have a great area of expertise here, but we understand that there are less intensive techniques such as reed beds and constructed wetlands, which have shown some potential for removing some of the chemicals that we have been talking about. I think the recent UK water industry research programme into chemicals has shown, plus other studies too, that there is potential there, and, as we understand it, those techniques are less carbon-intensive and also cheaper.

**Q45 Roger Williams:** We are receiving some evidence that it appears the UK may be facing greater challenges as far as the proposal for water quality is concerned. Professor Johnson, do you agree with that, and, if so, why is that?

**Professor Johnson:** Yes. The reason why I would indicate that the UK—and more specifically England—is facing the sternest challenge in trying to deal with these chemicals is due to the nature of our island, which is very densely populated and we have a very little amount of water to dilute our waste. This is different from citizens in many parts of Europe. France, Switzerland and Denmark all have an enormous amount of room for manoeuvre in the amount of dilution they have available. This issue of trying to deal with the pharmaceuticals has thrown that into sharp relief. We have very little room for manoeuvre with the amount of water we have to dilute our waste. If I could give you an example, in a dry summer the River Thames out there—slightly higher up the river, near where we work in Reading—could be between a quarter treated sewage effluent to a third. That shows you how careful we have to be with the chemicals that we discharge into our waterways.

**Q46 Roger Williams:** Within England itself, would there be specific water authorities that would face particular challenges?

**Neil Runnalls:** I think we have put in a little map somewhere in our submission. It is basically a swathe of country that runs from London up through, you could say, to Manchester, where there is high density population and low-flow rivers.

**Q47 Roger Williams:** That would be Thames, Anglian and Severn Trent.

**Neil Runnalls:** Yes, that is right.

**Professor Johnson:** These would be the main hot-spots where—I am sure you can understand yourself—we have a lot of population and not so much rainfall. As you start to drift towards, fortunately, people who live in Wales or Scotland, you are blessed with more rainfall. So the weight of the costs would fall more disproportionately on those drier parts of the country.

**Q48 Roger Williams:** The environment has some effect on that in the sense of different weather regimes.

**Professor Johnson:** Absolutely.

**Q49 Roger Williams:** Would the actual source of the water also have some effect on how chemically polluted or prone to chemical pollution it may be?

**Professor Johnson:** We are talking about rainfall. Rainfall is the same throughout the country. It is a case of how much resource we have available to use that rainfall, so it can be two or three times more rainfall as we go towards the north and west. Over here, where we are sitting in the Thames region, we have a very low rainfall, so, as you have heard, we are recycling that water as it goes down the Thames.

**Q50 Roger Williams:** The actual water source is not a key issue here. It is the weather or the climatic conditions at the source.

**Professor Johnson:** Yes. If, for example, a lot of your water source is, shall we say, ground water that was laid down from the last ice age, you start with a fairly good basis. Where you rely more and more on rain water—so it is very recent run-off—that is also the area, if you are taking the water from rivers, where your sewage effluent is going.

**Q51 Stephen Mosley:** Professor Johnson, I know that in the Centre for Ecology and Hydrology evidence you say that there is a constraint on investment in innovation within English companies because of their financial model, where their returns are based on how much they invest in infrastructure basically—probably low-risk infrastructure. Do they invest less in innovation?

**Neil Runnalls:** The Government have had a number of reviews in the last five years into the problem of lack of innovation in the water sector. There have been several of them. There have been some changes introduced, and some of those things were just mentioned to you by some of the chaps on the previous panel. It remains to be seen to what extent those changes, which have been introduced, have had an effect on the water companies’ ability to offset their research against their profits. Previously, 10 years ago, water companies were almost penalised for doing

research and they could not offset their investment in research, so it was a great disincentive. Things have improved, but, in the very nature of things, the way the companies are structured does restrict how much innovation is needed. That was particularly the case when so much of their financial returns depended upon capital expenditure. That is where their charging came through and a new regime for allowing a total expenditure perspective is a bit of a game changer, but, as to how much, we do not really know yet. There is a lot more activity in innovation, but there could possibly be more.

**Q52 Stephen Mosley:** But isn't the problem we are looking at, at the moment—with pharmaceuticals, oestrogen and so on going into the water—a known problem with a known solution? Isn't that a capital project rather than an innovation-type project that needs a solution?

**Professor Johnson:** It depends on which way you want to take it. As I mentioned earlier, if we wanted to solve the problem tomorrow, there are a number of drinking water-style approaches that one might use that consume a lot of energy, but we use them happily for our drinking water. Given time, we might be able to develop removal techniques that would be adequate or sufficient to remove these chemicals without perhaps being as energy-consuming and such a high burden as the techniques we might use off the shelf today. This might drive innovation if we have a sufficient lead-in time, which may reduce the costs.

**Q53 Stephen Mosley:** We have also heard that in Scotland and Wales there is more of a pro-innovation culture within the water industry. Is that true, and, if so, why?

**Neil Runnalls:** The Scottish Government have introduced this Scottish perspective, what they call "hydro nation", which is basically to try to put water as a key asset for the country, a key expertise for it to sell on global markets. That is basically owned from the First Minister all the way down and is being implemented across all Departments. Within that, you have Scottish Water bolstered by the research sector, bolstered by Government Departments. We do not see that in England. We see a similar kind of thing happening in Wales, where there is a lot more join-up with Welsh Water—what was Welsh EA—as it now merges across, as they bring a lot of their Departments together. In Wales, they take a lot more of a sustainability perspective about their water. The Scottish one seems to be a lot more entrepreneurial, looking at global markets and Scotland's unique assets in that respect. Slightly different ownership models allow them to do that.

Can I come back to that? The water companies are caught between a rock and a hard place. We have the Climate Change Act, which is requiring them to bring their carbon footprints down, and the Water Framework Directive, which is causing them to drive up their carbon usage, their energy usage, to get better quality water. That is a very uncomfortable place to be in.

I think, coming back to one of your questions about other ways of getting better water quality, some of the

water companies are trying to attack the problems of water quality generally through what they call catchment management, which is trying to reduce the inflow of pesticides and sediment, and reduce their water treatment costs that way with low carbon techniques. In this current AMP round, Ofwat is allowing 100 pilots to be run by the water companies to test these catchment management approaches. So that is a bit of creativity, but there are some more creative water companies and some that are maybe not quite so creative.

**Dr Collins:** One or two on that catchment management issue have had work under way for some years now, very successfully bringing down water treatment costs by engaging with farmers who have been polluting raw water sources.

**Q54 Stephen Mosley:** As the UK Government, what can we do to make sure that these good examples are spread across the whole industry?

**Neil Runnalls:** What I see, as I work internationally, is some countries that have, as it were, got their water act together. The Netherlands is one in particular. Obviously, if they cannot manage water, then they basically disappear under the sea, and they have a huge tradition in such management.

As to the greater co-ordination at national level, when I have to go into Europe and have representatives of the water companies or DEFRA with me, we are being shredded when we come to having to represent the UK against the much more integrated war machines of the Dutch, the Germans and the French as they organise in the way that Scotland has grasped this "hydro nation" concept. These are the things we are seeing. We have a Danish Water Forum and a Swedish Water House, where Government, industry and academia are all working together to improve sustainability nationally and to take advantage of global opportunities in water. That is one of the things we could do.

The Government Chief Scientific Adviser, John Beddington, in his term of office, whatever it is you call it, has said that the big issue globally—the biggest threat for this country—is water, food and energy. That has been his little mantra, and he has set up this UK Water Research and Innovation Partnership to try to bring things together. The biggest problem for that grouping is lack of political support for the imperative of water. This little issue—the tiny issue of these water quality things here—is a small manifestation that our water systems are under huge pressure, be they floods or droughts. The UK, using a civil war illustration, is kind of like cavaliers fighting a New Model Army. Other countries have got themselves organised and we are having a jolly old time.

**Professor Johnson:** We would welcome certainly the interest that the Select Committee has shown, and all of us in the research sector would welcome a more strategic joined-up approach, because, although these pharmaceuticals and this issue may appear to have come out of the blue, there is no doubt about it that the UK, and England in particular, are in a very tight spot with the lack of water we have available to dilute our waste, with our use of chemicals and possibly

with some rivers becoming drier and less able to dilute our waste in the future.

**Dr Collins:** I would add to that—it is speculation, but it is very likely—that other chemicals will be designated as priority substances in the future. There are a number of so-called emerging substances of concern, and it is very likely that some of those will end up on the list. In the longer term, it is perhaps not just two or three chemicals that we are talking about. It is a much wider issue than that.

**Q55 Stephen Metcalfe:** You have presented a very balanced approach here saying that, given time and with some innovation, we could balance the benefits of adopting these proposals by reducing the cost. However, if these proposals were adopted sooner rather than later, Thames Water have told us that it would cost somewhere between £27 billion and £31 billion to change their treatment works to accommodate this, and that is a conservative estimate. First, do you agree with that figure, and do you think that the £100 per year on people's bills is a price worth paying for the benefits that would be gained?

**Neil Runnalls:** I think the estimate of one of our scientists who was involved in modelling the water treatment plants where the problems were was, "Okay, yes; that is about the right kind of number. Those are the numbers of water treatment plants you are going to have to deal with, so you are probably in the ball park there." The extent to which you can play is maybe whether you say, selectively, we are only going to require some of these, but, again, things are so tight that you might as well say, "Fair enough."

**Professor Johnson:** I would add to that my suspicion that these costs are still somewhat preliminary, in which you take your most successful but most expensive treatment on the one hand, look at all the likely candidates on the other and put the two numbers together. I would suspect that, over time, the number would be refined when you look on a case-by-case basis as to whether you do not need to use such a high technology in such a high location because you have slightly more dilution. I suspect there will be some chance to refine those numbers down. We have to admit that, even with refinement and further review of those costs, we would still be facing a very substantial amount of investment, with constant funding required. But perhaps it is unwise to see these improvements of sewage treatment technology as just removing those chemicals, as Rob has mentioned. They could be removing a wide range of other pollutants that could be coming down the track in the future. So there is an argument that it could be a wiser investment long term.

**Q56 Stephen Metcalfe:** So it would set us up for the future; it would give us some future-proof technology that would enable us to meet new challenges coming down the line, potentially, in the future.

**Professor Johnson:** Yes. I do not think this issue is going to go away. It is likely that we and this Committee will be back here in five or 10 years with more chemicals and be in the same jam we are in now.

**Q57 Stephen Metcalfe:** NERC's written evidence said that the costs might not be as high as had been proposed. You are slightly at odds with that.

**Neil Runnalls:** That is all right. That was written in Swindon, I think.

**Stephen Metcalfe:** That would explain it.

**Neil Runnalls:** The thinking behind that—coming out of the EPSRC—was that they could probably not do the full treatment in every place.

**Q58 Stephen Metcalfe:** Okay. Finally, Dr Collins, your written evidence outlined the Swiss approach to this. Obviously, Thames Water said you were not comparing like with like. Is that a fair comment on their part, or do you think there is a balance to be struck?

**Dr Collins:** I am not sure I can fully comment on that. I do not know the real details of the Swiss study. I understand that their cost estimates are somewhere around 17 Swiss francs per head of population for advanced treatment across the country. It is speculation. As I understand things, Switzerland and a number of other countries in northern Europe—Denmark and Austria—have greater implementation of tertiary treatment anyway over and above the UK. As to whether that gains them lower cost, I am speculating and I do not know. I am not an expert on this.

**Q59 Stephen Metcalfe:** It could be that it is population density, lack of actual water resource—

**Dr Collins:** I totally accept—

**Q60 Stephen Metcalfe:** Actually what we need to say is, "If we are to adopt these, the costs are going to be as high as perhaps some of the estimates that are around at the moment, if we adopt them early."

**Professor Johnson:** Yes. I think the way of looking at it is that our costs will be among the highest in Europe.

**Q61 Stephen Metcalfe:** Fine, okay. Let us not pull back from that and try and mitigate that. Let us just talk about the benefits if this is worth doing and say it will give us some future-proof technology, hopefully.

**Professor Johnson:** Yes. But if we look further down the line—and again this may be an area of some controversy—if we were to convert our sewage effluent largely into effectively drinking water, it would change the balance of the ecosystem in the rivers. It would become more nutrient-poor, which might favour some species over others, like salmon or trout. Anglers might prefer that and coarse anglers may not, but that is something perhaps for further consideration. There is an issue here for the UK that we have to be absolutely focused on, if not now, for the future. This is not going to go away. There is a strong argument that this area does need further focus to see that there could be a lot of benefits for us coming down the line because we cannot get away from our lack of dilution problem.

**Q62 David Tredinnick:** I was slightly alarmed by your earlier remarks about the British being shredded by the Danish and Swedish in negotiations because

the Government, academia and business are not working together properly. What have the Government been doing to engage with the Commission proposals in the EU, and do you think that the British Government are severely disadvantaged because of what you said earlier?

**Neil Runnalls:** At the level of specific discussions about these, there are mechanisms through what is called a Water Framework Directive common implementation strategy for regular dialogue on these issues on the priority of things. There will be UK Government, DEFRA and EA people on those committees—the working route of common implementation strategy—to discuss this. Where I am particularly working, which is in the research and innovation area, there are some major problems. The Commission has just launched a thing called the European Innovation Partnership on water—an EIP on water. There is only one UK representative on the two strategic boards, which has about 50 people on it, with better representation from Bulgaria.

**Q63 David Tredinnick:** Why is that? Is that because of a poor recognition in the Government? Is it a resources issue?

**Neil Runnalls:** It is a human resources problem in many respects in that both DEFRA and EA have had substantial cuts in their staffing. Their budgets have been cut and therefore their staff are under a lot of pressure.

**Q64 David Tredinnick:** Just because the staffing has been reorganised and there has been a change in strategy, it does not necessarily mean that these points cannot be covered on the board. So I put it to you that it is more to do with allocation of resources and effective use of them.

**Neil Runnalls:** That is right. I think they have to continue to meet all their obligations of all sorts with fewer people and therefore some things have to go.

**Q65 David Tredinnick:** But if we have one man trying to cover two key committees and the Bulgarians have a dozen—to use your own paraphrase—surely that is something that needs to be addressed immediately, isn't it?

**Neil Runnalls:** Yes. That one man represents the trade association, British Water. There is a thing called the Joint Programming Initiative on water, which is for member state collaboration in water. I represent the UK there through NERC, and I think we have been able to get DEFRA and EA people along twice, and we are providing them with a feed of information, but they have to be very cautious with the resources they have. At various levels—and this is what John Beddington has been trying to do—there is the need to get a little bit more joined up, and that has been very difficult for him because he really does not have the financial resources to grease the wheels. He has had to get money wherever he can and it has been very hard for him to get mobilisation.

**Q66 David Tredinnick:** Turning to another issue that has come up in this session, which is catchment management issues, do you think that much more

should be done to look at the quality of water in different areas, that it should be valued on a scale of 1 to 10 and that we should be trying to bring more water from better catchment areas than those that are less favourable?

**Dr Collins:** It is very intensive to pump and to move water around. If you are moving from one catchment over a long distance to a poorer quality catchment, that is one issue to take into account. We would say it probably does not really address the bones of the problem. The issue at source should be tackled.

**Q67 David Tredinnick:** I would like to return to this. Shouldn't we be looking at the actual quality of water? We touched in the previous session—I didn't see if you were at the back or not—on the issue of minerals in water. We had a brief discussion about bottled water and why people go out and buy that. I think, Dr Collins, you came up with a catchment area where you have said it is the same as bottled water in terms of quality. Should we not be addressing this issue of the actual quality of clean water?

**Professor Johnson:** We have to be careful of what we are discussing here. Some areas are blessed in terms of having good quality water for drinking, which is easy to deal with and treat, as you heard earlier. Other areas, such as Thames, have limited resources and we have to treat river water, which has received a lot of our sewage effluent. I do not see any way round that easily. You could say, "Could we add more water to the Thames, perhaps diverting it from another large catchment to increase its dilution?" We may have to do that for water resource areas, but I am not quite sure we have quite understood the intent of your question.

**Q68 David Tredinnick:** In the earlier session I raised the Japanese studies, which showed that, under a microscope, the constitution of water was quite different, that some of it looked like little granules and others looked like interlocking snowflakes, which suggested, instinctively, that it was of a better quality because it had a finer structure. The previous panel were not able to comment other than the fact that they had seen the studies. Do you think this is an area that should be explored further?

**Dr Collins:** We monitor water quality quite extensively and intensively. Water companies themselves know the quality of the water and the Environment Agency does as well in our rivers, our ground water and our drinking water source areas. So, in that respect, we are probably not lacking in information. Of course we could always do more.

**Q69 David Tredinnick:** Finally, despite the costs of transportation of water, what is your view on the proposal to pipe water from Scotland to London?

**Professor Johnson:** We are talking about water quality issues this morning. There is another issue of just water as a resource. As you are aware, we came close to a drought situation, so those two things are slightly linked. It is one of those issues where we have to be very strategic and think about whether the water levels could decline still further in the future possibly due to climate change. I think it is wise to start



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planning now what those challenges might be. Channelling water—not necessarily from Scotland but possibly from the Severn or a similar river—as a way forward is one approach, or you start building bigger reservoirs in this area to use as a resource to increase the volume in the Thames as well, I do not know which is better on a cost or energy front. Perhaps Rob can answer.

**Dr Collins:** I cannot answer that, but what we probably need to exhaust first is managing demand for water—trying to reduce demand for water. In London and the south-east, I think we still use per capita quite a lot of water, and more can be done—we can be more efficient in our homes and industries—to address that. We believe a target of 15% to 20% reduction in water use is achievable through that approach. Whether that means you still need to look at the bigger picture with more reservoirs and so on I do not know, but we have not really begun to exhaust that management of the demand for water.

**Neil Runnalls:** I think it is about the demand and the supply thing. The Scottish pipeline idea is, I think, a bit of a long shot really. As an Australian, I am used to people pumping water hundreds and hundreds and hundreds of miles, but I am also used to far, far greater public awareness of the preciousness of water. There is some considerable way to go in this country for people to be aware that there are certain things they should have in their gardens and certain things in regard to homes. These changes are taking place in the UK, but there is considerably more scope.

One of the big things as far as human beings is concerned is that people do not know where their water is coming from., which is a problem in this country. There is no sense of ownership. People think it comes out of a tap. People seeing where it is actually coming from is one of the things that has had quite a big effect upon the Australian psyche about how they treat and value water. They know it comes from that catchment, they know the rivers are there and that those rivers are stressed. In Perth, where I come from, after the weather forecasts, there is a water quality bulletin every night on the TV.

**Q70 Chair:** Thank you very much. I have a final question, if I may. Since I worked in a laboratory, analytical techniques have moved on substantially and things that we simply could not measure are now routinely measured with enormous degrees of

accuracy. Is it the case, therefore, that we should make the assumption that analytical techniques are going to continue to advance and, therefore, the costs of coming to decisions about some of these marginal arguments would be more attractive to the consumer? That is my first point. The second point is how much of an issue is the bioaccumulation of some of the suggested chemicals?

**Professor Johnson:** What is interesting with a lot of the pharmaceuticals such as some of the ones that are on this list proposed by the European Union is that they are not particularly bioaccumulative, but, because we discharge them every day from our sewage works, you have what is called a plume of pseudo-persistence, so they are always present even though they flow through the system and out to sea. Typically, we get more concerned—or we have done in the past—in toxicology with the more bioaccumulative chemicals, and you will be familiar with things around heavy metals such as lead, which can build up and cause toxic effects. As to some of those chemicals that are the more bioaccumulative ones, we perhaps have some opportunities to reduce those at source. We have not talked about them so much in the session this morning. The pharmaceuticals are less bioaccumulative but it is a source we really cannot easily turn off.

Regarding the question about detection levels and analytical chemistry, that certainly has improved considerably; so, in other words, it will throw up more chemicals as we go on. But there is no getting away from the fact that we are all using many more pharmaceuticals and we demand more pharmaceuticals every day. So these will be coming into the system. The question is how good our understanding is of the toxicology and the effects of those chemicals, particularly when these chemicals are not toxic. Is it an effect that would be very harmful? Is it one that the general public would accept as being particularly harmful and prompt them to demand change? One of the interesting things about Switzerland—as Neil has said about Australia—is that there is a big public consensus on the need to have good water quality and, therefore, the public accepted a need to pay more to improve the quality of their sewage effluent going into their rivers.

**Chair:** Thank you very much indeed for your time this morning. It has been extremely interesting.

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### Examination of Witnesses

**Witnesses:** **Dr Sue Kinsey**, Senior Pollution Policy Officer, Marine Conservation Society, and **Professor Richard Thompson**, Plymouth University, gave evidence.

**Q71 Chair:** Good morning to you. Can I welcome you to our session? I would be grateful if, for the record, you would introduce yourselves.

**Dr Kinsey:** My name is Dr Sue Kinsey. I am a senior pollution policy officer with the Marine Conservation Society.

**Professor Thompson:** I am Professor Richard Thompson. I am a marine ecologist from Plymouth university.

**Q72 Chair:** I want to start off with something we have not touched on this morning about marine litter, particularly plastic waste. What effect does it have on the marine environment? We see pictures of the physical impact and so on, but presumably you have concerns that go more deeply than that. What action is being taken to reduce marine litter?

**Dr Kinsey:** In the Marine Conservation Society we have been monitoring litter around our coastlines for

over 20 years. We do a yearly monitoring of litter. Unfortunately, in that time, we have noticed that litter levels are going up by leaps and bounds, especially plastic litter. Going down to the microplastics, we are also seeing lots more small plastic pieces. These are having a number of serious effects for wildlife. The macroplastics and macrolitter are causing entanglement and ingestion. That is very deleterious for them. There is also the problem of clean-up costs. We are spending millions of euros or pounds every year just cleaning up marine litter on our coastlines. There is the effect on the fishing community, who, if they are constantly fishing up litter, are having spoilt catches. Their nets are being cut and they are having to throw catches back. Following that, there is the possible effect on human health from sewage-related debris that is landing on beaches. Again, there is the potential for microplastics, for toxins, to potentially bioaccumulate up the food chain, from the bottom of the food chain upwards to us—if you are sea-food consumers.

**Professor Thompson:** Sue has covered it pretty well. We did a review for the Convention on Biological Diversity last year of the numbers of species reported as entangled in or ingesting marine debris. Those encounters are predominantly plastic. We reported over 370 species worldwide, including some that are critically endangered. That is a substantial increase since the last time this matter was reviewed.

**Q73 Graham Stringer:** How abundant are microplastics in the marine environment?

**Professor Thompson:** In terms of microplastics—for the benefit of the Committee I will define those before I answer the question—we were the first to really use that term for very small fragments of plastic. At that time I was talking about truly microscopic pieces. Since then, NOAA, in the US, has broadened the definition to include anything less than 5 mm, which some would certainly consider not microscopic, as you can readily see it with the naked eye. The driver there was that they were interested in the effects of very small pieces that could be readily ingested and that the behaviour of those pieces might be slightly different from larger pieces, which would be more likely to result in entanglement. So there is some variation in the terminology for the definition, but, if we are talking about the NOAA definition of anything less than 5 mm, I could take you to locations in the UK where more than 10% by weight of the natural debris on the strand line was plastic. So it can be quite substantial. But if we look at the smaller fraction—

**Q74 Graham Stringer:** But not necessarily microplastics.

**Professor Thompson:** How small do you want to go? Talking about less than 5 mm, you could quantify as much as 10%. If we are going to bits that I would consider truly microscopic—sub-millimetres pieces—then you would be looking at quantities in the region of up to 20 particles per litre of sand. Perhaps in terms of items in the water column, it would be less than one item per cubic metre typically, but then in hot-spots, where there has been a spillage, quantities

in excess of 100,000 particles per metre cubed have been reported. So it is quite variable.

**Q75 Graham Stringer:** What is the main source? Is it the cosmetics industry or is it other parts of the industry?

**Dr Kinsey:** There is a variety of sources. The microplastics can come from larger articles that are breaking down into ever smaller pieces. Then there are the plastic particles that come from the plastics industry themselves—the raw product of all plastic products. They are shipped around the world in these little plastic pellets and are very easily spilled, and we find lots of them on the beaches. Then there are the cosmetics additives that people put into cosmetics for facial scrubbers and things like that. Also, plastic particles are coming off our own clothes through washing machines and down our sewers. Those kinds of plastic particles and the cosmetics particles are not screened out by the wastewater treatment sewage plants because they are simply not built to screen out those types of particles.

**Q76 Graham Stringer:** Could they be built to screen out those kinds of particles? Let me see if I can put a bit more substance on the question. Obviously if it is a lump of plastic that breaks down and eventually becomes much smaller particles, you are not going to be able to filter that out.

**Dr Kinsey:** No.

**Q77 Graham Stringer:** It is a different source, but there is quite a lot of this that does come through water plants. Could they not be built in order to get rid of that, and how much would it remove if you could remove all the plastic that does come through water plants?

**Dr Kinsey:** Water quality treatment plants can be improved, but, rather than going down that road, it would be much simpler to stop that microplastic at source, so stop the cosmetics industry using microplastics in the first place. That would cut out a whole source of microplastics. It would be hugely expensive, I would imagine, to retrofit all our wastewater treatment plants so that they would actually sort out these very small particles of microplastic.

**Professor Thompson:** I would agree with that. It is difficult once the material gets into the environment to know exactly where it came from because you are dealing with such small fragments. You can identify the polymer type, but polyethylene is used in cosmetic products and also in a wide range of other applications. It is quite difficult to know exactly where it has come from once it gets into the environment. It is certain that some is entering via waste water and it may be possible to remove some of that, but it does seem perhaps an unnecessary use of non-renewable resources. In the US alone, it was calculated that 260 tonnes per annum of plastic were being released into waste water from personal care products alone. So it is quite a substantial use. I have brought with me—if any of the Committee want to look at it later on—some samples of products and the quantities of plastic we have extracted from them, and some magnified

images to illustrate the kinds of material that there are. It is quite a substantial amount in every bottle that is used. It would be better to stop it going in perhaps rather than to try to screen it out in sewage treatment.

**Q78 David Tredinnick:** Is Government action necessary to stop or discourage the use of microplastics in personal care products? Should the Government take further action? Building on what you have been saying, isn't it really an awareness issue? Your colleague in the previous session was talking about awareness in Switzerland and in Australia. Is it not a fact that we need to get across to the public that, if they buy these products that are not in a glass bottle—or the products themselves—unless they are user-friendly, they will be damaging the environment?

**Dr Kinsey:** It would be easier if the product simply did not contain these products in the first place. We know that it is perfectly possible for a company to do this. Unilever has already promised to take out all the plastic materials from their products. I think that is an easier way of going rather than trying to get people to pick and choose the products that they use.

From a Government point of view, we would like to see a concerted effort either to persuade companies to voluntarily take out these particles from their products or to introduce an EU-wide ban, which is something that we and other European environmental NGOs are also asking the EU Governments to do. The Dutch Government have also agreed to look into this matter.

**Professor Thompson:** Can I add to that? You are absolutely right in terms of awareness, and I think that, although personal care products are part of the issue, they are only one of the sources of microplastic. The fragmentation of larger items is also a major source. Awareness is important to driving informed choice rather than necessarily legislation to ban something, but that is where perhaps Government need to take a role in terms of making sure that the public receive the kind of information that they need in order to make an informed choice. I would bring that in from a point of view of wider use of labelling. The plastics that we commonly find as marine debris can achieve their benefits for society without necessarily ending up in the natural environment, and that is about sustainable consumption and production. Reliable labelling could certainly help drive consumer awareness.

**Q79 David Tredinnick:** Is it just an issue for Government? I was thinking about Anita Roddick and Body Shop, with her animal testing campaign “Not tested on animals”, which was very effective. Why is it always down to Government? Government might be able to stimulate consumer awareness, but there is a good opportunity here, I would have thought, for an enterprising organisation to get a public campaign going.

**Professor Thompson:** You make a good point. I have also brought with me—and if the panel want to look at it later on they can—an example of early industry-led action to try to remediate this problem, the introduction of a degradable carrier bag, which was apparently the world's first. After eight years in my

office, what I am left with is a million small pieces of plastic. It has degraded as a carrier bag, but what we have ended up with is lots of pieces in the environment. So there is a role for legislature to make sure that products that are released with a supposedly ecologically-enhanced end of life are correctly labelled and that consumers have the correct information.

**Chair:** That leads very neatly to a specific question that Stephen is going to ask.

**Q80 Stephen Metcalfe:** Thank you, Chairman. You talked about Unilever having pledged to phase out the use of microplastics. That begs the question: is there an alternative to them? Does that mean that other companies are dragging their feet, or are Unilever being overambitious in their claims?

**Dr Kinsey:** There are plenty of alternatives. Microplastics have only been used relatively recently. Before that, alternatives such as nut husks or apricot shells—all those kinds of natural products—were used as the type of thing you would find in cosmetics these days. So it seems to me that the very fact that Unilever have said, “Okay, we will just change” means that it is very simple to go back to using the products that they used to use before microplastics.

**Q81 Stephen Metcalfe:** So it is something that we can genuinely make a difference to.

**Dr Kinsey:** Yes, absolutely, and it is also generally possible to do.

**Q82 Stephen Metcalfe:** I think I know the answer to this, but I will ask it anyway. I think you have already said no, but do you know how much of the microplastics that are found could be attributable to the cosmetics industry? Are there any other industries where there is an obvious quantifiable use that could be changed relatively simply?

**Dr Kinsey:** I don't think you can quantify the amount of microplastics that are coming down from the cosmetics industry. You would have to do some kind of analysis at the wastewater treatment, possibly, to find that out. The industries that do use microplastics now are, for example, sandblasting. Instead of using sand, they now use microplastic particles simply. I have been told, because they last longer and they can re-use them. Again, those are very likely to be washed down through wastewater treatments as well.

**Q83 Stephen Metcalfe:** Do you have anything to add to that?

**Professor Thompson:** No. Sandblasting is also a concern, with plastic particles being used as an alternative. Particularly where you are blasting something delicate and where it is an aluminium structure, plastics are quite widely used, and I have been sent photographs by members of the public of clean-up operations after transport of very fine particles where it was literally swept into a street drain. That was not a picture from the UK, but it emphasises the readiness with which this kind of small and relatively inexpensive material is perhaps being disposed of inappropriately in some locations.

**Q84 Chair:** Can I push you further on how the big corporates are acting, because there does seem to be a difference? Unilever have gone one way, L'Oréal have not thus far. Is it your perception that this has been done because there is a recognition of the environmental hazards? Is it an ethical decision, in other words, or is it a commercial one?

**Dr Kinsey:** Gosh, I am sure there is an element of both in reality. The statement from Unilever did say that, because they were concerned about the environment and they had taken on board the arguments that they had heard from the environmental NGOs, they were going to change, but I am sure, again, there is a very good PR value for them in doing so. If that means they change, then that sounds great.

**Q85 Chair:** Do you believe the science is strong enough for us to be saying to the rest of the industry, "Follow Unilever's lead"?

**Dr Kinsey:** I think it potentially is—and Richard knows much more than me—

**Q86 Chair:** That is "potentially". Let us be a bit more specific than that because we have to be evidence-based.

**Dr Kinsey:** If I could explain, there has been a lot of—actually, Richard, you are probably better to talk about the risks of toxins on microplastics than I am.

**Professor Thompson:** You want hard and fast evidence and there is an absence of that at the moment. Microplastics are relatively new and our knowledge of them affecting the environment is limited. There are studies that show they have the potential to increase the transport of chemicals to organisms that ingest them. In the recent Convention on Biological Diversity report that I mentioned, it is interesting that over the last 10 years there has been an increase, and over 10% of the encounters that are reported between wildlife and plastic debris are now with microplastics. The trends are increasing and these are persistent materials. They are going to remain in the environment as these small fragments and are not necessarily going to behave in the same way as natural sediments.

In some instances, where you are talking about the breakdown of a larger item that has got into the sea inadvertently, it is not going to be possible to stop that. But, in other cases, where you are adding small fragments in a cosmetic product, there is an element of us needing to take the precautionary principle, because the quantities are quite substantial, they are not likely to be removed by sewage treatment unless we change our practice, and they are going to accumulate in the environment. There is evidence that the rate of ingestion is increasing and there are concerns from the point of view of physical and toxicological harm, when actually there is potentially no need for these items to be there in the first place.

It was an interesting point that you raised, Stephen, about what these items were doing there and what industry could do. Yes, they are primarily there, I understand, as an abrasive, but I also question—looking at the quantities involved—whether, in some products, they could actually be a bulking agent; there could be a cost saving from including relatively

inexpensive plastic. Rather than thinning the product down with water, which might make it less attractive, you can put in something that does not alter its gelatinous nature. I am a little curious, and maybe some more probing is needed, as to how much is actually needed in a product to achieve an abrasive action. I think there is more that industry could do.

**Q87 Chair:** More research is needed to measure the impact.

**Professor Thompson:** Definitely.

**Q88 Chair:** But because we know there is a detrimental impact and there is a very quick fix because they are unnecessary products, your position would be to encourage the industry users to exclude such uses.

**Professor Thompson:** Absolutely, yes.

**Dr Kinsey:** Yes.

**Q89 Chair:** Would you expect that to happen rapidly or see things phased out, and, if so, over what sort of period is it reasonable to put to them?

**Dr Kinsey:** I would imagine a phased approach would have to be taken for industry's sake. We cannot expect them to change products from one day to another. But, if you follow the example of Unilever, they have promised to phase out products within the next few years, so I would hope that other industries would follow that lead and use the same type of time scale.

**Q90 David Morris:** Is Government action necessary to stop or discourage the use of microplastics in personal care products? What should that action be? Is the EU taking any action on this particular subject?

**Dr Kinsey:** Microplastics are part of the Marine Strategy Framework Directive. Our position is that a lot of these microplastics are coming from a land-based source—that is us—and that will affect the Water Framework Directive. If we can get them before they even get into the sea, we will meet our Marine Strategy Framework Directive necessity. I think it is a question that we need to look back and stop things at source before they get into the sea and, basically, once they are, there is very little we can do to control them and very little we can do to mitigate the potential that we have. In both the WFD and the MSFD, the cautionary principle is stated as a factor that needs to be taken into account. So I think we need some kind of either Government push or action to try and get these particles phased out of the cosmetics industry in the first place.

**Q91 David Morris:** Why does the Marine Conservation Society believe that the Water Framework Directive is the best regulatory tool to ban microplastics?

**Dr Kinsey:** I think it is because, with the WFD, you are getting them before they get into the marine environment. The marine environment is our main concern. If we stop them before they are even entering our waterways, whether rivers or the sea, then half the problem is over.

**Professor Thompson:** They are very difficult to remove once they enter the marine environment, and

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it is far better if we can work backwards towards the source in terms of regulation.

**Q92 Chair:** In terms of what we have heard this morning, if one takes a water supplier, Thames Water, which we have been told is treated, re-treated and re-treated, presumably before it gets to the sea, microplastics have been further concentrated potentially in Thames Water. So should Londoners be more worried than the rest of the country?

**Professor Thompson:** I do not think this is an issue from a public health perspective. It is not a question of these microscopic particles returning via drinking water. It is a concern, at the moment at least, more for the natural environment, and I think it is a case of reducing those concerns.

**Q93 Chair:** Let us put it slightly differently. Is there any evidence that in basins like the Thames there is any greater detrimental effect than there is in others where the water supply is from a more natural source?

**Professor Thompson:** There is no evidence that I am aware of at all, but our knowledge base is much weaker about the effects of debris and microplastics as we move into fresh waters. Most of the research on debris has been done in the marine environment, and that applies equally to the work on microscopic particles. There has been relatively little from freshwater systems.

**Q94 Chair:** Should we be encouraging the Research Councils to think about that as an environment to work in?

**Professor Thompson:** That would be very worth while.

**Dr Kinsey:** I think we should too.

**Chair:** That has been intriguing. Are there any further questions from colleagues? I am very grateful. It has been a short session but extremely valuable. Thank you very much indeed.

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Monday 4 March 2013

Members present:

Andrew Miller (Chair)

Jim Dowd  
Stephen Metcalfe  
Stephen Mosley

Pamela Nash  
Sarah Newton  
Roger Williams

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**Examination of Witnesses**

*Witnesses:* **Ian Barker**, Head of Water, Land and Biodiversity, Environment Agency, **Nick Cartwright**, Environment and Business Manager, Environment Agency, and **Regina Finn**, Chief Executive, Ofwat, gave evidence.

**Q95 Chair:** Can I welcome our witnesses this afternoon? Unusually, we are running a few minutes ahead of schedule; this is a rarity. Can I start off by asking you to introduce yourselves for the record?

**Nick Cartwright:** My name is Nick Cartwright. I work for the Environment Agency. I lead on chemicals with respect to the Water Framework Directive.

**Ian Barker:** Good afternoon. My name is Ian Barker from the Environment Agency. I am responsible for water, land and biodiversity.

**Regina Finn:** I am Regina Finn, chief executive of Ofwat, the economic regulator for the water and sewerage sectors in England and Wales.

**Q96 Chair:** My first question is for Mr Barker and Mr Cartwright. Simply, how would you describe the current ecological and chemical status of our surface water? Is it meeting the current requirements of the Water Framework Directive?

**Ian Barker:** When we first started to implement the Water Framework Directive, it became very clear that severe pressures on the water environment from a whole range of sources meant that in many cases it was degraded. In bald numeric terms, across England and Wales only 27% of rivers meet the so-called good status—in other words, the sort of state that one would expect to support fish, bugs and plants that one would expect to see in that sort of river. Of the remaining 73%—the failures—8% of those are down to chemicals. The remainder are due to a whole range of other factors, such as changes to the ways in which rivers have been altered over time and due to a whole range of other chemicals.

**Chair:** Do you have anything to add, Mr Cartwright?

**Nick Cartwright:** No, nothing specific.

**Q97 Chair:** In that respect, what are the main reasons why water fails the chemical standards? One hears lots of generalisations in the media. Certainly where I live in the north-west, one sees massive improvements in, for example, quality in the Mersey. The days when the chemical industry just tipped their effluents into the river are long since gone, thank goodness. One sees, particularly in the fish life, huge improvements. What are the main reasons for failure today?

**Ian Barker:** You are quite right, Chair, in that rivers like the Mersey are much cleaner than they were two or three decades ago. That is down very largely to the way in which point-source pollution, sewage effluent and industrial discharges have been hugely improved

over the last 20 to 25 years or so. Much of that improvement has stemmed from investment made by the water companies, funded by their customers, but also by other forms of industry.

We are now seeing what was previously hidden, which is a whole range of pressures that are causing degradation of the water environment, which previously were hidden by the gross and acute pollution from those point sources. We are now establishing, as I said earlier, that the shape of many rivers has been changed by the way in which we have wanted to use them over time by virtue of navigation or flood defence, but we are also seeing sources of pollution that were previously hidden. Much of that comes from agricultural run-off—phosphates and nitrates—but we are also seeing a whole range of other pollution, for example, diffuse pollution, run-off from urban areas, roads and so on, bringing oils, greases and other chemicals into the water environment.

We are also seeing in parts of the country the impact of historic metal mining. Up in the north-west, the north-east, Wales and the south-west, for example, that legacy of metal mining dating back to Roman times has left many metals within sediments in the rivers, and they are also present as a natural background. We are starting to pick up all of those background impacts and starting now to have a better sense of what needs to be done to address some of those pressures.

It is important to recognise, in terms of that level of understanding, that we think about what is the impact on the ecology and biology. For example, a water course might be failing for some particular chemical, but the important thing is what that actually means for the biology. Perhaps I could ask my colleague to explain, with metals in particular, the way in which that understanding has helped us to better target some of our actions.

**Nick Cartwright:** Yes. One of the positive things at EU level is a recognition in terms of metal toxicity that some of the new standards they are proposing, which we very much support, are moved to bioavailable standards, which are much more ecologically relevant because that is the fraction of metal that is toxic to organisms. That is particularly important for the UK because we have naturally elevated background levels of metals in various areas and because of the mining activity. Looking forward, that will make quite a significant difference in terms

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of the amount of failures that we see, due, for example, to abandoned mines, and it will enable us to target areas that are meaningful in terms of ecological quality.

**Q98 Chair:** Regarding some of the things that you have touched on—dealing with my example of the Mersey or the industrial pollution, for example, or some of the pollution that has come from man-made sources in things we use on an everyday basis, such as tributyltin—we have seen massive improvements in those areas. They started to happen before the Water Framework Directive emerged. What has the Water Framework Directive done in a positive sense?

**Ian Barker:** You mean the urban waste water treatment within the Water Framework Directive?

**Chair:** Yes. One of the points I am trying to make is that Britain started a programme of improvement to water quality before the framework directive. So what has the framework directive itself achieved beyond that which we were already doing?

**Ian Barker:** Thank you for your explanation, Chair. To take a step back, if I may, the Water Framework Directive is based upon the eminently sound principle that, since rivers operate within a catchment, that is the most sensible basis on which to manage the water environment. It requires us and other member states to think about the way in which landscape and human intervention interacts with the water environment. That means looking at land use as well as at point sources of pollution.

With that in mind, when the Water Framework Directive came in—you will be aware that it operates to three cycles of river basin plans, and we produced the first set of plans in 2009—in the preparation of that first set of plans we bagged the historic improvements that we had seen over the previous 20 years and said, “What state now is the water environment in?” The monitoring and assessment that we did on the state of the water environment then showed that there was still quite severe degradation from a range of sources that had not previously been considered because their impact had been masked. We were not clear, necessarily, about where those impacts were coming from and what needed to be done to address them. Although we have one of the densest monitoring networks in Europe, it was looking at a limited range of pressures; so we needed to expand the range of pressures that the Framework Directive required us to look at to understand what the various impacts were.

We have carried out in the past couple of years about 13,000 separate investigations, so that we now have a much better understanding of the state of the environment than we ever had before—and, where that is a degraded state, what the pressures are on it and where those pressures have come from. We now have a very strong weight of evidence as to where the problems are and, consequently, what needs to be done to address them. That is what we will work through to the second cycle of plans.

In that second cycle we expect to see a much broader range of interventions, not just by the water companies—although there is a lot more to do in terms of cleaning up sewage effluent because we are

now starting to understand that domestic influences in sewage are having a big impact—but also further work to address pressures from other industrial discharges and land use from which many chemicals also reach the water environment.

I have talked about the interaction between land and water. To give you some sense of what that then translates into, we have been working closely with the agricultural community with the catchment sensitive farming initiative, which is now starting to show some real results in terms of improving water quality as a result of farming that is much more allied to the impact on water. This involves better targeting by farmers on the application of pesticides and fertilisers to ensure that they do the job that they are there to do and that they are not over-applied or applied in the wrong conditions and end up in the water course, where they are wasting farmers’ money and damaging the environment.

**Q99 Chair:** Can I just test you on that a little bit further? We have only one fertiliser manufacturer left in the UK; an awful lot is imported. The UK-based company has a policy at the sales end of working with farmers and testing soils before sales are made, to get away from the old idea that, if 1 tonne per hectare is good, then 2 tonnes is twice as good, which was a good marketing ploy but not very good environmentally. Are you suggesting that there are other companies importing that are not doing that yet?

**Ian Barker:** I can’t speak for other companies, but I do know that most agronomists will want to work with farmers in exactly that way, to help them understand their soil chemistry and the need for nutrients on a very targeted basis, often using GIS for pinpoint precision.

**Q100 Roger Williams:** The European Commission is recommending or proposing that another 15 additional substances be added to the priority list. Is that a good idea, and if not, why not?

**Nick Cartwright:** We agree that most of the substances included in the updated list are probably warranted on balance. The EC has a prioritisation process in place, which is fairly robust and follows well-established approaches in terms of evaluating hazard and exposure, to identify substances that pose the biggest risk across the whole of Europe. Part of that process includes a formal process that looks at monitoring results and modelling results to evaluate exposure. Substances can be deselected at that stage if the exposure is not considered wide enough, but we have concerns about some pharmaceuticals that were proposed. Seven pharmaceuticals were proposed, which entered the process at a later stage than that and went through to detailed evaluation. Most of those were screened out at that stage, but ethinyloestradiol and oestradiol proceeded through to proposals for standards. In that case, environmental exposure was concerned through data from research studies and extrapolated from product use across the EC to assume a certain level of exposure.

We would say that, given this approach is, perhaps, less rigorous and the consequences are really quite significant, we would not think that inclusion at this

point would be appropriate. For that reason as well, we would welcome the inclusion of a watch list whereby substances are monitored more uniformly across the EC as an improved approach to getting monitoring data around the substances in question and getting a better representation across the whole of the EC.

**Q101 Roger Williams:** You would say that the Commission's recommendations are not based on sound science, then.

**Nick Cartwright:** I would say, by and large, that they are soundly based. These substances entered through a slightly different route, and the evaluation of exposure was, perhaps, less rigorous. That is not to say that there are not some concerns about pharmaceuticals. We have detected low levels of pharmaceuticals both on sewage effluent and in rivers, but, by and large, there is not a lot of data available in pharmaceuticals to evaluate the risk to the environment.

Perhaps the exception is ethinyl oestradiol, which has been extensively studied. We did identify impacts on individual fish within the environment in terms of feminisation of those fish that were linked to sewage effluent and to substances like ethinyl oestradiol. In that respect, the main concern is about fish populations and the impact on fish populations. There is no evidence that those are in immediate danger of collapse. Given that the standards being proposed would lead to a quite widespread failure of those standards, we would see those as over-precautionary compared with the environmental evidence that we are seeing at the moment.

**Regina Finn:** I would like to build on my colleague's response. I do not pretend to have the sort of scientific knowledge of my colleagues in the EA, but I would like to come at this from a slightly different angle as the economic regulator. We regulate water and sewerage bills to end customers. One thing we have learned over the last 25 years is that the ability of customers and the willingness of customers to pay those bills have delivered massive environmental improvements over that time. It really has changed the environmental landscape along the lines that Ian and Nick have been talking about.

To ensure that we get that continued environment sustainability, we have to ensure that our sector in the UK, which is quite unique, is socially sustainable. That means that customers are willing and able to afford and pay their bills, because in the UK, uniquely in Europe, that is where the money comes from to pay for what the water sector does to play its part in these particular improvements. From our point of view, we have a clear duty to protect the interests of our customers in the long term, so it is important to us that we have environmental sustainability. From that point of view, the concerns expressed by my colleagues on the evidence are something that I would share very strongly.

You asked, Chair, if I can paraphrase you, what the Water Framework Directive has ever done for us. The one thing that it has done is to bring in a concept of disproportionate costs and it being important that measures we impose do not result in disproportionate

costs. That is a really important recognition for the UK. If customers stop being able to afford their bills, not only will we lose the environmental improvements of the future but we will go backwards. There is a balancing act to be had here. I would certainly support my colleagues in the EA in their call for greater evidence and a very evidence-based approach to whatever obligations we impose here, because at the end of the day customers are not having an easy time of it right now and the bills are painful for some of them.

**Q102 Roger Williams:** Thank you for that. We will be coming on to the question of costs in a minute. Mr Cartwright, is not the feminisation of fish only a concern if you are a fish? It is not a matter of concern for the environment, biodiversity or, indeed, a read-across for something that could be affecting the human population?

**Nick Cartwright:** It is not to say that we are not concerned about that. The understanding of fish population dynamics is quite a complex area and it is not fully understood yet. We continue to support research to better understand the potential long-term impacts on fish populations. Fish status is a component of the ecological status and is a cause of failure in a number of areas, but, by and large, those failures have been down to factors such as obstacles to the passage of fish, habitat, and impact of sedimentation—all of those things that can impact on fish populations—and are probably more urgent problems to sort out in terms of the health and sustainability of fish populations. These longer-term, more subtle effects may be relevant in the future in identifying waters that are most at risk in terms of endocrine-disrupting chemicals. The proposal at the moment would result in failure in a large proportion of waters, which we think is maybe not proportionate to the risks that we are currently seeing.

**Q103 Roger Williams:** You both spoke highly of the watch list. Can you explain how that works and why you believe it is a good thing?

**Nick Cartwright:** I will have a go at answering that. The idea of a watch list is to establish a limited list of substances on which the EC wants better information across the whole of Europe. Each member state would have a designated number of sites that they would monitor for a range of substances that have been identified at EC level for potential prioritisation. That would then mean that there is a more systematic way of monitoring information around a range of chemicals, which is great in theory, although there are some practical issues with it, which are around ensuring that monitoring data is collected at environmentally relevant levels. There may be timing issues in the amount of time that is needed to develop appropriate analytical techniques and the consistency of that across the whole of Europe to get good information and data. But the concept would be welcome in terms of getting a better understanding about which substances truly are the highest priority across Europe.



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**Q104 Roger Williams:** Do you want to add anything, Mr Barker?

**Ian Barker:** I would like to reinforce the point that we are certainly not complacent about the issue of feminisation of fish. Across the UK we need to ensure that we and others continue to monitor the situation in terms of fish populations, to better understand the way in which this situation might be changing, and assess the risk in terms of levels of concentration of these substances and their impact on fish. We must then be prepared to act as necessary. At the moment, the proposed levels appear to be very precautionary and not based upon sound evidence.

**Q105 Stephen Mosley:** We have seen the evidence from the Environment Agency suggesting that it might cost £27 billion to remove these oestrogen products from waste water. We have also seen evidence from NERC disputing that figure, saying that it could be done at an awful lot less cost. You are from the Environment Agency. Could you justify that £27 billion figure, please?

**Nick Cartwright:** We were asked to provide advice to DEFRA during the preparations for the directive. Towards the end of 2011, we did some modelling exercises to identify the extent of the potential failure against a range of different standards that might come through. Against the proposed EC standard, we estimated that about 11,000 km could potentially fail, and up to about 1,300 sewage treatment works could be contributing to that level of failure. There was a UK endocrine-disrupting demonstration programme previously as part of our national environment programme, where the water industry looked at treatment options and the cost of different treatment options for endocrine-disrupting chemicals. We drew on that costing information to provide some initial costings about the potential size of the challenge for the water industry.

The endocrine-disrupting demonstration programme included various pilots and some full-scale demonstrations of some more advanced technologies, which included advanced oxidation treatment and granular activated carbon. Both of those required fairly clean effluent to be effective, and that was the scenario that was tested at that point in time. Our assumptions included an assumption that you would need to clean up effluent before the final stage of treatment was applied. That was a significant proportion of the overall costs that we estimated.

As time has gone on, there is currently a chemicals investigation programme being undertaken by the water industry. It is a very substantial programme of about £25 million, which looks at a whole range of chemicals. It looks at about 70 different substances at over 150 sites and three quarters of a million actual chemical analyses, and it looks at a range of different treatment plants, including pilot technologies, some of which look at piloting treatment without the need to clean up effluent further before you apply the final stage. Some of those look promising and if these could be more generally applied, that could reduce the costs. But, at the end of the day, that is at a pilot stage; it has not been demonstrated at full scale. Those

would, therefore, be indications coming out of that programme at this point in time.

As our knowledge improves, we would expect our cost estimates to change to some extent. Also, from these sorts of programmes, you find that when you go out and apply things in reality, actual treatment technologies that can be applied on the ground will depend a lot on site-specific circumstances. They will depend on the range of chemicals that they have to deal with. Other factors such as space will come in. You will end up with a range of different technologies that have to be applied at site-specific places. So you have to build up a more detailed understanding of costs as you go through this process.

**Q106 Chair:** I know that £27 billion sounds like a very precise figure, but I am slightly baffled in your answer to Mr Mosley's question as to where you got that figure from. You said it was modelled. Was that model subject to external peer review or was it a back-of-a-cigarette-packet calculation? What was the calculation that resulted in £27 billion?

**Nick Cartwright:** We have been developing models for some years around these different chemicals, which have also been refined through the latest information coming out from the water industry. Some of the models were developed by CEH around the potential emissions from sewage treatment works. That latest modelling was on the back of an endocrine-disrupting demonstration programme, which was a substantial programme by the water industry to understand levels that were reaching the environment and treatment options. From those models, we could estimate the extent of failure. We used the best information at the time to look at those models and evaluate treatment plants and the degree of treatment improvement that they would need to estimate the costs. Those costs were based on the information that was available at the time.

**Q107 Chair:** So where is the gap between you and NERC?

**Nick Cartwright:** I have not seen the NERC evidence. As I said, new information is coming out of the current chemicals investigation programme that the water industry is undertaking. As part of that investigation, they are looking at pilot plants that use higher doses of, for example, advanced oxidation techniques—this is going beyond the current experience—which, if successful in terms of removing these substances, means that you can miss out a stage of the treatment process. If you can miss out that stage of the treatment process, it would cut out a proportion of the costs.

**Q108 Stephen Mosley:** Another way it has been suggested that costs could be reduced is if there is better control of the substances at source. Would that reduce the costs from the waste water perspective, because I guess that, if you are providing a waste water plant, you have got to cover these chemicals in case one puts them in rather than assume that there are none coming in? Does control at source reduce costs?

**Nick Cartwright:** It would depend on the chemical in question. Are you focusing specifically on

pharmaceuticals? There is a range of chemicals, some of which are already controlled at source. In terms of a broader picture for the water industry, one of the things that have been established through this chemicals investigation programme is that household use of chemicals is quite a significant source of chemicals looking forward and, therefore, through sewage treatment works. Source control may provide an option for some of those different chemicals. It depends on the type of use that you are talking about. In terms of the treatment options, again, those vary depending on the types of substances in question. You would, quite often, need a fairly substantial reduction in source before that would allow you to adopt different treatment options if you want to get the same quality.

**Q109 Stephen Mosley:** You say that some substances are currently controlled at source. Do you see those substances coming through into the waste water?

**Nick Cartwright:** Yes. Those are some of the significant challenges coming forward. There are some substances that have been banned for some years now that we still see coming through sewage treatment works. Some of the proposals for more stringent standards for those would be quite challenging as a result.

**Q110 Stephen Mosley:** Ms Finn, we talked about the cost and the impact on the consumers. Is there any action that Ofwat can take to help reduce the costs that are passed on to consumers?

**Regina Finn:** Yes. A number of things are happening here. The first thing is that we want to get the best evidence base we possibly can, as my colleagues have talked about, to decide on what the best environmental priorities are and where we need to target our resources.

The next thing is that we need to get the best possible solutions to that, which may include, where appropriate, source control, as you have suggested yourself, and we need to ensure that innovation, new technologies and new ways of doing this at a lower cost can all be deployed.

At the end of the day, though, whether it is £10 billion, £20 billion, £30 billion or whatever it is, it is a very big number. Over the last 25 years, this sector has invested £108 billion in delivering a clean environment and safe water to all our homes. Of that figure, £23 billion is driven directly by environmental improvements. It is a regular investment programme of about £20 billion to £22 billion every five years, so another £20 billion on top of that is a big number. Whatever the number is, it looks like a big number. Those steps of ensuring that we get the best possible evidence base, prioritising and deciding what are the most important things, and then trying to encourage and incentivise innovation for the best lowest-cost delivery, all need to be part of the programme.

As far as we are concerned, our job is to protect customers now and in the long term. So we set price limits on what the companies can charge their customers. When we come to do that, we do it having regard to the statutory obligations that the companies

have to deliver—that is one thing—but also the ability of customers to pay and the ability of companies to finance that investment over time.

We will challenge companies very hard on how they go about delivering solutions. We work with the Environment Agency in the lead-up to that process, where we are challenging companies to ensure that we have a good understanding on those first points—the evidence base and the priorities—so that we are not putting customers' bills up for something that is not really well evidence-based and is going to deliver in the long term. So there is something that we can do. We need to work with colleagues and experts who know more about the science of this, but at the end of the day our job is to ensure that we have a sustainable water sector—and that means sustainable bills as well as a sustainable environment.

**Q111 Chair:** Before we move on, Mr Cartwright, you referred to controlled substances that are still coming through into the system. Can you give some examples as to where such events are occurring and in what sort of concentrations?

**Nick Cartwright:** Okay. The most problematic substances are the brominated flame retardants. These were banned back in 2006. The chemical investigation shows that they are still coming through. That is likely to increase the level of failure we see against current standards, but, more importantly, with some of these substances, what we are seeing in the current proposals are examples of the types of substances persistent in the environment and that potentially accumulate in biota and in the food chain. For a lot of those substances, the EC is trying to set standards in biota. That means that those standards are really quite challenging. Also, at the current point in time there is no agreed approach to interpret and implement those at European level, although it is sensible in concept in trying to set things in biota that better reflect the potential for accumulation.

The consequence is when we try and estimate the risk from those substances. We currently use an equivalent level in water that is very low. Although we can detect substances at relevant levels in sewage effluent, we would not be able to detect them after they have been diluted down in the receiving water, although we can model that. Based on that, we predict quite an extensive failure of the standards, but we would not currently be able to confirm those levels in the receiving water. We would want that sort of certainty before we went forward with any expensive measures.

**Q112 Chair:** Are there any areas of the country that are particularly bad?

**Nick Cartwright:** Generally, we would expect the south-east, the midlands and areas where you have a reasonable amount of sewage effluent going into rivers in lower dilutions. Generally, lowland rivers would be under more risk than some of the other areas.

**Q113 Stephen Metcalfe:** Good afternoon. With regard to pharmaceutical pollution, going back to the point that Stephen Mosley raised, where do you think

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the balance lies between source control and end-of-pipe treatment?

**Ian Barker:** This is starting to get into an area that is really about Government policy. There is a balance of risk, clearly, between public health, on the one hand, and environmental risk and impact on the other. Our role is to advise Government to the best of our ability on environmental risk, but it would not be a matter for us to determine the way in which pharmaceuticals should be managed.

**Q114 Stephen Metcalfe:** Does anyone want to comment further?

**Regina Finn:** From our point of view, again coming from the perspective of the economic regulator, it is very important that all of these avenues are explored, because the end-of-pipe solution essentially loads all of the costs on to the water customer, even where the water customer is not the one responsible for putting whatever it is that needs to be cleaned up into the environment. That is not necessarily fair. So you would expect an economic regulator to say that we would like to see fairness that does reflect the “polluter pays” principle. At the same time, we think that there is a role for the water industry that we regulate to work sometimes in partnership to help with that source control.

It is particularly tricky in terms of pharmaceuticals; I understand that. But, for example, in the current five-year period, about £60 million is being spent by the water companies on catchment management schemes, which involves working with farmers to prevent pollution getting into water streams in the first place. The reason for doing that is that it is a bit innovative and risk-based. We need to see if it will work. If it does work, it reduces the cost to water customers because it reduces the end-of-pipe solution. If it does not work, then, obviously, customers end up paying twice. They end up paying end of pipe and at source. So there is a bit of experimentation here, but it is important for companies to innovate and to play their part in source control. We would be keen to see that happen across the economy and not just with the water sector.

**Q115 Stephen Metcalfe:** You said that that project has been in place for five years.

**Regina Finn:** Water companies invest in five-year periods. We set prices for five-year periods. In the current five-year period, which is 2010–2015, when you put together the business plans of all the companies, 108 catchment management schemes were being developed and the total cost of that is around £60 million. Water customers are paying that cost, and we allow that cost to be passed through because we expect that innovation to deliver benefits, both from the point of view of giving evidence of doing more in the future to reduce costs at the end-of-pipe solution and also some will be winners and will deliver those benefits now in this five-year period. That is the water industry taking a more innovative approach to thinking about how it delivers for the environment and its customers at the lowest cost overall.

**Q116 Stephen Metcalfe:** But we won’t know the results of that until 2015 at the earliest.

**Regina Finn:** Some of them have been going on longer than that. Some of them started in the previous five-year period. Wessex Water, for example, published a report on one of their catchment management schemes, which was very positive from a cost-benefit point of view for customers. A lot of these are experimental, yes, and if you experiment you should expect some to fail, some to succeed and for us all to be able to learn lessons from those. So we have some schemes where the evidence coming out is positive, but a lot of these are quite innovative and they will take a number of years to deliver evidence.

**Stephen Metcalfe:** Mr Barker, you look like you want to add something.

**Ian Barker:** Thank you. I would just like to build on what Regina has said, which we certainly endorse very strongly because we recognise that the catchment-based approach has the potential by working with farmers and land managers to reduce pollution inputs into the river in a way that may be more cost-effective than conventional solutions. In parallel with that, we are working with the water industry to explore how our regulatory regime can reduce regulatory burden and create space for them in which to innovate. In other words, we would conventionally permit every discharge that a water company makes, with very specific parameters for each discharge.

By taking a step back and taking a catchment-based approach, we are saying to companies, “If you think about all your various discharges in the catchment, the outcome you want to achieve in this catchment is this”, whatever that might be for a particular chemical, and then the company can flex its various waste water treatment works and work with land managers in whatever it believes to be the most cost-effective solution to deliver the outcomes that we are looking for on behalf of Government and that give the best value to their customers.

It is important to stress that here in the UK, and certainly in England, we face particular challenges that do not manifest in quite the same way across the rest of Europe. The challenges we face are that we have a high density of population, relatively small rivers with relatively low dilution factors, and when one gets a number of towns or cities along a river one gets a cumulative impact of many of these persistent substances that bioaccumulate.

In addition—you may have seen reference in the media today to our work on climate change—we have suggested that, by the 2050s, average summer flows in many of our rivers will reduce by between 50% to 80%. In other words, dilution in the future will be very substantially reduced compared with where it is today. That, then, suggests that the water industry needs to take a strategic view in terms of the management of its waste water networks and its waste water treatment and consider how it will operate, potentially, with an increased population and a greater load on its works and reduce dilution capacity. There is a real challenge for the future. It is important that we use the best possible evidence base in which to

drive the standards that will be needed not just today but in the future.

**Q117 Stephen Metcalfe:** Some of the innovation that is going on is a positive step, you would think.

**Ian Barker:** Very much.

**Stephen Metcalfe:** So there is a balance to be struck.

**Ian Barker:** Professor Martin Cave, in his review on behalf of DEFRA on competition and innovation in the water sector, identified that much of the innovation within the water sector has been driven by higher water and environmental quality standards. Very often, the innovation resulted in capital-intensive solutions. The way in which Regina has described the catchment-based approach would suggest that non-capital-intensive and non-revenue-based solutions may well have more of a part to play in the future, but I think it will need to be a mix of solutions. It is very important that we see more applied research to try and tackle some of these problems, which we can see coming not very far away.

**Regina Finn:** Just to build on what Ian said, the issue of innovation and finding smarter ways certainly to manage our waste water, but, also, frankly, to manage our whole water resources in a sustainable way, is very much at the heart of the work that Ofwat is trying to do on changing how we regulate. It is at the heart of the Government's Water White Paper. It is certainly at the heart of the draft Water Bill. It is across the entire spectrum of usage of water and the treatment of waste water that we need more creativity in innovation. I can assure you that it is certainly very much on our agenda.

**Q118 Stephen Metcalfe:** Thank you for that assurance. There are those who are concerned that adding pharmaceuticals to the priority list will damage our innovation in a whole different area, so we will have clean water but we will not necessarily get the new stream of drugs that we need. Is that something that you are taking into account, or is it something that you do not feel is part of your remit but is just a question of dealing with Government policy and a cleaner environment?

**Ian Barker:** Our role is very much as an adviser to Government and what you describe is a matter of Government policy, I would suggest.

**Q119 Stephen Metcalfe:** I suspect that you will give the same answer to my next question, which is about labelling pharmaceuticals better so that we know what is in them and whether that would drive out some of the chemical pollutants. Again, you would say that it is Government policy to look at the labelling issue.

**Ian Barker:** I would—not specifically about pharmaceuticals but generally about everything that we use and consume. There is a case for some whole-life impacts to be considered, whether it is domestic cleaning products or whatever. As I outlined a moment ago, we face a great deal of pressures on the water environment on a very crowded island. Constantly reverting to the challenge we place on the water industry at wider expense may not be the most cost-effective or sustainable way to go in the future.

**Nick Cartwright:** In relation to other substances, we have looked at enforcement on source control restrictions. We do have a role on some of those. In fact, we helped lead an EC-wide study of PAHs, which is one of the substances in question, in tyres. We involved other member states in that to see how effectively that could be enforced. Most recently, we worked on another of the substances of interest—nonylphenol. One of the areas that we identified there was an understanding of global supply chains for some of these substances, because some of the issues we were finding were associated with the use of chemicals in imported goods and how well some of the companies understood their supply chains. That is one of the difficult areas in terms of source control that is, perhaps, relevant, whereas when we looked, for example, at UK manufacturing they were pretty compliant.

**Q120 Chair:** Just before we move on, it would be reasonable to expect pharmaceutical companies to proactively encourage people to dispose of pharmaceuticals in a safe manner, not just simply by flushing them down the loo. Similarly, it would be perfectly reasonable for people like you to be praising companies, for example, like Unilever phasing out microplastics. Should there not be a proactive approach on your part to encourage companies to engage in environmentally better practices?

**Nick Cartwright:** Yes. We do engage in some of the green chemistry forums. We would actively seek to encourage developments in less harmful substances and for companies to take the initiative in moving that forward. So, yes, we would like to encourage that.

**Q121 Sarah Newton:** Why do you think England faces more of a challenge in meeting these potential obligations compared with our European neighbours?

**Ian Barker:** Very much for the reasons that I outlined in terms of density of population, the fact that we have relatively small rivers with lower dilution, and we have cumulative pressures going down a river. There is a slight Catch-22 here in that we are, probably, in many ways more aware of the pressures than in other parts of Europe. From our perspective as a regulator and delivery body, we are very well placed in Europe to be able to join up all the dots, essentially, to help ensure that we have a better understanding of the scale of the problems and the challenges, and to advise DEFRA accordingly.

Also, we have a close working relationship with the water industry that allowed us to jointly develop the chemicals investigation programme. As Nick said earlier, we have had three quarters of a million results from that, which then helps us to understand which parts of the country are most at risk from various chemicals, and we can better target, through our understanding, where those risks are coming from. Then we can go through, as we discussed earlier, options for the treatment of pilots and so on.

By putting all that lot together, with our basic geography and as our role as a regulator and our relationship with the water industry, we face great challenges, on the one hand, but, on the other hand,

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we are able to ensure that we are as well placed as we can be to face those challenges.

**Q122 Sarah Newton:** Thank you. You have touched on my next question because you started to talk about the different regions within England. What are the particular challenges facing particular regions in being able to meet the new standards?

**Ian Barker:** Different parts of the country face very different pressures in terms of the impact of a wide range of chemicals on the natural environment. Agricultural chemicals, pesticides and so on are very clearly across East Anglia and the south-east. Those parts of the country typically have alkaline rivers, which are more at risk from phosphate pollution. Consequently, we struggle more with that. More generally, we are increasingly seeing chemicals derived from domestic use as the biggest challenge wherever there are major conurbations, such as the midlands and the south-east, and metals pollution in the south-west, Wales and the north of England.

**Q123 Sarah Newton:** That is very good for understanding the different impacts around the country. How are you going to enable—maybe this is a question more for the regulator as well—the different regions to overcome those issues in meeting their obligations?

**Regina Finn:** Working backwards, the water industry in England and Wales is regional in that companies are regionally based so they do face different circumstances, and we are very experienced in dealing with that. When I talked about £23 billion being invested and driven directly by environmental improvements over the last 24 years, that is differentiated depending on the challenge in the particular company's area. It is very different. With the work that Ian talked about, in terms of weather volatility, changing population patterns and usage patterns, that differentiation may become even more so in the future. So we are ensuring that our regulation is enabling companies to meet the challenges facing their customers and their regions, which could be very different in different parts of the country.

**Q124 Sarah Newton:** The different types of chemicals cause different issues in different places; so you would look on a regional basis to see what those challenges were. This is definitely not a one-suit-fits-all situation.

**Regina Finn:** Yes. The enforcement approach that the Environment Agency is moving to is incredibly helpful with that in allowing companies to take whole-catchment quality into account rather than the rigid end-of-pipe standards. That aligns very much with our regulatory approach of removing capex bias and giving companies more choice over the solutions that they actually deliver in order to get to the right outcome.

**Q125 Sarah Newton:** If the catchment was in one water authority's area but the outflow and the treatment was in another water company's area, how would you cope with that?

**Regina Finn:** Company regions are, generally, historically based around environmental boundaries, so that is a reasonably good starting point. It does not mean that companies do not need to deal with each other—that is true—both in terms of waste water treatment but also in terms of water usage, where the water source might be in one company's area and the need is in another company's area. Again, that is not a new thing. However, co-operation across borders from a water point of view—interconnection from a waste water and discharge point of view—is something that we would encourage where the right way of dealing with it is to have a collaborative solution or for one company to service another. It is not brand new, but it might be a little bit uncomfortable for regional companies that are used to dealing with their own region. In so far as that needs to be part of the solution, we would want to make sure that our regulation allows and encourages that innovation. I would say that the starting point—Ian can talk more about this—is that the boundaries generally did come originally from the environmental regions.

**Ian Barker:** The 10 major water and sewage companies evolved from the regional water authorities' privatisation in 1989, and their boundaries follow river catchments. That makes the job of joining up that Regina described that much easier.

**Q126 Chair:** It does not quite work out, does it? In my own constituency, I have United Utilities, the Dee Valley Water Company, which is also in Stephen's patch, and some of my constituents dispose of their sewage to Wales. That is very confusing for the customer.

**Regina Finn:** We have 10 water and sewerage companies, as Ian said, but we have 20-plus water companies, so there are some companies that are water-only companies that sit within a water and sewerage company's area; their customers get their water bill from one company and their sewerage bill from another company. In many cases the companies collaborate and the customers get a combined bill. You are absolutely right that geography and, particularly, national boundaries do not necessarily always match up.

**Q127 Jim Dowd:** Can I look at innovation and investment in technology? I think this question was aimed originally at the Environment Agency representatives—I don't know who wants to take it—but do water companies spend as much as they should on research into innovation, and if not, why not?

**Ian Barker:** When Professor Martin Cave looked at the water companies, he found a significant variation in the amount of spend individually that they put into research and development. He also concluded that many companies appeared to act as recipients of other's research, so they would be willing to implement rather than lead from the front. It does vary very much from one company to another. My sense is that, looking at the future challenges from climate change, population growth and an increasing concern about chemicals, the water industry will need to work hard, either directly or through research institutes, to

ensure that it is well placed for some of those future challenges. I would not like to comment on whether it is spending enough, but I would throw down the gauntlet in that it needs to ensure that it is able to respond to future uncertainty and future challenges.

**Q128 Jim Dowd:** The Council for Science and Technology recently stated that “the water industry’s performance in terms of investment in technology and application of innovative solutions is highly variable between companies in both clean water delivery and in wastewater and sewerage treatment”. Has much changed in the industry since that report appeared, for good or ill?

**Regina Finn:** When you say “since that report appeared”—

**Jim Dowd:** I am sorry. I meant since the Council for Science and Technology reported on that.

**Regina Finn:** I am not sure when that report was; so I am not sure what time period we are talking about. Let us be very clear. This is not necessarily the economic regulator saying this, but there have been a number of studies into the water sector, and Ian mentioned Martin Cave’s report, which had questioned whether this is an innovative type of industry. Those questions have certainly been put forward.

Let us also be clear that what the sector has delivered over 20-odd years has been quite impressive in terms of the outcomes. But—and this is echoing what Ian said—the challenges of the future are quite different from the challenges of the past, and a steady-state delivery may not necessarily be what this sector needs. I would say that there is a need for this sector to become more innovative, and that means throughout the entire value chain—the supply chain in particular, which Ian mentioned. Innovation often comes from the supply chain—the people who supply the technology, who do the construction work—and then the water industry may adopt that. Encouraging innovation in the supply chain and in the companies themselves is something that we do need to focus on. From our point of view, we are changing the way we regulate in order to deliver greater incentives for companies.

I mentioned the issue of catchment management and getting companies to innovate. When you innovate, that means you try something, which means that sometimes it works and sometimes it does not. We are regulating differently in the future to take away the bias that companies have towards capital expenditure, for example, which allows them the freedom to innovate in revenue-based expenditure. That, along with the Environment Agency’s more risk-based approach to enforcement, gives the companies a stronger incentive to innovate and to rise to these challenges in the future.

**Q129 Jim Dowd:** Do you think that that approach will deal with the problem that Mr Barker outlined, namely, that some companies are prepared just to hang back and benefit from the efforts of others and there is not much benefit to those who are pioneers in this field?

**Regina Finn:** When I mentioned that we want to change the way we regulate to a degree, we are in consultation with the industry about the number of changes that we are making because we have heard that the companies are biased towards traditional capex solutions so we are changing those incentives on the companies. We are allowing companies greater freedom in how they do something so that what they deliver is important for their customers. They will have a contract with a customer; a customer pays its bill and the company delivers certain things, such as safe, clean drinking water, a clean environment and possibly other things like protection against sewer flooding. There is a list of things that they deliver. But we are allowing the companies more freedom in how they do that, and the incentive is there for them to find smarter and cheaper ways to do that because then that company performs better. So there are incentives there. The well-performing companies should do well out of that regime, and poorer-performing companies will be incentivised to catch up. We have a number of companies—that is a benefit—which means that companies can differentiate themselves. They can perform better than others and they get an actual advantage out of that. If they were all homogenous in one bunch, then you do not get anyone outperforming. We want to encourage that outperformance.

That is also, frankly, a key factor in the Government’s Water White Paper and the draft Bill, because we know that innovation comes where companies have the opportunity, incentive and drive to innovate. In Scotland, for example, business customers are able to choose their water supplier. What we have seen is that, since then, the Scottish regulator has estimated that by 2021 customers will have saved £55 million in terms of water efficiency because companies are innovating and delivering better services to their customers. Behind a lot of the changes in regulation, the Water White Paper and the Bill is the drive to give companies both an incentive and ability to innovate, and I think that is very important.

**Q130 Jim Dowd:** It is overwhelmingly carrot rather than stick, then.

**Regina Finn:** Yes. If you look at where we have been, 25 years ago we had a reputation as the dirty man of Europe. Basically, you need a big stick to get to minimum standards. Although there are still issues, we have made quite a pretty impressive improvement, and what we need is the carrot for greater performance to go further than the basic standards.

**Q131 Jim Dowd:** Could the projected costs of controlling priority substances be reduced by innovation in water treatment technology?

**Regina Finn:** From our point of view, we would absolutely hope so. This is the province of the water industry itself to find more innovative ways of delivering at the best possible cost. I mentioned earlier that there are a number of things we need to do. We need to get the best possible evidence base, prioritise the things we want for the environment and customers and get the best solutions, which includes innovation by the water sector. We hope that our regulatory regime in incentivising them to do that will help

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reduce costs. At this stage, that is work that the industry still needs to do.

**Q132 Jim Dowd:** The Commission's proposal for the extra 15 priority substances could be a driver of that innovation.

**Regina Finn:** In the first instance, having the right evidence base to ensure that we prioritise the right things for the companies to innovate on is very important. I would echo what my colleagues have said about us being in a very good position in the UK to help inform that evidence base. We should try and get that as good as we can so that, indeed, standards could help drive innovation, but we want to make sure that they are the right standards on the right substances.

**Jim Dowd:** Let me point out that the Council for Science and Technology report that I referred to was March 2009, but, as you have clearly not noticed any considerable change in the recent past, I assume that it has had no impact on the water companies at all. I leave that just as an idea for you.

**Q133 Stephen Mosley:** In Ofwat's written evidence, you say that the Government should "consider all of its options to mitigate the impact of these proposals". What are its options?

**Regina Finn:** The Committee has helpfully asked some questions around what those options are, which include the options around source control, for example, and the options around things being on the watch list first so that the evidence base is improved and we get a better understanding of the choices that need to be made. Then we can consider prioritisation, and then we can consider cost. It is that range of issues. The reason why, in our evidence, we said that that is particularly important is because we are quite unique in the EU in that, at the end of the day, if we ask our water sector to deliver some environmental improvement, it is customers' bills that will pay for that. It is not smeared across taxpayers. It is paid for by customers' bills. I suppose the reason why we said in our evidence that we wish to explore all the options to mitigate costs is because, right now, customers' incomes are going down and bills going up makes life very tough, and it is important that those bills keep being paid. That is the revenue stream that is going to keep paying for the environmental improvements over the long term for today's customers, their children and their grandchildren.

**Q134 Stephen Mosley:** It is being discussed in May, isn't it, in the European Parliament? This question is to all of you. How well do you think that the

Government have engaged with the EU in the drawing up of these proposals?

**Ian Barker:** It is fair to say that the Government have probably led the way in terms of mounting an evidence-based challenge against some of these proposals. They have always pressed for an evidence-based approach within Europe. My sense is that they have worked with other member states to help them understand the evidence base and the consequences of a particular course of action. I am sure that colleagues from DEFRA will be able to expand on that, but we have worked very closely with DEFRA to support them in terms of providing them with an evidence base to help them in those discussions. As I say, this goes back to the broader perspective that we have, which I hope they have found helpful.

I know that, Nick, you have been involved in some of the working groups. Do you have anything to add?

**Nick Cartwright:** Yes. As well as supporting DEFRA with evidence in the direct discussions around these proposals, one of the other things we do is work on a number of the key working groups in Europe on chemicals. One of the things we bring to those discussions is a broader perspective as a regulator because, in terms of the standards being proposed, we also end up having to implement them. We have that broader perspective as well. Again, we are very robust about ensuring the scrutiny of the widest possible evidence for any proposals that are coming through. We have been quite influential, for example, in getting consideration of field-based data during the standards derivation process potentially to reduce the degree of safety margin that is built into standards. I also mentioned earlier about moving towards bioavailable metal standards, which are more ecologically relevant. Influencing at that stage and being involved in the technical debate at that stage is also very valuable as well as influencing the direct negotiations. A lot of the work that we have done with the water industry around the chemicals investigation programme has put us in a very good position to understand what is coming out of waste water treatment works. In parallel with that, we have had this major exercise in terms of developing and bringing that into environmental models. As a consequence of that, we have been able to present what the risks look like for different substances and what the potential scale of those is in a way that other member states have not been able to at this stage. That has assisted DEFRA in terms of them pushing forward their evidence-based approach.

**Chair:** Can I thank you very much for your time this afternoon? It has been very interesting.

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## Wednesday 6 March 2013

Members present:

Andrew Miller (Chair)

Stephen Metcalfe  
Stephen Mosley  
Graham Stringer

David Tredinnick  
Roger Williams

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### Examination of Witness

*Witness:* **Peter Gammeltoft**, Head of Unit, Env.01, Protection of Water Resources, European Commission, gave evidence.

**Chair:** Mr Gammeltoft, I welcome you to our session. I am not sure whether you have appeared before a Parliamentary Select Committee before.

*Peter Gammeltoft:* No.

**Q135 Chair:** Our task is to focus today on the issues of water quality, looking particularly at the European regulatory structure, so we will be pressing you on a few questions on that. First, welcome to our hearing. For the record, I would be grateful if you would introduce yourself.

*Peter Gammeltoft:* Good morning, and thank you for the invitation to come here. It is always very useful for those of us who represent the European Commission also to discuss directly with those who take decisions in the member states. My name is Peter Gammeltoft. I am head of the unit for water protection in the directorate-general of the environment of the European Commission.

**Q136 Chair:** Thank you very much. First of all, could you tell us the main conclusions of the Commission's recent review on priority substances?

*Peter Gammeltoft:* Let's start at the beginning. We have a Water Framework Directive that imposes on the Commission the obligation to review regularly a list of priority substances. It is clear from that directive that this review is based on risk, so we are asked to come up with a review, on the basis of risk, of substances that can pose a risk to or via the aquatic environment. This is what we have come up with.

To sum up the results of the latest review, which is currently under discussion between the European Parliament and the Council of Ministers, to the existing list of 33 priority substances we found that 15 additional substances merited inclusion. A certain number of substances merited upgrading to so-called priority hazardous substances, which are substances that pose a particular threat to the environment and for which in the longer term a phase-out is required. We also came up with some more technical issues. When you have a list of substances and you present these in maps, if you always update the list, you fail on the new substances. So we have addressed a number of presentational issues to make it clear what overall water quality is, but at the same time allowing for presentation of progress made over the past so that you can see that progress is made on substances that have been included in the past.

We have also proposed the addition of something new, which we have called a watch list. This is a list of

substances where we feel that we have insufficient evidence of their presence in the environment. We have a bit of a chicken-and-egg problem here. The substances where there is an obligation to monitor are those that are already listed; for substances that are not listed there is no obligation to monitor, and therefore data are more scarce. The idea is that one could have a dynamic list where one could put on and take off substances where there is a founded suspicion that there may be a need to regulate; so you can have them on for a period of time and take the monitoring data into consideration in further reviews of priority substances.

**Q137 Chair:** So that we are using the same terminology here, which is sometimes quite difficult in technical discussions across the 27 countries, when you use the word "risk", you are applying it in the way we do: it is hazard multiplied by exposure. Is that your approach?

*Peter Gammeltoft:* Yes; that is what we mean by "risk".

**Q138 Chair:** Which do you consider to be the most important elements of the Commission's current proposals to change the priority substances list?

*Peter Gammeltoft:* I think they are all important. Updating the list of substances is a routine matter. The patterns of use of chemical substances change over time; the emissions to the environment change over time. Therefore, it is natural that the list of priority substances will have to evolve over time, and this can, in principle, include adding new substances and taking substances off the list. I consider this to be a routine matter. If you are fishing for anything new, we have included three pharmaceutical substances in this review for the first time. We have a number of industrial chemicals, pesticides and biocides, some of which have already been phased out; we have a number of plasticisers for chemicals and flame retardants, and things like that, in the list. We have not had pharmaceuticals before, and this is a new element in this proposal.

**Q139 Chair:** In terms of your previous response to me about the definition of "risk", is there something that stands out as the top priority that we must do quickly?

*Peter Gammeltoft:* When you deal with chemical substances, they are all different, so they pose different kinds of risk. Some are toxic in the very



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classical sense of the word, like cyanide, arsenic or something like that. Some of these are so-called endocrine disruptors, which means they interfere with the hormone regulation systems in animals and humans. This is an issue. Two of the pharmaceuticals that we have included are hormone substances, but there are also other substances already on the list—industrial chemicals—that have this kind of effect. It is not new but it is important.

**Q140 Graham Stringer:** What process did you go through to select the priority substances, and how did you collect and evaluate the evidence?

**Peter Gammeltoft:** We live in a less than perfect world in terms of information about risk of chemical substances. As I pointed out initially, the Water Framework Directive asked us to do it on the basis of risk. If you look in the detail of the provision, all of this refers to outdated regulations that have been replaced by REACH and by the pesticides regulation, the biocide regulation and so on. We have based ourselves on the information available through those systems, but we are not at the end of the road. REACH is still being run in. There is a schedule for assessing chemicals under REACH, which runs until 2018, so we are not there yet. That is one stream of evidence that has been brought in.

Another stream is evidence from monitoring in the member states; evidence from existing risk assessments made outside the REACH framework; and evidence provided by stakeholders and member states. All of this has been run together in an expert review. Under the Water Framework Directive we have a so-called common implementation strategy, which is a joint venture between the European Commission and the 27 member states of the Union. In this common implementation strategy we have associated stakeholders. A lot of industrial stakeholders but also NGOs and intergovernmental organisations participate in this. We have formed an expert group that has been charged with taking forward the prioritisation process. We have been assisted in this by the European Commission's joint research centre, which has been taking care of producing documents and so on for discussions in the expert group.

In terms of the methodologies that are being used, we have elaborated methodologies that are REACH-consistent, and we have guidance on how to assess EQS, which is consistent with the approach taken in REACH.

On prioritisation, we have consulted with the Commission's Scientific Committee on Health and Environmental Risk—the so-called SCHER—and their remarks have been taken into account in finalising the methodologies.

Finally, all of the limits proposed for the so-called EQS values have been consulted on with the Scientific Committee. That is basically the scientific basis and process for identifying the substances and proposing quality standards.

**Q141 Graham Stringer:** The British pharmaceutical industry is not impressed by that process. In evidence to us, it says that the process you have gone through

lacks the normal scientific rigour. Is all the evidence you use peer-reviewed?

**Peter Gammeltoft:** The procedure that we have used is a combination of monitoring data, risk assessment and modelling. The principle is that we have tried to calculate predicted environmental concentrations and then related these to—

**Q142 Graham Stringer:** Is all that work peer-reviewed?

**Peter Gammeltoft:** The methodologies have been peer-reviewed, and the setting of safe levels has been peer-reviewed by the committee.

**Q143 Graham Stringer:** I do not quite understand what “peer-reviewed by the committee” means. Peer review is a process within science where scientists of equivalent expertise and knowledge in that field look at it. It is not usually done by a committee.

**Peter Gammeltoft:** Maybe I was not clear. The Scientific Committee on Health and Environmental Risk is an independent scientific committee set up by the Commission after a call for a manifestation of interest. It has been set up as an independent body to peer-review documents from the Commission to provide the necessary scientific guarantees for the products.

**Q144 Graham Stringer:** I think you might be using “peer-review” in a slightly different sense.

**Peter Gammeltoft:** These are all academics; they are not representatives of the member states.

**Q145 Graham Stringer:** Let me give you an example, not on this, of the previous banning of chemicals. In the case of phthalates, one was seen to be carcinogenic in an animal study. That led to six phthalates being banned without evidence from the other areas. Has a similar process been gone through with generic chemicals where there is a bit of evidence here and it has been expanded?

**Peter Gammeltoft:** I have not touched on this, but what we are doing here is setting safe levels for the environment; we are not discussing bans.

**Q146 Graham Stringer:** I am sorry. I should have said “put into the list”—not “banned”.

**Peter Gammeltoft:** As to the things put into the list, basically we assess the predicted environmental concentration and relate this to the safe levels that have been underpinned by our scientific committee. If we see that the predicted environmental concentrations are larger than what scientists are telling us are the safe levels, prima facie we think there is a case for regulation.

**Q147 Graham Stringer:** The Severn Trent Water Authority said that you have over-used the precautionary principle in coming to this list. What would be your response to that criticism?

**Peter Gammeltoft:** My first question is: what does over-use of the precautionary principle mean? The precautionary principle obviously does not mean that in any case where there is any doubt you have to regulate on the side of the doubt; you have to weigh

the risks. How much is at risk? How many are at risk before you decide there has to be some degree of proportionality in the application of the precautionary principle? We do not believe that we have gone beyond the limits of proportionality.

**Q148 David Tredinnick:** Three pharmaceutical products are proposed as priority substances. One of them is an oral contraceptive; another is a hormone replacement therapy; and the third is an anti-inflammatory. Could you elaborate a bit on why you have included these in the proposals?

**Peter Gammeltoft:** They were included in the overall review of substances, which involved many, many substances—thousands of substances—because of very express concerns from a number of member states who were concerned about their presence in the environment. When they went out to measure they found them, and they were concerned about the effects that they had. Also, some but not all stakeholders—not the pharmaceutical industry, for example, but other stakeholders—have expressed concerns about this, and this is why they were also subject to an assessment.

**Q149 David Tredinnick:** From an enforcement point of view, is it not an almost impossible task? These three products would be largely found in people's bathrooms and are likely to be flushed down the toilet as medicines that are no longer required—for example, the anti-inflammatory—or are they used widely by farmers? I cannot imagine the oral contraceptives are. What is the landscape of usage of these substances?

**Peter Gammeltoft:** We have looked at use patterns for all of them. If we start with diclofenac, that is for both veterinary and human use. If we look at sources of E2, which is the easiest way of naming it, that originates both from animal husbandry but also from people. It is linked to issues such as population density, and it is also used in contraceptive pills, although for this particular substance contraceptive pills are a minor source of this. Then there is the substance called EE2, which almost exclusively is from pharmaceuticals—contraceptives.

**Q150 David Tredinnick:** The British medical industry has expressed concerns and cautioned that “access to medicines could be inappropriately limited due to the Commission's proposals”. Is this a worry for you?

**Peter Gammeltoft:** No. We have no intention of restricting access to these pharmaceuticals, but, as with other pharmaceuticals, one of the options you have is to look at prescription habits. This is done in a routine manner by health services in the member states for cost reasons. When you come to substances like antibiotics, this is done not only for cost reasons but also to limit the spread of antibiotic resistance. So there is nothing new in this.

There are also issues about take-back schemes. The evidence we have is that the effectiveness of take-back schemes in the member states varies between 10% and 90%. So there is scope for doing something there.

Finally, with a substance like E2, there is an issue about proximity of cattle to water resources. A possible option here could be to fence cattle in to prevent them walking into the rivers.

**Q151 David Tredinnick:** Did you look at labelling products?

**Peter Gammeltoft:** Sorry?

**David Tredinnick:** Is that something that is within your remit? Would better labelling reduce the problem—for example, expressly stating not to flush these medicines down the toilet but dispose of them in a different way or hand them back?

**Peter Gammeltoft:** This is something that could be considered. I am not sure whose competence this is, but it is something that needs to be considered in the context of the pharmaceuticals.

**Q152 Chair:** It does not matter whose competence it is. We would be interested in your opinion. Would it be a good idea if that were included?

**Peter Gammeltoft:** Yes. From an environmental point of view, it is obviously a good idea to inform those who are less informed about it that it might be a good idea not to flush it down the toilet.

**Q153 David Tredinnick:** People very often will behave reasonably if they know why they should behave reasonably.

**Peter Gammeltoft:** Yes.

**Q154 David Tredinnick:** Certainly, labelling is very important in other aspects of life. We have talked about the traffic light system for some foodstuffs—red, amber and green—to deal with sugar and salt levels. Do you think it might be appropriate to have a traffic light system on these products?

**Peter Gammeltoft:** It has to be considered. This is not my specialty. We all know these information sheets in packages of medicines that have very small letters, which are difficult to read, with lots of information. I think it is for the people who deal with pharmaceuticals to consider how best to pass on this message.

**Q155 Stephen Metcalfe:** There is a huge cost to all of this. The estimates range between £27 billion and £31 billion, all of which will be borne by the actual customer—the end user—which over 20 years might account for £100 to £110 for every household. Did you or the committee make any estimates of what the cost of adding these 15 new items would be?

**Peter Gammeltoft:** We did seek information from member states and stakeholders. I have to say that the amount of information we received was not impressive. We would have liked to have much more information and we did not have it. We have just talked about the options on pharmaceuticals. The one option we did not talk about was removing them at the sewage treatment phase, and that is by far the most expensive option. We believe that the preventive option and addressing the issue at source should be the preferred one. This does not mean that there will never be any residual that would have to be treated in terms of sewage treatment.

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We did look at a few estimates that were available at the time. We looked at evidence from Switzerland, which is not an EU country but from which we had evidence, where there is a system in place to remove this kind of compound from sewage. The added cost was in the range of €11 to €18 per inhabitant per year. At the time, we also had some figures from the UK, but there were problems with the estimates because they were based on a more stringent standard than was actually proposed. At the time, I think the number was about €18 per inhabitant per year. Since then we have seen reports on other estimates. If you recalculate the cost over 20 years and simply divide by 20 and the number of inhabitants in England and Wales, you arrive at about €30 per inhabitant per year. Our current view is that, if you choose the most expensive option and remove everything in sewage treatment, the likely costs are probably somewhere in the region of €10 to €30 per inhabitant per year.

We should also remember that under the Water Framework Directive, with the Commission's proposals, these standards would have to be applied by 2021. We are talking about more or less 10 years down the line compared with the time when the Commission made its proposal. The further you move in time the more meaningless the cost estimate becomes, because we do not know what technologies will be available 10 or 20 years down the line.

I would also add here that the Water Framework Directive works on the basis of setting water quality standards according to a risk assessment, not cost. There are other provisions about cost that allow member states to defer the application of the standards, provided certain criteria are met. This is for two six-year periods, so it is 12 years in addition to the 2021, which brings us to 2033, or something like that. Again, the cost estimates here become, in my view, more and more meaningless the further we go out in time. There is a possibility to defer costs, if costs are disproportionate or there is an issue of technical non-feasibility or it is impossible, for natural reasons, to attain the standard within the time limit that is normally foreseen. Yes, we did look at costs, and the only costs we could find were sewage treatment costs.

The other possible measures are very often those that have to be taken at the level of the member states. There we have a methodological difficulty in deciding which measures member states will choose and what they cost. This is an inherent difficulty in doing a cost estimate for a proposal like this where competence to take the measures cuts across the member states and the EU.

**Q156 Stephen Metcalfe:** If we are to adopt these proposals—if they are adopted—and we then have to sell this increased cost to a sceptical public, how do we communicate the benefits of what is being done in a way that the wider public would understand?

**Peter Gammeltoft:** It is a bit like explaining the benefits of biodiversity. It is a challenge to do it, but what we will have is cleaner water; probably fewer costs in drinking water treatment; and fewer costs in treating things like polluted sediments, because a lot of these substances will end up in sediments and may

have to be cleaned up for other purposes. This will increase the amenity value of our waters, improve the potential for things like aquaculture in our waters and provide us with healthier aquaculture products. We will have cleaner water also to give our livestock to drink, which is likely to give us better quality or cleaner meat; and it will also reduce accumulation in crops where you irrigate with this kind of water. There is a whole series of benefits. Some of them are easier to visualise than others.

There is the famous issue with the endocrine-disrupting substances in so-called intersex in fish where they stop reproducing. It is to do with the feminisation of fish. The people who have been dealing with this professionally have been raising this issue for many years, including the England and Wales Environment Agency. This is an example of something that is easily explainable. The EQS proposed for some of these hormone-disrupting substances is to make sure that we do not have these intersex issues.

**Q157 Stephen Metcalfe:** On the pharmaceuticals issue, we have discussed controlling it at source. There is a balance between source control and end-of-pipe treatment. Where do you think that balance lies? How much should we be trying to control what goes into the water to start with, rather than just taking it out at the end of the process?

**Peter Gammeltoft:** Given that the costs are likely to be significantly higher at end of pipe, you should do as much as you can on control at source and then deal with the residual in terms of treatment. If you do that, you will also reduce the number of treatment stations where you need to have more advanced treatment, but there are even things you can do also in treatment, like reconfiguring traditional treatment plants. I believe you can remove half of E2 by changing recirculation rates of water and so on; you can configure your reactors in parallel or in series, and things like that. You can very easily remove quite a lot of this.

**Q158 Stephen Metcalfe:** That would have an impact on the overall cost.

**Peter Gammeltoft:** Yes, it would.

**Q159 Stephen Metcalfe:** Those who are talking about the very high figures are using that to try and push us away from this.

**Peter Gammeltoft:** I would share that view, yes.

**Q160 Chair:** In your answer to Mr Metcalfe you referred to the Swiss study. One witness who came before us suggested that the Commission was not making a fair comparison because Switzerland's river system and density of population is wildly different from that of the UK, for example. Isn't that a fair observation?

**Peter Gammeltoft:** We all know the mountainous nature of Switzerland, which means that in the valleys you have a lot of people and high population densities.

**Q161 Chair:** But per head of population you have a larger volume of water flowing through. Therefore,

the dilution factor is going to be greater and would bring down the cost of hitting any established target. Isn't that a fair observation?

**Peter Gammeltoft:** Yes, but it is not the only factor.

**Q162 Chair:** But it was the one you referred to, and that is why I am picking you up on it.

**Peter Gammeltoft:** Yes; you may have larger volumes of water because you have water flowing off glaciers, mountains and so on, but you also have very high population densities where the population is. In reality, the population lives in a fairly limited area of Switzerland.

**Q163 Stephen Mosley:** The Commission has produced its watch list. I know that Richard Seeber MEP has suggested some changes to that list. Have you seen those suggestions? Have you got any comments or thoughts on them?

**Peter Gammeltoft:** The Parliament has proposed some changes to the watch list. The Parliament is basically in favour of the watch list, but it had some concerns. It thought that once we put substances on the watch list they would stay there for ever. As I said before, we consider that the watch list has to be dynamic. We do not want substances to stay or sit on the watch list for longer than necessary, but we are also happy to clarify this. We are currently in discussions—the so-called informal trilogue—with the Council of Ministers and Parliament. Therefore, I cannot tell you here everything that is going on in these discussions, but there are intensive discussions on the watch list. My feeling is that, at the end of the day, the watch list is probably something that is the least controversial in this proposal. This is where I feel there is a large degree of agreement.

**Q164 Stephen Mosley:** Witnesses from the industry have come to speak to us. One of their concerns is that for some of the chemicals on the watch list the quantities in which they occur are so low that it is impossible to measure them. How do you anticipate the member states will be able to monitor some of the chemicals on that watch list?

**Peter Gammeltoft:** For each chemical there is a limit of detection and quantification. Of course, this is to do with analytical methods. Different analytical methods have different limits of detection and quantification. There are no substances on the watch list; the watch list is a mechanism at the moment. The idea is that, through a simplified procedure, you could put substances on this list and take them off again and have them monitored. This would be the proposal from the Commission. I can tell you that we will look also at the issue of measurability in this context. This will play a role.

Concerns have been raised by some member states about whether they have the necessary analytical equipment. We have signalled openness to discuss this. There are other laboratories in the EU. We have a joint research centre. You need to take samples from a certain number of monitoring stations, bring them to a laboratory and analyse them. We are open to discussion about where they could be analysed, if there are these kinds of difficulties. We have signalled

this in negotiations. But I quite agree with you that you need to be able to measure; otherwise, it makes no sense to put things on the watch list.

**Q165 Stephen Mosley:** Do you think the watch list is a good substitute for having chemicals on the priority substances list, or where does the balance lie between the two?

**Peter Gammeltoft:** We see things going on the priority substances list because there has been a risk assessment, and there is a risk that concentrations will be higher than the no-effect concentration. Those are the basic criteria for putting things on the priority substances list. Putting them on the watch list helps us to decide whether or not to put them on the priority substances list. We see a very clear division of labour, but putting them on the watch list is providing some of the evidence that we need.

**Q166 Roger Williams:** We are talking about Richard Seeber, the MEP.

**Peter Gammeltoft:** Yes.

**Q167 Roger Williams:** He suggested, for instance, keeping the three pharmaceuticals on the priority list but not actually setting any environmental quality standards. I do not quite follow that. What is he trying to get at there, and what is your view on that?

**Peter Gammeltoft:** We have put the same issue to him. He is the person who can ultimately provide the answer to this. I suspect that he sees this as a way of gaining a bit more time. Basically, this would postpone any application of standards for these substances for a further six years, and this would provide additional time to find out what the right measures are.

**Q168 Roger Williams:** One of the other issues that he has brought up—we have already heard about it from David—is building up a better public awareness campaign about water quality and moving it up the political agenda. What do you think about that? In this country health and education are at the top of the political agenda. I am not quite sure where water quality comes exactly in that.

**Peter Gammeltoft:** Let me put it this way. It is perhaps not just in this country that this kind of issue is in for a difficult time at the moment. We came forward with a blueprint to safeguard Europe's water resources in November, and we flagged that water resources were coming under increasing pressure in terms of both quantity and quality. If demand for water is increasing and water quality gets worse, we are building up tension in the system. Yes, we do believe there is a very good case for doing something to increase public awareness in this area. This is also one of the Parliament's proposals. The proposal there is not particularly clear; it is very open-ended, if I may put it in that way. They want something done and to have more public information about water quality and chemicals, and we think that basically this is a good idea.

**Q169 David Tredinnick:** I want to ask a few questions about sharing innovation across the

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European Union and start by asking you what role you think innovation has in helping to meet the environmental quality standards set by priority substances legislation.

**Peter Gammeltoft:** We believe that innovation has a big role to play. The water industry for many reasons is operating with the same kind of technologies that it operated with 100 years ago, so nothing much has happened in the sector in terms of innovation. We see a clear need for more innovation in this sector. We also see that there is a business perspective for Europe here. We are not the only part of the world that is having problems with water, and, if Europe gets there first with the products that everyone needs, this could be a basis to help on the agenda for jobs and growth. We launched an innovation partnership last year. We established a steering group with 27 high-level personalities. We have established a task force and they have developed a strategic implementation plan, and wastewater and drinking water treatment is one of six priorities, I think, in this innovation partnership. I hasten to add that this is not something run by the European Commission; it is something that is facilitated by the Commission. The idea is to bring together the people who own the problems and the potential solutions and develop solutions. We are supporting this process. It is a priority for Commissioner Potočník to take this forward, and we see a big role for innovation here. We have talked about the pharmaceuticals and the costs of treating them, and we also see innovation as a means of bringing down costs.

**Q170 David Tredinnick:** On reflection, don't you feel it is a very sweeping statement to say that we have got only 19th century technology in use? In my Leicestershire constituency we used to have dye works. One of the issues is how you clear out phosphorescent dyes and deal with those. There are quite stringent water standards now in terms of inputs and what the factories are allowed to release into the water stream—whether they process it before it gets into the water stream and how it comes out the other end. On reflection, do you think that is perhaps a bit sweeping?

**Peter Gammeltoft:** If you look at the way that most of our waste water is treated, basically the technology is all the same; so-called activated sludge treatment is the standard treatment today, and that was invented 100 years ago. Of course, things have happened and they have not been at a complete standstill. That is not what I am saying.

**Q171 David Tredinnick:** You explained just now how the European Union is supporting innovation and coming up with different programmes. How well do you think the UK fits into that scheme? We appear to be operating two financial models in this country. We have the shareholder investment model, which I suppose is the English model, and the one that has been operating in Scotland, which is the hydro nation policy, where you have more financial support from Government. Could you tell us your views on that?

**Peter Gammeltoft:** Under the European treaties we are not supposed to get involved in the choice of

models for ownership. We do not get involved in the choice that is made by member states. There is an issue here to do with financing because, if we want things to change in the water sector, investment will be needed. There is an issue about where this investment is going to come from. There are not so many sources of investments. The OECD refers to taxes, tariffs and transfers—the three “t”s. The tax route is increasingly becoming more difficult because of austerity budgets in the member states. Therefore, one needs to think of new ways of financing and how to bring in private capital in one way or another to finance this, and this is independent of the issue of ownership.

**Q172 David Tredinnick:** How diverse is the approach across Europe? What variations are there in the different European Union countries in their approach to innovation? I am thinking particularly of the new east European countries. I remember going out there and looking at these industrial wastelands in the Deutsche Demokratische Republik and beyond before the end of the cold war. There is a massive clear-up of waste and poor standards over there in those emerging countries. How different is it?

**Peter Gammeltoft:** If we look at the member states that are very involved in innovation initiatives, it is more the old EU member states than the new ones. There is an interest that is clear from the new member states—the EU-12, as we call them—but there is less capacity, I think it is fair to say, to get involved.

**Q173 Chair:** Following from that, in some countries innovation and expenditure on R and D has historically been higher. If the EU sets a common set of standards—we know that some river systems cross national boundaries between countries that are better than others in handling their water—is there not going to be a political problem stemming from that?

**Peter Gammeltoft:** There is a problem but there is also an answer to it. A lot of these countries that are less well off have access to the cohesion fund. The cohesion fund is exactly there to offset this kind of problem. The cohesion fund is intended mainly for transport and environment and enables countries with fewer resources to be able to comply with EU standards, so there is a mechanism for that.

**Q174 Chair:** While I accept it is not your role to comment on different economic models that apply in different countries, you will presumably have a view on which countries are leading the way in terms of innovation.

**Peter Gammeltoft:** I can tell you that there are several that are visibly active in innovation. If we look in the water area, in particular some stand out: the Netherlands; Spain; Germany; the Scandinavian countries; the UK is doing something—I am not sure how much; and France. These are countries with very visible efforts in innovation in the water area.

**Q175 Stephen Mosley:** On that same point about the difference between countries, we have had evidence that some countries are going to face bigger problems than others. Because Britain and Belgium, which I

think is the other one, are quite small populous nations, by their very nature they have got more going into the waste water than some of the larger nations with more water to dilute their output. Have you any thoughts on that or have you given any consideration to that?

**Peter Gammeltoft:** We have to think of this in the context of the Water Framework Directive, which, unlike many other European directives, does not harmonise the efforts but the results in terms of environmental quality. The idea is that you should have a harmonised level of environmental quality, or what is called good status under the Water Framework Directive.

The pressures in each member state are different. Some member states, like large parts of the UK, the Netherlands and Belgium, have very high population density. They are the leaders in terms of population density and, therefore, they have the kinds of problems that you mention. Others have different kinds of pressures. For example, some have huge cooling water abstractions from fresh water; others have intensive animal husbandry, if you look at animal density across the country. There are different pressures. Each member state has its own particular set of pressures that it needs to address, but you are right that the UK is on top in terms of pressure from population density.

**Q176 Stephen Mosley:** One of the arguments we have heard is that some of the less high density population countries are able to dilute their waste output down. They have plenty of fresh water, so they add the fresh water to the waste, and they are not getting rid of or reducing any of the actual chemicals in the water; they are just diluting it down, whereas in the UK we cannot do that; we physically have to go for some high-cost options to remove the chemicals. Is that a fair summary?

**Peter Gammeltoft:** That is fair, but the fact that others have lower population density does not mean they do not have other challenges. Take a country like Austria, which has very intensive hydro power. Hydro power has obvious impacts on water courses. The continuity of rivers is at risk. A very large proportion of Austria's energy comes from hydro power. Hydro power is a big challenge for a country like Austria. Germany, the Netherlands and Belgium have very high densities of chemical industries, much higher than the UK. If you look at output per square kilometre, or something like that, you can see that the numbers are much larger. The country I know best, Denmark, has a huge issue of animal density that it needs to address. It has many animals; there are more pigs than people.

**Q177 Stephen Mosley:** How much interaction have you had with the UK Government on this issue?

**Peter Gammeltoft:** On priority substances, the UK Government have been quite active. We have had working groups on priority substances out of which we have formed the expert groups who have assisted us in developing the proposal, and the UK has co-chaired some of these. The UK has also been in charge, for example, of developing the environmental quality standards proposed for E2 and EE2. Yes, the

UK has been very active in the preparatory work on this.

**Q178 Stephen Mosley:** Comparing the UK Government with other European countries, have we pulled our weight?

**Peter Gammeltoft:** Yes, definitely. In terms of participation in the preparatory work, yes, the UK has definitely pulled its weight. It has probably been more active than the average member state.

**Q179 Stephen Metcalfe:** Changing track a little bit, have you done any work on the use of microplastics in products? Do you have a view on where that might lead us?

**Peter Gammeltoft:** Yes, we do. We have work in preparation for this. We issued a staff working document in the autumn. There is a Green Paper on this coming out tomorrow, I think, and there will be public consultation, and from there we will see how to take it further. There is a big issue of plastic waste. The most visible sign is the famous island in the Pacific, but it is linked to chemicals because, when plastic degrades, the plasticisers in the chemicals diffuse out of the plastic and into the water, and also the microplastic particles function as a sort of nuclei for adsorption of hazardous chemicals. So when it is ingested by fish and so on there is a risk that it will enter the food chain.

We want more science on this. More science is on the way in the research framework programmes of the EU, but it will be some time before we have the results. What we have at the moment is more anecdotal than systematic, robust science, but we will get there. What we see is a cause for concern, so there is all the reason from our point of view to continue working on this.

**Q180 Stephen Metcalfe:** Therefore, without the science it would not be appropriate to include microplastics in the Water Framework Directive.

**Peter Gammeltoft:** At this stage we would be at a bit of a loss with respect to what standards we should test, and for what.

**Q181 Stephen Metcalfe:** Have you done any work with consumer companies who include microplastics in their products to remove them as an easy win—a quick win?

**Peter Gammeltoft:** There are discussions going on. We hope to see some first movers or companies in this area to move soon, but it is early days. We do not have any specific commitment at this stage.

**Q182 Chair:** I understood there was a clear commitment from Unilever.

**Peter Gammeltoft:** That is what I have heard as well.

**Q183 Chair:** That has been announced in the UK.

**Peter Gammeltoft:** It has been announced; okay, yes.

**Q184 Chair:** Finally, Mr Gammeltoft, you and I happen to be exactly the same age. When you did your masters in 1976 it was my last year working in

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a laboratory. Since then instrumentation techniques have moved on tremendously.

**Peter Gammeltoft:** Indeed.

**Q185 Chair:** A lot of what you are proposing would not have been practical in terms of analytical techniques back then.

**Peter Gammeltoft:** No, definitely not.

**Q186 Chair:** Do you see an endgame here, or are we going to carry on until we reach the absolute limits of modern instrumentation and tools that we have not even dreamed of yet?

**Peter Gammeltoft:** If we look at the history of these things, it has been full of surprises. I would never say

never. Of course there are limits to what you can do. When we start moving into the limits defined by quantum mechanics, I am not sure we can do much about that. We are far off from that still, so there is a lot of scope for further progress. The better we get at this, the more important it is that we have a proper risk assessment, because we can measure ever-more minute quantities that we need to.

**Q187 Chair:** Just because we can measure them does not mean to say we should forbid them.

**Peter Gammeltoft:** No, no; well, exactly.

**Chair:** Mr Gammeltoft, thank you very much indeed for an interesting presentation.

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**Wednesday 13 March 2013**

Members present:

Andrew Miller (Chair)

Jim Dowd  
Stephen Metcalfe  
David Morris  
Stephen Mosley

Pamela Nash  
Sarah Newton  
Graham Stringer  
Hywel Williams

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**Examination of Witnesses**

*Witnesses:* **Richard Benyon MP**, Parliamentary Under-Secretary for Natural Environment, Water and Rural Affairs, Department for Environment, Food and Rural Affairs, **Rory Wallace**, Head of the Water Framework Directive Team, Department for Environment, Food and Rural Affairs, and **Dr Caroline Whalley**, Priority Substances Policy/Technical Adviser, Department for Environment, Food and Rural Affairs, gave evidence.

**Q188 Chair:** Minister, welcome to our session. Thank you for coming this afternoon. I understand there is a likelihood of a vote at around 4 o'clock, so we will try to be as sharp as we can. It would be helpful if your two colleagues would kindly introduce themselves.

**Dr Whalley:** I am Caroline Whalley, and I am concerned with the technical parts of the priority substances.

**Rory Wallace:** I am Rory Wallace, and I head up the Water Framework Directive team, also in DEFRA.

**Q189 Chair:** This is the third evidence session we have had today. One of them was a bit stormy; the other was fantastic. We are hoping to have a balance of two fantastics and one stormy.

To start off, do you support the proposals put forward by the EU to add 15 chemicals to the priority substances list? If not, why not?

**Richard Benyon:** Most of the proposed 15 chemicals should be listed. The prioritisation process sifted through a few thousand chemicals and identified those presenting most risk to the environment. However, as you know, we strongly believe that E2, EE2 and Diclofenac did not go through the same prioritisation processes as other chemicals on the list. We just cannot be confident that they pose a risk of equivalent concern to the other 12, and, together with significant concerns about the cost-benefit analysis of proposing these three chemicals as priority substances, that is why we do not think they should be listed at the present time.

**Q190 Chair:** Is that because the scientific evidence does not back it up?

**Richard Benyon:** We believe there was a real shortage of scientific evidence to back it up. The Environment Agency carried out a cost-benefit analysis, which was a rigorous process. The Commission has largely accepted that it is within the bandwidth of what the impact would be, and that has set alarm bells ringing, but principally we are looking at this in terms of what scientific evidence there is to support the listing of these chemicals.

**Q191 Chair:** In your written evidence the Government stated that there ought to be intervention

when there is an unacceptable risk. Could you explain to us what you mean by "unacceptable risk"?

**Richard Benyon:** When unacceptable risk might be faced by people or the environment, Government and regulators should intervene. The Government's role is to protect people and the environment, and for chemicals we need to balance the value of being able to use a substance against its potential human and environmental impacts. To clarify this, we use risk assessment techniques to help to judge the balance I was just talking about. For example, REACH, the EU system for regulating chemicals, uses processes to assess and manage the risk in the use of chemicals both to people and to the environment, including the existence of suitable alternatives. If a dangerous chemical's potential to cause harm is too high compared with any benefits it may offer, it can lose authorisation for use.

**Q192 Chair:** If you look at risk as a multiplier between the hazard and the exposure, as is conventionally done within HSE circles, some of these chemicals may appear at a level where, when those two are multiplied together, they produce an unacceptable risk, but some might be at a level so low that it does not present a risk. How are you going to create a definition that works?

**Richard Benyon:** I will ask my colleagues to come in on this. We apply the precautionary approach, and that is what underpins the Water Framework Directive. A number of people have legitimately raised the question of whether that does apply in this case, because there is simply not enough evidence to back it up.

**Rory Wallace:** I would certainly support the Minister on that. The Water Framework Directive allows us to look at setting standards on the precautionary basis, but it also has in it the exemption process. We are able to look at the evidence base presented to us and also the other considerations of costs and benefits to society, the environment and people, and therefore we are allowed to make those balanced judgments in developing river basin management plans and the river basin planning process.

**Q193 Chair:** To go to other measures in the various proposals, such as reclassifying some chemicals as



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priority hazardous substances or developing a watch list, do you support those proposals?

**Richard Benyon:** Yes—the watch list is a sensible way forward. Where there is a degree of concern, those chemicals can be put on a watch list and a rigorous process of trying to find out proper scientific data can inform the risk, and we are then taking a decision on the basis of evidence, rather than what we would strongly argue has been done here which is listing as priority substances without adequate evidence. If you like, it is about a probation system where a chemical is listed and rigorously investigated. That sort of clarity also helps industry, rather than something coming out of left field with a huge economic impact.

**Q194 Graham Stringer:** I would like to explore a little more how you assess the evidence base. When we had the representative from the Commission here last week, I asked him whether the evidence they had had been peer-reviewed in different papers. He said that it had been assessed by a Scientific Committee on Health and Environmental Risks, which is not the standard that one usually expects for scientific evidence. You have made a distinction. You think they have overestimated the potential harm EE2 might do, but you are satisfied about the other substances. Why are you satisfied with one evidence base and not the other, particularly as a lot of the water companies have complained that the methods used by the Commission are not scientifically rigorous?

**Richard Benyon:** The UK made a significant commitment to the technical process supporting the proposals. We have been involved in this right from the start, and that is why we are supportive of 12 of the 15. You heard from Peter Gammeltoft from the Commission, who supported that and said the UK was very active in the preparations for this. Having helped to prepare evidence for assessing the environmental quality standards, member states were not given the opportunity to review the proposal in its entirety ahead of its publication. This is really important. We would have expected the Commission to take a more considered view on the practical implementation of the proposal. I have a number of suggestions about how changes to the proposal process could make this better in future. You two have been on the Eurostar a lot going to Brussels and negotiating this. You might like to give some clarification in response to Mr Stringer's point.

**Dr Whalley:** The prioritisation process is set out in the technical background to the proposal. It is quite a detailed and rigorous system for identifying the pollutants of most concern that are the most hazardous. There is quite a rigorous process, and a lot of chemicals are sifted out on the way through. For pharmaceuticals there is a nomination route; it is not wrong per se, but it misses out that sifting process. Something can be nominated, and then the EQS is set. Chemicals that come in at that level are then reviewed alongside all those that have gone through a very rigorous sifting process. That is where the pharmaceuticals come into the process, and that is why we do not think there is a level playing field between the two sets.

**Q195 Graham Stringer:** That is very helpful in explaining the difference between how the pharmaceuticals and the other chemicals are treated, but what I am trying to get at is whether there are scientific papers out there on the toxicology of these substances that have been peer-reviewed, saying that these substances are dangerous so they should go on the list, or whether it is process-led—“We're a bit worried about this substance.” How hard is the science? The water authorities are telling us that the science is rubbish.

**Dr Whalley:** There are papers out there that say, “If you do the toxicology, this is the harm level presented by these chemicals.” The role of the technical committee supporting the Commission is to assess the quality of those papers—the quality of the information—and see how relevant that is, and therefore whether it should go through. That is part of the expert judgment that forms part of the process. There are arguments about whether for some of them, particularly Diclofenac, the science is strong enough. The advice we have had from the agency is that there are concerns about EE2. We are not denying there are concerns about EE2, but the main concern about the prioritisation of EE2 is that there is not evidence for EU-wide action. For it to be assessed as a priority substance, there has to be a concern across the EU.

**Q196 Graham Stringer:** Is the precautionary principle that you mentioned the get-out clause here? You have a certain level of evidence that rats, or whatever it may be, when fed this stuff, get a bit poorly. On the other hand, the get-out clause is, “We'd better be careful about this and use the precautionary principle,” which really applies when there is an absence of evidence. How do you balance up those things? How do you answer the accusations of the water authorities that the scientific evidence is not there?

**Richard Benyon:** First, the precautionary approach is one that we support. It aims to prevent harm before it occurs. It is the principle that underpins our whole approach to the Water Framework Directive, and the directive itself. The WFD also recognises that there are cases when it may be difficult to meet the standards, and it contains exemption criteria that can be used in such cases. The water industry is understandably concerned about the potential increase in cost and the energy use of more intense wastewater treatment. These costs are ultimately met by our constituents. The precautionary principle is very often prayed in aid as an absolute. It is not an absolute. I think what you are wrestling with is whether the Commission has got the balance right, and whether we have got our response to the Commission right. At the moment, we are of the clear view that this is one that is fulfilled in the Water Framework Directive by the exemption criteria.

**Q197 Graham Stringer:** What advice have you had from Professor Boyd on this issue?

**Richard Benyon:** At the moment we are analysing a proposal, but going forward we will require a clear view from Professor Boyd about how this fits in with DEFRA's evidence standards. I see Professor Boyd

most days; I just do not feel that I am at the particular point where I need to have that conversation with him, but my colleagues are working through protocols in DEFRA on scientific evidence that I am sure apply right across the piece. Most of the work on this has been done elsewhere in the DEFRA family, by the Environment Agency.

**Q198 Chair:** Yesterday, at the Liaison Committee, the Prime Minister agreed with me that, should a Minister receive scientific advice and choose to go against it for other policy reasons, the Minister ought to publish his reasons for going against such advice. Do you agree with that?

**Richard Benyon:** If the Prime Minister said it, it's absolutely right.

**Q199 Chair:** You must agree with him; he is absolutely right.

**Richard Benyon:** Of course he is right. A career-limiting move—

**Q200 Chair:** Minister, you and I are both agreeing with the Prime Minister here, and that is a very important distinction to be made.

**Richard Benyon:** I think that is the place I want to be.

**Q201 David Morris:** The proposed inclusion of the three pharmaceutical products as priority substances has proved particularly controversial. Do you think they should be included in the priority substances list?

**Richard Benyon:** The three chemicals.

**David Morris:** Yes.

**Richard Benyon:** We think not. There is a paucity of evidence and an extremely worrying potential impact on the economy. We have to make sure that we are looking at this in a proportionate way, but on the basis of evidence. We think that the proposal for these three chemicals came slightly out of left field, through a different route from that taken for the other 12, which were rigorously examined by SCHER, whereas these were not. That is a fundamental flaw in the process—a point that we are trying to make very forcefully in our negotiations with the Commission.

**Dr Whalley:** They should not be listed at the present time. On the evidence we have available at the present time, there is not the evidence, and in our view it is not appropriate.

**Q202 David Morris:** Your written evidence states that there is insufficient data from real-world conditions. How do you propose to collect such data if the pharmaceuticals are not on the priority substances list?

**Dr Whalley:** If they were on the watch list, they would come through in that way, because it would get EU-wide coverage.

**Q203 Chair:** To have it on the watch list would be your preferred route, but it is not in the exclusion list.

**Dr Whalley:** The three pharmaceuticals should not be on the priority list because there is not enough evidence for them at the present time, but if they are on the watch list, you get the evidence and find out.

**Rory Wallace:** The watch list enables us to get data from across all Europe on the presence of these chemicals. That is quite important, because this proposal will affect all of Europe. That is why we are particularly keen that that data will enable collection from across Europe.

**Q204 David Morris:** What assessment have you made of the potential for improving take-back schemes, or proper disposal of medicines, to reduce their emissions to the environment?

**Richard Benyon:** This is looking at the other end of the process. There is ongoing work. The Government have a key role in trying to encourage the pharmaceutical industry to take back unused drugs and for them to be destroyed in a way that, frankly, is not happening in the home. We recognise that all these chemicals are finding their way into the environment, primarily because they are excreted and make their way into the sewerage system. Those that are surplus to use may just be poured down the loo or the sink. That is obviously not what we want to happen. Pharmacists have got to work with the Government to try to improve take-back schemes, and there is work going on in this.

**Q205 Chair:** That needs the involvement of pharmacists, the health service, pharmaceutical manufacturers and yourselves. There are circumstances I have seen quite regularly in which, for example, some pharmaceuticals are prescribed in sevens and others in 10s, so people end up with a mismatch, which they put down the toilet. That is something you ought to be discussing with your opposite number in Health and the Department for Business, Innovation and Skills, to try to get a rational prescribing process that mitigates the risk you are describing.

**Richard Benyon:** It is a moot point, which will not interest your Committee at all, as to where this sits in DEFRA, but water is where I am coming from on this. This is an issue of waste, but it is also about protocols. What are pharmacists doing with what they get back? It has to go to incineration, and there has to be an auditable process and clear protocols. This is as much a matter for the Department of Health and other Departments, but I can assure you that there is a determination to try to look at controlling the source as well as the impact it has on the environment.

**Q206 Stephen Metcalfe:** We have heard, and I think you have stated in your written evidence, that the cost of removing the priority substances would be between £27 billion and £31 billion, or about £110 per household, over the next 20 years. Do you still stand by those estimates? Secondly, we have had evidence from a Swiss study to suggest that the costs could be considerably lower. Why do you think our estimates are so high compared with the Swiss estimates, which are about one sixth of what we are proposing?

**Richard Benyon:** Our estimate, which came out of a fairly rigorous process that the Environment Agency went through, has been tested, and the Commission found that it is at the upper end of the bandwidth of possibility. That is reassuring. If we were just out on

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our own, I as a Minister would be asking questions about whether we needed to revisit it. On the basis of the information we have at the moment, it is right to work on the basis of this impact. I have no doubt that if this moved forward, new processes would be found to deal with it, and that might bring the cost down, but from a policy framework position, it is right to be operating in this area. People are rightly alarmed at the impact this could have on our constituents' water bills.

**Q207 Stephen Metcalfe:** Why is it so much higher than the Swiss evidence suggests, from their end?

**Dr Whalley:** I do not think it is that much higher. The EU estimate was about €18 per head in the UK, and the Swiss estimated impact assessment is about €11 to €18. Ours was towards the upper end, but it was not massively different.

**Q208 Stephen Metcalfe:** But why was theirs at the lower end?

**Dr Whalley:** Local conditions. The Swiss study is really interesting and we need to look more closely at it.

**Richard Benyon:** We know there is a different geology in Britain. We have a much higher percentage of population per metre or mile of river, so in certain parts of this country there would be a much higher impact than in more disparate and spread-out communities on the continent, but there will be a difference in different parts of the United Kingdom and England, too, so we have to make sure that our view takes all that into account. It is an average view; it would not be the same in the north-west as it is in the south-east, and we have to work to a best-guess estimate.

**Q209 Stephen Metcalfe:** Is that information publicly available? I do not mean just the headline figure, but the assumptions on which you have based it and the methodologies to calculate it. If so, where?

**Richard Benyon:** The Environment Agency did the work. We are not talking about state secrets here. I can't imagine that it's—

**Q210 Chair:** If it is not on the Environment Agency website, you would be encouraging it to publish that information.

**Richard Benyon:** Yes.

**Q211 Stephen Metcalfe:** If we were to improve source control and take out these substances before—at one end of the pipe as opposed to the other—would that have any significant impact on the costs?

**Dr Whalley:** One of the big questions around this is the way the proposal is phrased and structured, substance by substance. But you don't treat one substance at a time. One thing you need to think about is that if you put in this advanced treatment, which is very expensive, it will take out a lot of micro-pollutants. We could clean up a lot of stuff all at once, but it would be very expensive. A lot of thought and analysis is required to understand what would be the appropriate action in that case. With source control you can do it one by one. That is relatively easy, and

it is a good thing to do, but if you are talking about something like brominated flame retardants, which are everywhere, it would take years to get rid of them, and currently we can't treat them at the end of the pipe. That might require a different sort of control, so we need to understand these in the round before we start taking any action too quickly.

**Richard Benyon:** We think there is a lack of a strategic Europe-wide approach to source control. These three substances in particular are absolutely vital for public health, and we have to make sure we are getting across the message that these are important for people for a variety of reasons. We have raised concerns with the Commission about its lack of a strategic approach to pharmaceuticals during discussions on this. As Caroline says, we need to understand properly the impact of a range of micro-pollutants, and the possible options around treatment and source control, before taking properly thought-out policy decisions.

**Q212 Stephen Metcalfe:** You said you had to get that message across. Are you having success at getting that message across?

**Rory Wallace:** We are. Work is going on now within the Commission. DG SANCO is looking at a study on pharmaceuticals in the environment. I believe that is due to report later this year. That is the start of the process of looking at this on a much wider scale. We have been pushing that as well, because this agenda is far wider than the particular substances we are looking at now. It is very early days to look at this as well, but this is certainly an area that will grow over time, so we are quite strongly pushing the Commission to look at this more strategically, as the Minister has said.

**Q213 Hywel Williams:** Why does the UK lag behind other European countries when it comes to innovation and water treatment?

**Richard Benyon:** Let me tell you what the Government want to achieve. We want to create a water sector where innovation is able to flourish. Constrained water resources here and abroad create opportunities for ambitious companies with innovative ideas. I think we are going to catch up pretty fast. Our new approach to the price review in 2014 is encouraging more innovation with water companies. We made clear to Ofwat and water companies our priorities for environmental improvements. That will drive innovation—for example, by expanding catchment schemes, which can achieve better environmental results at lower cost than expensive treatment works.

I think we have provided strategic leadership through the refreshed Water Sector Innovation Leadership Group. This is providing clear guidance to drive innovation in the water sector. DEFRA, along with the research councils, has funded a Technology Strategy Board competition. We have put £1 million towards feasibility studies and collaborative R and D. You will be aware that a water Bill is coming forward, hopefully in the next Session. That will introduce innovation into the provision of water services, remove barriers to competition and encourage new

entrants and new technologies, and these will increase our resilience. That is what comes out of last year's drought and other extreme weather conditions. We need to consider in future changing climate and growing population. Innovation is absolutely key.

I am taking water-focused trade missions abroad, because there are some fantastic supply chain industries in this country doing remarkable things. There are great growth opportunities here for our economy. I am sorry; this is a long answer to your question, but it is a really important one. This is not something that just the Government can do. We need to create the circumstances in which innovation can happen in the industry and across the whole sector, but it has to be a partnership approach.

**Q214 Hywel Williams:** Thank you. You have already answered my next question in full, so can I ask you another one? I was looking at the written evidence of the Centre for Ecology and Hydrology. It concludes that "a major constraint to innovation in the English utilities is the financial model whereby income, and hence shareholder returns, is linked to capital expenditure on infrastructure. This model has incentivised low risk infrastructure solutions." Are you familiar with the stewardship model in Wales, which is a non-profit-making trust with no shareholders that reinvests all the returns? If you are familiar with it, do you think that is a better financial model? Is it more effective in respect of the treatment of the chemicals that we are discussing?

**Richard Benyon:** To be a better Minister, I should probably be better informed about how countries like Wales are structuring things. I do seem to talk about water a lot with the Welsh Minister and his team, because we share a lot of water coming down various rivers. I know what an important political issue it is in Wales. I am playing the hand I am dealt here. We have managed to unlock £100 billion of investment in a pretty failing infrastructure. We are modernising our water industry quite dramatically. Our ability to clean up water, regulate it in the right way and get in a lot more investment is going to lead to greater innovation. This is a fast-changing area of technology and we want to make sure we are at the leading edge of it. I do not see the system constraining it. In fact, I can see lots of incentives within the current investment model. There is a slight change in terms of capex and totex schemes in the way Ofwat is discussing this through the new price review process. It is going to see a lot more innovative schemes. I mentioned the catchment approach earlier. When you build concrete and steel, or something, to strip out some of the chemicals we have been talking about, you can measure the quality of the water going in and the quality of the water going out and form an absolutely accurate view about how successful that asset has been. If you are trying to do something in a more nuanced way using environmental factors—lowering stocking rates, slowing up water and allowing systems to clean that water in a natural way—it is much harder to measure that, but we have to be braver at doing it, and that is what we are trying to achieve through the changes we are making in how water companies are both regulated and incentivised.

**Q215 Hywel Williams:** Do you have meetings with various people in the water industry specifically about improving innovation? How many have you had in, say, the past 12 months?

**Richard Benyon:** I do not know any sector where there are more conferences. I could spend all my time speaking at water industry conferences—and you don't get through a question and answer session without using the "i" word—innovation is everything. It fascinates me. I listen to some of these companies talking about what they are doing about leakage, pollutants and micro-particles. There are lots of conversations about that, lots with the regulator and lots with the Environment Agency, in particular on the Water Framework Directive. We have to make a quantum leap forward in our delivery of the Water Framework Directive, and the work Rory and his team are doing, and our catchment approach, fills a lot of my time.

**Q216 Stephen Mosley:** Some of the evidence we have heard has suggested that there might be a lack of political support for the importance of water policy. Is water policy a priority for you and your Department?

**Richard Benyon:** I am mildly piqued that people should think that. Of course it is really important. Regulators should regulate; the Government should do policy. Our water White Paper was part of a process; there is a thread going through it. Before that we had the natural environment White Paper, which came about through things like the national ecosystems assessment. That was the largest piece of work of its kind, using 500 scientists to look at how our natural systems work—or, more importantly, do not work. What we have been trying to do, feeding through to the water White Paper, and now the water Bill—plus lots of other stuff we are doing that does not require legislation—is to show precisely that water policy is important, and that we can drive forward modest evolutionary changes to how our water companies operate, getting in new upstream competition that will bring in more innovation, but also looking at abstraction and a range of other issues. It is a massive issue not just for DEFRA but right across the Government. This is about growth, jobs, the bills households are paying, public health, safety and particular issues of social deprivation. How do we enable people who are in water poverty to pay their bills? It is massive.

**Q217 Stephen Mosley:** A fair amount of the criticism that we received related to involvement with the EU. A couple of points were raised. One is that apparently Bulgaria has more representatives than the UK on the strategy board of the European Innovation Partnership on Water; another is that DEFRA has apparently been absent from some EU negotiations. Do you think those criticisms were fair, or do you think you play your full role in Europe?

**Richard Benyon:** As Ministers there are no empty chairs. We attend every meeting.

**Q218 Stephen Mosley:** I meant "you" as in the broader DEFRA context, rather than you personally.

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**Richard Benyon:** Meetings go on every week relating to some aspect of DEFRA's work. The others might like to say—

**Rory Wallace:** To add to that, we play a very full part in our role in discussions within the Commission and other member states. I and my team, and the rest of the water directive team, play a very active role in negotiations and led resistance to inclusion of the three pharmaceuticals. I am not entirely sure what evidence was given previously to suggest which particular meetings we were missing from, because we are very active participants.

**Q219 Stephen Mosley:** I am reading here some evidence from Neil Runnalls from the Centre for Ecology and Hydrology. He says that the UK has been “shredded” when it comes to negotiations with the EU. He made a comparison with the English civil war and said we were the cavaliers and the Europeans were the new model army. Other countries had got themselves organised and were “having a jolly old time”. Is there much truth behind that?

**Dr Whalley:** I think that was in relation to the European innovation partnership. That is not just for Government to attend; various people can take part in it. There was an opportunity for other sectors to go along, and they chose not to. The UK has a representative on one of the committees. That was a particular bit of the partnership; it was not that per se.

**Richard Benyon:** I would not criticise what any individual has said, and I do not know the details of that, but as someone who goes to Brussels a lot, I know that there are a lot of forums in Brussels that are fantastic talking shops, where absolutely no change to the welfare or livelihood of any of our constituents happens. I do not come at this from some great Eurosceptic standpoint, but I just make the point that there may be long debates in the Committee of the Regions, or some other fantastic organisation, that do not change people's lives one iota. What we are concentrating on is where we think we can bring about change, with the right proportionate evidence-based decisions to how we do stuff.

**Q220 Sarah Newton:** We have heard a lot of really good information from all of you today about actions the UK Government are taking to meet the European proposals, and there is a lot of passion and commitment to that. I am just wondering how much the public of Britain are engaged in this. How much are they aware of the issues about substances? There is a huge public benefit, as you said, but we now have to manage the impacts on our water environment. To what extent do you think the public are aware of the issue, and what are you going to do to increase their awareness of this? As the Minister has said, the bills are going to go up by another £110 over the next few years. If we do not get the communication right, are people just going to say, “Oh, that lot over there in the EU are banging out ridiculous directives that are a waste of time and pushing up our bills”? That is highly likely at the moment unless they understand some of the benefits. Do you want to discuss with us your plans to raise public awareness?

**Richard Benyon:** This is really important. That was brought home this time last year when we were staring down the barrel of a gun. There was the possibility of a low summer's rainfall after two dry winters, with the jubilee, the Olympic games and various other things, but no water and the impact this was going to have. A lot of what we are taking forward came out of that learning experience.

One of the things we have in this country is good-quality drinking water. Unfortunately, most of us in the south-east of England wash our cars and water our gardens with prime-quality drinking water, which is another thing we would quite like to see changed with different types of behaviour being incentivised. We have to address the issue of awareness at a time of changing climate and growing population, and transform consumer attitudes to water so that there is a better understanding of the important part it plays in our lives, and the personal choices people can make. Our *Water for Life* White Paper set out several proposals for that. We want to simplify and deregulate under various legislation to reduce the burdens on certain businesses to stimulate growth. You can do that only if you are carrying people with you and engage at household level—for example, through green deal providers and these sorts of things. Everything can have an impact. It is about incentivising water companies to deal with people in a way that changes their behaviour.

It is a very good story to tell. I know you come from the south-west, so I use this statistic very carefully, but in this country we provide all the water we need, and the sewage and waste is taken away from our homes, for an average of around £1 a day. That is a lot of money for some households, but it is quite a remarkable thing when you consider how far we have to move water, what we have to do to it and how we deal with sewerage and tackle complex issues, such as the ones we have been discussing this afternoon. There is much more we can do. The Government are not the only player here—far from it—but increasing people's awareness on a day-to-day basis of the importance of water in their lives is a real challenge for all of us in Parliament and in government at every level.

**Q221 Sarah Newton:** You are right to say that the Government cannot do this on their own. Obviously, you see the water companies as having a big role. You mentioned the green deal. Can you elaborate on what you are asking the water companies to do, what sort of incentives there are and how it is going to work with the green deal, or some of the other ideas?

**Richard Benyon:** We are encouraging water companies to create partnerships with green deal providers to offer advice on water efficiency and how households and businesses can be part of a wider sustainability package. These are companies that interface with hundreds of thousands of households around the country, and we want to make sure we are using that relationship for more than just energy saving, and that water is part of this conversation. I am sure that, going forward, that relationship will pay dividends—for example, if we wanted to do a blue deal around grey water systems and household level

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measures, that could bring about a dramatic reduction in people's bills and a benefit to the environment. As for what we throw away, and what we dispose of in modern life, we do not want to preach to people about how they live their lives, but there is a lot they can do, with an added win that they will be getting lower bills at the end of it. I have been out with people working with companies like Southern Water to talk to those on benefits about how this can have a dramatic effect on their monthly bills.

**Q222 Pamela Nash:** Good afternoon. I am sorry I could not be here at the beginning of the session. How concerned is the Department about the issue of micro-plastics in water and what steps have DEFRA taken so far to address this problem?

**Richard Benyon:** Micro-plastics are an emerging issue and are of particular interest in the marine environment, which is another area of my brief. The level of any threat from micro-plastics in the marine environment is still pretty unclear, but, given the current state of knowledge, Government action to limit micro-plastics could be very premature. In laboratory trials, micro-plastics can be ingested by a range of marine organisms—mussels, lugworms and fish—but there is little evidence to suggest how they could cause any harm. We invested quite a lot of money—£440,000 so far—in a research programme which was initiated in 2010, and we hope to be better informed as this piece of research continues.

**Chair:** We have a couple of very quick questions.

**Q223 Pamela Nash:** I will wind it up. I will ask everything else in one question. We are aware as a Committee that Unilever has already said it will phase

out various micro-plastics in its products. I would be interested to know whether the Government have had any conversations with other companies that use micro-plastics to see if they are considering phasing out their use. We are also aware that the Commission has already published a green paper on this issue, and we want to know whether DEFRA is going to submit to the consultation on micro-plastic waste.

**Richard Benyon:** It might be possible for the cosmetics industry to withdraw the use of micro-plastics as part of its ingredients voluntarily. As you rightly say, Unilever has recently issued a statement promising to withdraw micro-plastic particles from its personal care products. Where they are used in industrial cleaning agents, such as the shot-blasting of ships and aircraft, and in abrasive scrubbers in domestic cleaning products, it is possible that these industries could withdraw the use of micro-plastics, given the right incentives, and replace them with substances that were previously used, prior to the widespread development of the micro-plastics innovation. We think there is work to be done. We are at an early stage in the knowledge base on this, but we are very keen to consider anything that your Committee may bring forward.

**Q224 Pamela Nash:** Will there be a submission to the European Commission's consultation?

**Richard Benyon:** Can I write to you on that? I am not sure where we are on that consultation.

**Chair:** We would be grateful for that. There are a couple of other minor issues stemming from today's questions that we would like to follow up in writing, but in the interests of everyone's valuable time, let's end the session at this point.

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# Written evidence

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## Written evidence submitted by the Department for Environment, Food and Rural Affairs (WQ00)

### (a) *Introductory comments*

1. We welcome this inquiry into water quality in relation to surface waters. The Government supports actions to improve water quality in the environment which take into account the full range of environmental, social and economic considerations. It looks forward to the debate and outcome of the inquiry as part of an overall evidence-based approach to policy-making.

2. The questions and therefore responses below are focused on environmental water quality of surface waters which may be impacted by discharges from direct inputs (such as from wastewater treatment works) and diffuse inputs (such as from runoff and agriculture)—ie those that the Water Framework Directive tries to address. Given the enquiry's focus on chemicals, nutrient pollution by nitrates and phosphates would seem to be out of scope and measures to address these pressures are not considered further here. Chemicals also enter surface waters as fallout from atmospheric sources and there is a range of instruments to control these. Marine waters are impacted both by surface deposition and, particularly in the nearshore area, by riverine inputs.

3. All chemicals<sup>1</sup> have the potential to be harmful to organisms above a certain level of exposure. Some chemicals present a much higher risk than others. The aim of legislation to protect the environment should be to minimise the risk that chemicals may pose whilst allowing their beneficial use. Our understanding of the behaviour of chemicals in the environment is a constantly evolving field, as new chemicals with useful properties are derived or new uses of existing chemicals identified, then their potential impact assessed and risks mitigated.

### (b) *What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

4. Chemical controls and thresholds should be based on a robust evidence base considering both science and socio-economic evidence for potential impacts and their mitigation. The Environmental Quality Standards Directive<sup>2</sup> (EQSD) provides a process for the scientific advice with the EU Commission in control of the evidence assessment. Under the EQSD, the aim of controlling chemicals in discharges to water is to reduce risks to or via the aquatic environment ie biota living in the aquatic environment (including sediments) and those living off those biota, to avoid secondary poisoning effects on humans, birds etc. Chemicals which have been designated as “priority hazardous substances” under the EQSD are especially important owing to their toxicity and persistence in the marine environment and their bioaccumulation in plant and animal tissues.

5. In most situations,<sup>3</sup> it is better to control the release of harmful chemicals at source (which could be the point of production or use): this approach reduces the dispersion of harmful waste and makes it more likely that the “polluters pay” principle is achievable. Such an approach is central to the Water Framework Directive<sup>4</sup> (WFD). An alternative, controlling through “end of pipe” following release into the sewage system or the environment, is less favoured as it leads to much larger, but more dilute, quantities of contaminated material and would seem to remove responsibility for waste and its costs from the originator. “Source control” and “end of pipe” approaches represent two ends of a spectrum of current options for managing chemicals in the water environment. It is possible for both approaches to be integrated with other approaches such as catchment management.

6. Much of the EU and international legislation on chemicals looks to control at source such as REACH,<sup>5</sup> plant protection,<sup>6</sup> persistent organic pollutants<sup>7</sup> etc. Chemicals can be assessed with respect to their potential impact being balanced against the socio-economic benefits that their use may bring. Steps can then be taken to manage and mitigate the remaining risks. Monitoring and modelling under WFD should then provide a check on the various controls to minimise the extent to which harmful chemicals reach the environment. In practice, there are legacy issues which can make it difficult to reach the desired environmental quality, while it may be possible to introduce controls for previously unrecognised sources.

7. The risks that human and veterinary pharmaceuticals pose for the environment are assessed under the specific pharmaceuticals legislation which controls the placing of human and veterinary medicinal products on the market.

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<sup>1</sup> All chemicals can lead to adverse effects on organisms. The technical term “hazard” refers to this inherent ability of a chemical or other agent to cause harm. However, just because a chemical poses a hazard (such as toxicity) does not necessarily mean that it will cause an adverse impact. The technical term “risk” describes the likelihood of harm actually occurring. For risk to occur there has to be exposure to the chemical at a sufficient amount—even the most toxic agent will cause no harm if exposure levels are low enough.

<sup>2</sup> 2008/105/EC

<sup>3</sup> the main exception being the case of pesticides, where there are both measures to ensure that products are not authorised if they are liable to cause damage to the aquatic environment and measures to mitigate environmental impact following application.

<sup>4</sup> 2000/60/EC Art 9 and recital 1; 2008/105/EC recital 2

<sup>5</sup> 1907/2006/EC

<sup>6</sup> 1107/2009/EC

<sup>7</sup> <http://chm.pops.int/default.aspx>

8. All veterinary medicinal products undergo an environmental risk assessment<sup>8</sup> as part of the scientific evaluation that results in a Marketing Authorisation being granted. Applicants must demonstrate that the concentration of the pharmaceutical substance in the aquatic compartment is not a risk for aquatic organisms. If a serious risk for the environment is identified that cannot be mitigated against, a negative benefit:risk balance would be recorded in which case a Marketing Authorisation could be refused.

9. A class of chemicals for which authorisation cannot currently be refused on environmental grounds is human pharmaceuticals. Data on the environmental risk assessment of human pharmaceuticals are required.<sup>9</sup> The European Commission is currently performing a study to look into the effect of medicines on the environment and the need to amend the current legislative framework, including the need to strengthen the Environmental Risk Assessment that a manufacturer is required to submit when applying for a new Marketing Authorisation.

10. There are strict environmental requirements for the introduction of pesticides in EU legislation on plant protection products<sup>6</sup> and biocidal products.<sup>10</sup> Regulation 1107/2009 requires that a product shall have no unacceptable effects on the environment, having particular regard to: its fate and distribution in the environment, including contamination of surface waters, estuarine and coastal waters and groundwater; its impact on non-target species, including on the ongoing behaviour of those species; and its impact on biodiversity and the ecosystem.

11. Returning to the EQSD, thresholds for Environmental Quality Standards (EQSs) are set to protect the most sensitive species likely to be encountered in European waterbodies. These EQSs are derived according to recent guidance<sup>11</sup> and include steps to account for uncertainties eg where there are no data for species of interest. Modelling techniques are available that can address this to some extent, but heavy reliance is placed on “assessment factors” (multipliers) which apply the precautionary principle when accounting for uncertainties such as missing data.

12. In the UK, EQSs for Specific Pollutants (effectively, substances of national rather than European concern) impose an upper limit on the size of assessment factor, so that EQSs with very large assessment factors are not introduced. Deriving more data can help reduce the size of the assessment factor needed.

13. The EQSD approach may be regarded by some as being overly-precautionary, but rarely is there evidence to clarify the issue. It is designed to allow for known unknowns, such as the possibility of more sensitive species than those that have been tested. Meanwhile, the risk of an overly-precautionary EQS is of spending resources without proper understanding of the environmental benefit.

*(c) What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

14. Responsibilities for controlling chemicals cover the range of those producing, using and disposing of the substances. Government’s role should be to enable the cost effective derivation, production, transport, use and disposal of chemicals such that the users and environment face minimal risk. Where unacceptable risk might be faced by people or the environment, then Government and regulators should intervene.

15. Regulators monitor and enforce the relevant legislation. They also identify and act where previously unknown problems occur, which may include feeding back to Government if new legislation is required. Regulators have a key role for Government in providing expertise and evidence eg in monitoring, policy-relevant research, costs and benefits, affordability.

16. Industry roles are those of producing and distributing, using and disposing of chemicals. Producers of industrial chemicals are required to carry out a chemical safety assessment of the substance’s potential human health and environmental hazards, recommending risk management measures where appropriate. For human medicines, all community pharmacies in England must accept waste and unused medicines from patients for safe disposal. Professional pesticide users must apply products according to its specific conditions of use and general sustainable use requirements. More broadly, there is an onus on industry to manage wastes responsibly and comply with the legislation, for instance in licensed discharges to sewer and following relevant codes of practice. Industry also looks to maximise efficiency of production, efficiency of resource use, and reduce and reuse the wastes it produces. Such practice reduces costs, waste and the potential for harmful discharges.

17. Members of the public likewise have responsibilities to use and dispose of chemicals according to product instructions. It is however difficult to enforce regulations among this group. While “the public” may historically not have been seen as significant polluters of water, recent evidence<sup>12</sup> suggests that domestic sewage now represents a significant source of chemical contaminants to wastewater treatment works. In other evidence, nonylphenol was found in imported clothes, the laundering of which introduces nonylphenol into the

<sup>8</sup> 2001/82/EC

<sup>9</sup> 2001/83/EC as amended. Art 8(3)

<sup>10</sup> 98/8/EC

<sup>11</sup> Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 27. Deriving Environmental Quality Standards. Technical Report—2011–055.

<sup>12</sup> UK Water Industry Research Chemical Investigations Programme <http://www.ukwir.org/site/web/news/news-items/ukwir-chemicals-investigation-programme>



sewage system.<sup>13</sup> Such evidence poses new challenges in relation to our understanding of “polluter pays” and “control at end of pipe”.

(d) *Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

18. Pharmaceuticals in the environment is an area of increasing concern, partly brought about by improvements in analytical chemistry which can now detect very low concentrations. It is not yet possible to make a robust decision on the need to control the discharge of pharmaceuticals into water, owing to insufficient, reliable data based on “real world” conditions.

19. Potential restrictions on pharmaceuticals through WFD “bottom-up” legislation arise because there is currently no sectoral legislation to control the source. However, medicines pose a contentious choice to consider restricting for environmental reasons. Clinicians prescribe the most effective medicine for their patients and their medical conditions. There is an expectation (by both clinicians and patients) that the most appropriate medicine will be available: awareness of wider environmental impacts is probably low. Experience in Europe<sup>14</sup> taking environmental considerations into account in prescribing practice is limited currently to physicians in Stockholm. The Government is not aware of research into patient views on this matter.

20. Pharmaceuticals cover a wide range of substances which act in different ways. For instance, in a high profile example, the active ingredient of the contraceptive pill alpha ethinylestradiol (EE2) has endocrine-disrupting properties. Other medicines may have different or no apparent adverse impacts.<sup>15,16</sup> Parts of the pharmaceutical industry work collaboratively to better understand the potential ecotoxicological impact of pharmaceutical substances.<sup>17</sup> There is a need to avoid simply substituting one medicine with known environmental impact by another for which such information is lacking.

21. Medicines along with their metabolites are naturally excreted into the sewage system and if not removed will be discharged into surface waters. Targeted research<sup>18</sup> measured concentrations in sewage effluent and receiving waters at five sites in England in 2002. A recent study<sup>19</sup> targeted at four surface water sites where high levels of pharmaceuticals might be expected, detected ten of the 17 compounds tested, all at concentrations below 1 µg/l.

22. If the environmental impact were to demand it, controlling pharmaceutical inputs to sewage would therefore seem to be limited to either restricting access to medicines or to removing them from wastewater. Restricting the supply of one particular drug is likely to increase use of others which may be less medicinally effective, have unwanted side effects, and may be less well-characterised in relation to any environmental impact. Any restriction on widely used and effective medicines such as ethinylestradiol, which is present in the majority of oral contraceptives on the UK market, would have a major impact on public health and patient outcomes, and would reverse trends in policies that Governments have been seeking for some years.

23. Consideration of what could be done to control discharges of pharmaceuticals from wastewater needs to take account of the medicine’s toxicity, its place in current therapy, and the quantities used. It may be feasible to consider installing local wastewater treatment facilities in certain cases<sup>20</sup>. In the more general case, wastewater treatment to remove pharmaceuticals would represent a new challenge for which existing sewage treatment plants were not designed. Current technologies to treat pharmaceuticals in wastewater are very expensive, owing eg to energy consumption, while significant costs are also associated with research into new removal techniques and capital investment required to implement new treatment processes.

24. Medicines improperly disposed “down the toilet” represent a source to wastewater which could perhaps be reduced—at present there is little evidence identifying how much of the pharmaceutical load in the environment is generated this way, nor the proportion this represents in relation to that entering following excretion.

25. Veterinary medicinal products excreted by farm animals have the potential to enter both groundwater and surface water. In addition, discharges of veterinary medicinal products from land-based fish farms will enter surface waters when the effluent rejoins the river. Both these “discharges” are considered during the application procedure for granting a Marketing Authorisation. Improper disposal of veterinary medicines has the potential to contaminate surface waters.

26. Veterinary medicinal products are also used in marine fish farms. The product enters the water either directly when fish are treated by external application or as a medicated food. There is an additional control in that users must have an authorisation to “discharge” the veterinary medicinal product into the marine environment, based on a risk assessment of the specific site.

<sup>13</sup> Environment Agency <http://a0768b4a8a31e106d8b0-50dc802554eb38a24458b98ff72d550b.r19.cf3.rackcdn.com/geho0712bwsx-e-e.pdf>

<sup>14</sup> Environmentally Classified Pharmaceuticals. Stockholm County Council. [www.janusinfo.se/environment](http://www.janusinfo.se/environment)

<sup>15</sup> [http://www.mistrapharma.se/download/18.d3c937136e935f4864b1b/MistraPharma\\_annual+book\\_2011.pdf](http://www.mistrapharma.se/download/18.d3c937136e935f4864b1b/MistraPharma_annual+book_2011.pdf)

<sup>16</sup> Singer et al (2008) *Environ Health Perspect* 116:1563–1567. doi:10.1289/ehp.11310 available via <http://dx.doi.org/>

<sup>17</sup> EU Innovative Medicines Programme [www.imi.europa.eu](http://www.imi.europa.eu)

<sup>18</sup> Targeted Monitoring Programme for Pharmaceuticals in the Aquatic Environment, Hilton et al, EA R+D technical report P6-012/06/TR, 2003

<sup>19</sup> [http://dwi.defra.gov.uk/research/completed-research/reports/DWI70\\_2\\_231.pdf](http://dwi.defra.gov.uk/research/completed-research/reports/DWI70_2_231.pdf)

<sup>20</sup> <http://www.pills-project.eu/>

(e) *To what extent is innovation in water treatment supported in the UK? How successfully is innovation shared across the UK and the EU?*

27. The Water Sector Innovation Leadership Group<sup>21</sup> led by Defra and Ofwat aims to identify, prioritise and promote strategic innovation challenges within the water sector. It has outlined innovation priorities for the water sector, one of which is to increase efficiencies in treatment processes and waste management. It also recommended aspiring to energy-efficient and carbon-neutral treatment solutions which produce no waste and to develop chemical-free water treatment solutions.

28. A water security competition<sup>22</sup> jointly funded by Defra, Technology Strategy Board, Engineering and Physical Research Council and Natural Environment Research Council awarded grants in 2012 totalling over £2.5 million for major collaborative research and development projects and feasibility projects that aim to deliver innovation to help safeguard future water supplies.

29. Other UK initiatives include the UK Water Research and Innovation Partnership, composed of private, public and third sector organisations, which published a framework<sup>23</sup> in November 2011 setting out a strategic approach to address urgent and important water challenges. This highlights key priorities and mechanisms to ensure better coherence and co-ordination of different public funding schemes for water research and innovation. The Water Security Knowledge Exchange Programme<sup>24</sup> engages with users to accelerate uptake of existing research, and to shape water research for the future. It has developed the UK Water Research Directory<sup>25</sup> which is a searchable listing of individuals who are active in water research.

30. The European Innovation Partnership<sup>26</sup> for Water was established in 2012 with a view to stimulating creative and innovative solutions that contribute significantly to tackling water challenges at the European and global level, while stimulating sustainable economic growth and job creation. A Strategic Implementation Plan identified water and wastewater treatment and resource recovery as priority areas, with Action Groups invited to develop innovative concepts for wastewater treatment, source control methods, cost-effective on-site technologies and water treatment innovation hubs.

(f) *Has European Commission taken an evidence-based approach to the designation of chemicals that present a significant risk to/via the aquatic environment under the Water Framework Directive?*

31. Scientific evidence is required for the prioritisation of chemicals (leading to inclusion on the list of Priority/Priority Hazardous Substances) and the derivation of EQSs. A Commission paper<sup>27</sup> set out the process taken to prioritising substances for the Priority Substances proposal published in 2012. Scientific experts and stakeholders working under the WFD Common Implementation Strategy identified substances for EQS derivation. Technical guidance on the derivation of EQSs<sup>28</sup> was written by an expert group and reviewed by the EC Scientific Committee on Hazards and Environmental Risk (SCHER). Most substances were prioritised through an exercise which considered monitoring and/or modelling risk assessment.

32. Prioritisation is based on a conventional assessment of risk, incorporating information about a substance's environmental occurrence and the hazard it poses (its toxicity, bioaccumulation and persistence). However, the burden of proof required for a substance to be declared a Priority or Priority Hazardous Substance can be more subjective, for example in the amount of evidence available on its occurrence in European waters and a substance's hazard properties (especially chronic toxicity). This means the evidence base for designating a substance as a Priority or Priority Hazardous Substance can vary. Discussions are open to stakeholders and this can sometimes lead to new data becoming available. However, deliberations can be hampered by a lack of data while experts differ in the level of precaution they believe is appropriate.

33. In addition to the substances prioritised through the risk assessment routes, seven pharmaceuticals entered the process after being proposed by the European Environmental Bureau. These pharmaceuticals had not been highlighted up to that point, largely because the data providing evidence of their environmental exposure were lacking. These substances were subsequently refined to three, seemingly bypassing the more rigorous selection process. SCHER then peer reviewed the proposed EQS against specific terms of reference: its role was not to assess whether the substance should be prioritised.

34. Impact assessment of the proposed EQSs is required. While those for individual substances were considered by the scientific group, the impact assessment for the proposal itself was not made available in advance of publication. The UK has serious concerns about the quality of parts of the impact assessment, particularly the Commission's assumptions about the costs and benefits of listing estradiol, ethinylestradiol (EE2) and diclofenac as priority substances. However, even when taking the Commission's estimates at face value, the Government remains concerned about the proportionality of the Commission proposal (see paragraph

<sup>21</sup> [http://www.ofwat.gov.uk/regulating/prs\\_web\\_innovationforum](http://www.ofwat.gov.uk/regulating/prs_web_innovationforum)

<sup>22</sup> <http://www.innovateuk.org/content/competition-announcements/new-rd-will-stimulate-water-industry-innovation.ashx>

<sup>23</sup> <http://www.lwec.org.uk/stories/uk-water-research-and-innovation-framework-launched>

<sup>24</sup> [www.wskp.net](http://www.wskp.net)

<sup>25</sup> [www.ukwaterresearch.net](http://www.ukwaterresearch.net)

<sup>26</sup> [http://ec.europa.eu/environment/water/innovationpartnership/index\\_en.htm](http://ec.europa.eu/environment/water/innovationpartnership/index_en.htm)

<sup>27</sup> Commission staff working paper "Technical background (SEC (2011) 1544 / COM (2011) 875

<sup>28</sup> Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Guidance Document No. 27. Deriving Environmental Quality Standards. Technical Report—2011–055.

38). The Commission's own Impact Assessment Board was critical about the lack of transparency around the figures used.

35. Briefly, the process for setting EQS is evidence-based and follows accepted guidance. However, it cannot account for every eventuality and datasets are rarely comprehensive, so some aspects of the standard-setting process remain subject to expert debate. In part, this is due to a lack of a clear and shared understanding of a tolerable level of risk to the environment. This contrasts, for example, with hazard assessments for human health where tolerable risks are considered and potential side effects are assessed against benefits. Although the Commission proposal process allows for debate of costs and benefits, the process was not completely followed here. Ultimately, the exemption process under WFD could be applied to mitigate impacts.

*(g) What likely impacts could the Commission's proposals have in the UK? How could any adverse effects be mitigated?*

36. Compliance with standards set under the EQSD forms the basis of good chemical status under the WFD. Under the WFD classification system, failure of one EQS in a waterbody means that the waterbody cannot achieve good status. Member States must aim to achieve good status by 2015, although it is possible to extend the deadline to 2021 or 2027 for reasons of disproportionate cost, technical feasibility or natural condition recovery.

37. The Commission proposal published in January 2012 added 15 substances to the existing list of 33 priority substances. Adding substances to those already controlled under EQSD makes it more likely that waterbodies will fail to achieve good status under WFD.

38. There are significant costs associated with the proposal to list estradiol (E2- naturally produced by people and animals) ethinylestradiol (EE2—used in contraceptives) and diclofenac (an anti-inflammatory) as Priority Substances. Upgrading wastewater treatment plant to remove EE2 has been estimated by the EA at £27–31 billion over 20 years in England and Wales, compared to that estimated by the EC to remove E2 for the UK as £20 billion.<sup>29</sup> Further evidence is being developed and we expect other estimates of costs to become available.

39. There are other chemicals for which the proposed EQS will prove very challenging:—at  $4.9 \times 10^{-8}$  ug/l, that for poly-brominated diphenylethers (historically used as flame retardants) for which most sources have already been banned under chemicals and product legislation, seems likely to be failed in most places.

40. The benefits of meeting EQSs are expected for users of surface waters, including water abstractors, through improved chemical quality and biodiversity. Benefits for biodiversity are poorly quantified however, with particular gaps in understanding around quantifiable benefits of chemical compliance and progressive reduction of chemical pollution.

41. Mitigation options depend upon the substance—preventing estradiol in sewage entering the environment can only be achieved by wastewater treatment. Where there is historic contamination, such as mercury in sediments, little can practically be done. With other substances, such as tributyltin where source control appears not to be fully effective, better controls could reduce contamination.

42. The UKWIR study<sup>30</sup> into sewage effluent is showing that domestic sources are a major source of chemicals. While advanced wastewater treatment is very costly for one pollutant, its installation would co-remove others of concern which could alter the balance of costs and benefits.

43. Taking a more strategic view of chemicals in water, for instance in relation to the broader issue of water resources, could provide dividends for the UK in future. Resource efficiency in the chemicals we use and reducing energy use/carbon emissions in wastewater treatment are examples of “no regrets” measures, while the expertise developed could provide commercial opportunities.

*February 2013*

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### Written evidence submitted by the Environment Agency (WQ16)

#### INTRODUCTION

1. We are the principal environmental regulator in England and Wales responsible for protecting and improving environmental water quality and regulating discharges of potentially polluting substances to water, to protect people and the environment.

2. As part of our role we gather evidence on chemical risks, the state of the environment (for instance through our monitoring programmes) and the potential to achieve water quality objectives to inform government's policy decisions.

<sup>29</sup> Commission staff working paper Impact Assessment SEC(2011)1547 / COM(2011)876

<sup>30</sup> UK Water Industry Research Chemical Investigations Programme <http://www.ukwir.org/site/web/news/news-items/ukwir-chemicals-investigation-programme>

## KEY MESSAGES

3. Improvements in sewage treatment by the water and sewage companies in England and Wales over the past 25 years have helped reduce pollution significantly and have achieved substantial benefits for the water environment.

4. As a result of a £25 million investigation by the water industry, there is now greater understanding of chemical discharges from waste water treatment works.

The proposal, to include more priority substances within scope and to tighten existing standards, would result in more water bodies failing to achieve “good status” as defined by the Water Framework Directive. A summary of chemicals, including pharmaceuticals, found in wastewater treatment works effluent is provided in Gardner et al 2012 and detailed information will be made available by UK Water Industry Research on this programme over the next few months.

5. Further work is required to:

- Develop techniques and technologies to measure the proposed substances at the required levels.
- Understand the concentration of some of the proposed chemicals in the environment or the effect they are having.

6. An end-of-pipe solution is unlikely to be technically feasible for all substances at all sites and costs are potentially very significant. Many chemicals discharging from wastewater treatment works come primarily from the domestic use of substances and products and so controls at source may have a role for some substances.

*Question: What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

7. We regulate potentially polluting point source discharges (including discharges from sewage treatment works) into surface and ground waters in England and Wales. Where necessary we set concentration limits on chemicals in discharge permits to achieve the required quality in the receiving water body.

8. Environmental Quality Standards (EQSs), applied across the European Union or nationally, establish environmental concentrations of chemicals to be used as benchmarks of good quality in surface waters. We use these when determining the concentrations of chemicals to allow in permits.

9. The Drinking Water Inspectorate regulates drinking water quality from the tap. To protect drinking water supplies, we designate Drinking Water Protected Areas (DrWPAs) and develop action plans, identifying the necessary mitigation measures for both surface water and groundwater Safeguard Zones, in conjunction with water companies.

10. A catchment based approach is used where relevant partners work together to help ensure the sustainability of future resources for drinking water supply and avoid the need for expensive new treatment or widespread substance restrictions. Currently, the most significant risks of failure for chemicals for both surface and groundwater DrWPAs are from pesticides although solvents and hydrocarbons are also significant for groundwaters.

*Question: What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled*

11. The Environment Agency is required to prevent deterioration in the status of water bodies in England and Wales. We also aim to improve water quality for people and the environment where the cost of achieving this is not disproportionate. We use river basin management plans to describe the condition of water bodies and to agree with partners the action, where necessary, to improve it. We will be consulting on chemicals as significant water management issues in June 2013. The consultation will inform draft river basin management plans in 2014. The Secretary of State will agree final plans in December 2015. The final plans will set out the beneficial and affordable water quality improvements that can be achieved by 2021 and 2027.

12. When developing River Basin Management Plans we consider the full range of options available to achieve water quality objectives. We are implementing a catchment based approach to encourage and facilitate the identification and adoption of local solutions to issues to complement any national approaches, including the evaluation of the specific local benefits from any improvements.

13. We regulate potentially polluting point source discharges (including discharges from sewage treatment works) to surface and groundwater. Where necessary we set concentration limits on chemicals in discharge permits to achieve the required quality in the receiving water body. It is the responsibility of a discharger to meet their permit conditions. Most discharges from industrial operations are not released directly into the environment but into the sewerage system, along with other industrial and domestic waste. The quality of trade effluent accepted to sewer is regulated by the water company that operates the receiving sewage treatment works. It will determine and agree trade effluent consents specifying concentrations that are allowable taking into consideration its own permits for discharge to the environment.

14. We work with the relevant organisations to help reduce the use of substances where this might be appropriate. For example, the Registration, Evaluation, Authorisation and restriction of Chemicals (REACH) Regulation has provisions for risk management of commercial chemicals that are not already subject to an equivalent standard of European legislation. Working with the UK REACH Competent Authority, we can seek, where appropriate, to develop proposals to reduce emissions at source. Where further restrictions are proposed, we ensure that any enforcement campaigns we run are clearly targeted and proportionate to the risk presented.

*Question: What likely impacts could the Commission's proposals have in the UK? How could any adverse effects be mitigated?*

15. A summary of chemicals, including pharmaceuticals, found in wastewater treatment works effluent is provided in Gardner et al 2012 and detailed information will be made available by UK Water Industry Research on this programme over the next few months.

16. In the first set of River Basin Management Plans published in 2009 about 2% (163) of water bodies failed Good Chemical Status in relation to standards and 11% (759) failed UK Specific Pollutants standards. Largely as a result of a better understanding of chemicals discharged from wastewater treatment works, many more water bodies will be at risk of failing current environmental standards. Proposed new and tighter standards will result in more water bodies being at risk of failing to meet the designated standards.

17. The principal source of the great majority of substances discharged from waste water treatment works is domestic sewage. A relatively small number of chemicals are associated with trade or industrial applications, but household sources predominate

18. Conventional waste water treatment works processes, designed to tackle sanitary parameters, are quite effective at removing many hazardous chemicals. But, there are several hundred wastewater treatment works discharging to low dilution waters which are likely to contribute to risks of failure of multiple chemical standards in these waters both now and in the future. It is difficult to quantify the environmental benefits arising from compliance with these standards.

19. The UK Government will consider affordability when agreeing timescales for achieving objectives to be set out in River Basin Management Plans.

February 2013

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### Written evidence submitted by Ofwat (WQ19)

1. We welcome the House of Commons inquiry into water quality, and into the European Commission's proposals to require certain priority substances, including some pharmaceutical products, to be removed from wastewater discharges to improve environmental quality. We are pleased to have the opportunity to contribute.

2. Ofwat (the Water Services Regulation Authority) is the economic regulator of the water and sewerage sectors in England and Wales. There are 33<sup>31</sup> regulated companies in the water and sewerage sectors. We regulate sectors with a combined turnover of more than £10 billion every year. Ofwat has been in existence since 1989. It became a corporate body with a Board structure on 1 April 2006.

3. Our main duties are to:

- protect the interests of consumers, wherever appropriate by promoting effective competition; and
- enable efficient water and sewerage companies to carry out and finance their functions.

4. We are also required to contribute to the achievement of sustainable development, and promote economy and efficiency.

5. The cost of water and wastewater services in the UK is borne entirely by water customers and is not subsidised by the taxpayer. This is unique in the EU. Because EU legislation is a key driver of investment in the water and wastewater sector, it is also a key driver of customer bills. One of our main tools to protect customers is that we set limits on the prices that water companies can charge their customers. We aim to set these limits at a level that ensures efficient companies can make the investment needed to deliver their services (including their contribution to environmental outcomes) at a price that is affordable for customers.

### KEY MESSAGES

6. The Commission's proposals on priority substances could have significant implications for water bills in England and Wales at a time when many customers are struggling to pay them. Given the unique structure of the water sector in the UK, it is important to note that the significant environmental improvements that have been delivered by the water sector have been funded by customers and it is crucial to the continued delivery of such improvements that customers can continue to afford and pay their bills.

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<sup>31</sup> This comprises 10 regional companies providing both water and sewerage services, 10 regional companies providing water services only, five local companies providing either water or sewerage services or both, and eight water supply licensees offering water services to large use customers who can choose their supplier.

7. The impact on customer bills will be made worse if these proposals do not follow the “polluter pays” principle. This could mean a disproportionate share of the costs of these proposals fall on water customers rather than on other sectors.

8. Early evidence from the Environment Agency suggests that installing the additional wastewater treatment capacity needed to meet the EU requirements could cost as much as £27 billion over 20 years. This represents a quarter of the total investment by water companies since privatisation in 1989, and exceeds the cost of all company investment to improve the environment over that time.

9. In view of the scale of the costs involved, we think further monitoring should be done to understand the presence and impacts of, and trends relating to, these products in the environment before limits are set.

10. And we are concerned that the proposals do not adequately take into account the impacts on carbon emissions of the additional treatment capacity.

#### OUR RESPONSE TO THE SPECIFIC QUESTIONS IN THE TERMS OF REFERENCE

*What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

*Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

11. We have taken these two questions together.

12. We expect water companies to meet the costs of mitigating the impacts of their operations on the environment. These costs are wholly paid for by water customers, not tax payers. This is a unique system in the EU. So where other sectors contribute to pollution, we expect them to contribute proportionally to the cost of mitigating their actions. This is fair as it means that all parties bear their fair share of the costs and a disproportionate burden does not fall on water customers alone.

13. “At source” solutions would meet the “polluter pays” principle and are generally considered more efficient and sustainable than enhanced treatment. Water companies are for example increasingly working with farmers and land managers on the development of catchment management approaches to tackle declining raw water quality. For pharmaceutical products these could include:

- working with agrochemical and pharmaceutical manufacturers to improve products and/or their guidance on use;
- developing strategic approaches to policy and regulations governing the entry of new pharmaceutical products into the market or the prescription of current products, so that they take account of the impact of residues excreted by patients and consumers; and
- sharing of costs of achieving the required outcomes for the water environment between the sectors involved.

14. The way that chemicals that pose a risk to the environment are controlled could have significant cost implications if left to water companies to deal with. The Environment Agency has estimated costs amounting to £27 billion over 20 years for the advanced wastewater treatment plant in England and Wales that would be needed to remove the proposed pharmaceutical additions to the list of priority substances. This represents 25% of the total of £108 billion invested by water companies in England and Wales since privatisation in 1989. And it exceeds our estimate of the cost of all environmental investment by the companies since then (£23 billion).

15. Such an approach would also result in significant increases in carbon emissions from the sector, if not mitigated by other measures. This is because of the extra energy and materials needed to operate the additional wastewater treatment capacity required by the proposals.

16. If new EU limits are agreed for the proposed priority substances, we suggest the fairest and most economically efficient response would be to take a phased, strategic approach to compliance, covering both investment by water companies and feasible source control options.

*To what extent is innovation in water treatment supported in the UK? How successfully is innovation shared across the UK and the EU?*

17. Successful innovation can lead to better solutions and improved services for water customers and lower bills through improved efficiency. Our regulatory framework encourages such innovation and efficiency. We estimate that water bills are about £120 lower than they otherwise would have been because of this approach.

18. This approach has resulted in the significant environmental improvements that have taken place since privatisation of the water companies. However, we may now be reaching the limits of what is achievable by doing the same things more efficiently. Our proposals for the next price review covering the five years from 2015 to 2020 aim to incentivise more innovative approaches by rewarding companies that are operationally responsive, make the right investments and use water resources more sustainably.

19. One of the ways we propose to do this is by incentivising water companies to deliver long-term outcomes, rather than short-term outputs. This will mean they have more freedom to decide how to deliver for the long

term—finding new innovative ways of working that deliver the services customers want, for less money and with less impact on the environment.

20. Ofwat is an active member of the independently chaired Water Industry Innovation Leadership Group. The aim of this group is to identify, promote and prioritise strategic issues within the water sector and to provide the leadership and direction necessary to drive innovation to meet future challenges.

*Has European Commission taken an evidence-based approach to the designation of chemicals that present a significant risk to/via the aquatic environment under the Water Framework Directive?*

21. We are concerned that the Commission’s impact assessment concluded that there would be little cost impact for Member States in complying with the Directive if it is revised as proposed.

22. While there is still a significant degree of uncertainty about the evidence base to define the most cost effective treatment for the proposed chemicals, early evidence suggests that enhanced treatment would be needed at all large wastewater treatment works in England and Wales to deal with the steroidal hormone compounds and other pharmaceuticals.

*What likely impacts could the Commission’s proposals have in the UK? How could any adverse effects be mitigated?*

23. The estimated investment required of £27 billion over 20 years would clearly have a substantial impact on customer bills and affordability, with the precise impact depending on the timing, pace and scope of implementation and the population served by each company. This would significantly limit a company’s scope to finance other environmental and service improvements.

24. Given the potential impact, we consider it is vital that any revised proposals are grounded on sound monitoring information and implemented in a way that takes a realistic approach to the environmental objectives and pace of delivery, given affordability concerns.

25. If this is not the case and the Commission continues to consider the impact to be slight, the Government should consider all of its options to mitigate the impact of these proposals, given the unique structure of the water sector in England and Wales, compared with other EU member states.

26. If limits are considered necessary, it will be important to ensure they are implemented in a way that:

- spreads the burden in a fair and proportionate way across all sectors contributing to the problem—in line with the “polluter pays principle” written into the Water Framework Directive; and
- uses to the full the exemption processes under the Water Framework Directive on grounds of technical infeasibility and disproportionate costs.

*February 2013*

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**Correspondence from the Chair of the Committee to the Parliamentary Under-Secretary for Natural Environment, Water and Rural Affairs (WQ00a)**

Thank you for giving evidence to the Committee on 13 March. During the evidence session, there were a number of topics that we did not have time to explore in detail. I would appreciate if you therefore could provide further written evidence on the following:

- Action taken by Defra, and its engagement with Sir John Beddington, on the issue of water security;
- The number of UK representatives in the European Innovation Partnership on water;
- Details of the Environment Agency’s analysis of costs associated with treating water to remove the suggested priority substances, and where these are published; and
- Defra’s assessment of the additional carbon emissions from processes required to remove the 15 proposed priority substances.

*19 March 2013*

**Correspondence from the Parliamentary Under-Secretary for Natural Environment, Water and Rural Affairs to the Chair of the Committee**

Thank you for your letter of 19 March in which you asked a number of follow-up questions to the oral session of 13 March. Please see below my response to your questions including the one raised at the oral session concerning the European Commission’s Green Paper on microplastics.

#### ACTION TAKEN BY DEFRA, AND ITS ENGAGEMENT WITH SIR JOHN BEDDINGTON, ON THE ISSUE OF WATER SECURITY

There is a well developed policy approach for managing water resources, including during times of drought. This framework includes drought plans for water companies and the Environment Agency that set out the actions that will be taken and the triggers for those actions.

During the recent drought there was extensive cross Government and industry collaboration on the management of available water and actions to tackle the impacts of drought. Sir John Beddington was briefed on the situation and the actions that were being taken.

Looking at the longer term, Sir John Beddington chairs the UK Water Research and Innovation Framework. My officials have worked with this body on the reform of the water abstraction regulation system to respond to future water scarcity.

#### THE NUMBER OF UK REPRESENTATIVES IN THE EUROPEAN INNOVATION PARTNERSHIP ON WATER

The UK has a representative on the Steering Group of the European Innovation Partnership on Water who is an expert on private equity funding. Funding is an important aspect for the support of innovation. Membership of the Steering Group is open to any UK organisation or individual, but it is not Government's responsibility to drive representation.

#### DETAILS OF THE ENVIRONMENT AGENCY'S ANALYSIS OF COSTS ASSOCIATED WITH TREATING WATER TO REMOVE THE SUGGESTED PRIORITY SUBSTANCES, AND WHERE THESE ARE PUBLISHED

Please see appendix A for details. These will be published alongside the impact assessment for the priority substances proposal. The appendix focuses on costs of treating EE2, as failures to meet the environmental quality standard (EQS) for E2 are a subset of those for EE2 (ie modelling shows there are no failures for E2 alone; where E2 fails, EE2 also fails).

#### DEFRA'S ASSESSMENT OF THE ADDITIONAL CARBON EMISSIONS FROM PROCESSES REQUIRED TO REMOVE THE 15 PROPOSED PRIORITY SUBSTANCES

Calculation of the additional carbon emissions arising from treating wastewaters to meet the proposed new environmental quality standards (EQS) are estimates based on current technology. Consideration has been given to a range of estimated carbon I energy impacts, for example:

- In their impact assessment, the European Commission estimated that the increased treatment required by the proposal would result in a significant increase in energy use, equivalent to 1 million tons of CO<sub>2</sub> in England and Wales, an increase of 20% in relation to the current energy consumption in wastewater treatment plants.
- One UK water company estimate was that the additional treatment required to meet the requirements of the priority substances proposal would amount to an increase in energy consumption of one third, compared to 2011 figures.
- Meanwhile, the Environment Agency commissioned work to investigate carbon emissions, resulting in a report published in 2009 "Transforming wastewater treatment to reduce carbon emissions".<sup>32</sup>

This work indicates that, based on current technology, meeting the standards set by the proposed new EQS is likely to result in significantly higher energy use compared to that currently used in wastewater treatment. Impact on carbon emissions is difficult to assess given the UK industry's take-up of renewable energy. Finding the balance between water quality impacts and mitigating climate change is an area that is considered as a part of the river basin planning process.

#### GREEN PAPER ON MICROPLASTICS

My officials will be submitting a response to the consultation on the Green Paper on microplastics. The Government has concerns about the Green Paper, for instance in that the Paper makes a strong, positive association between harm and marine life where no link has been made in the original, referenced studies. A balanced discussion would show that microplastics have been shown to adsorb pollutants from the marine environment, that they have the capacity to serve as transport medium, they are sometimes ingested by marine organisms and that this is a cause for concern, although presently we are unable to characterise this harm. Researchers are generally agreed that further work in this area is required to improve understanding.

31 March 2013

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<sup>32</sup> <https://publications.environmentagency.gov.uk/skeleton/publicationsNiewPublication.aspx?id=c3fddd53-4f49-4624-af16-f9522e31d5de>.



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**APPENDIX A**
**ENVIRONMENT AGENCY'S ASSESSMENT OF COSTS TO TREAT EE2**
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12	Postscript 1: Note on the modelled impact of proposed EC standard of the steroid oestrogen oestradiol on river quality in England and Wales	March 2012
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**Written evidence submitted by Natural Environment Research Council (NERC) (WQ02)**

The Centre for Ecology and Hydrology is the UK's centre of excellence for integrated research in freshwater and terrestrial ecosystems and the impact of human activity upon those systems. As part of NERC, we provide National Capability based on innovative, independent and interdisciplinary science and long-term environmental monitoring. Working in partnership with the research community, policy-makers, industry and society, we deliver world-class solutions to the most complex environmental challenges facing humankind. CEH undertakes water quality monitoring, experimental studies and the development of numerical models to improve understanding and predict the passage of these chemicals from their source, through the sewer system, wastewater plants, into rivers, groundwater and the sea; and their impacts upon freshwater ecosystems. This includes research into pharmaceuticals and endocrine disrupting chemicals.

CEH has undertaken research with European partners for more than thirty years under European Framework programmes, COST, EUREKA, DG Environment Life+ and European Topic Centre on Water, and other Directorates General. CEH leads UK involvement in the European Joint Programming Initiative (JPI) on Water; is a member of the European Water Supply and Sanitation Technology Platform (WssTP) and the EurAqua network of European freshwater research organisations, and is a contributor to the European Innovation Partnership (EIP) on water. CEH manages the NERC Water Security Knowledge Exchange Programme (WSKEP) which is bringing industry, government and the research community closer together to address major challenges such as water quality.

**1. The main points that we make are:**

- 1.1 Controlling pollution at source is more cost effective than efforts to remove these chemicals once they have been released into the environment. This is however a particular challenge when dealing with pharmaceuticals that are widely used by the public (para's 7, 8, 17 and 18);
- 1.2 Recent CEH research on European scale water quality indicate that the UK and Belgium are the two European countries which face the greatest challenge in meeting European Water Quality legislation of the type being considered (See Para's 11, 12 and Appendix);
- 1.3 The scientific evidence is not strong that endocrine disrupting compounds (EDC's), at the EQS levels being proposed by the Commission, have an adverse effect upon aquatic life. Recent research indicates that current water treatment processes are effective in removing EDC's from raw water (Para's 14 and 15);
- 1.4 Current best available analytical technology (LC-MSM) can only determine ethinyloestradiol concentrations reliably to around 0.05ng/L in environmental waters. More advanced analytical methods will need to be developed in order to prove that discharges are giving rise to river concentrations below the proposed EQS of 0.035ng/L (Para 4);
- 1.5 The impacts of mixtures of chemicals is poorly understood, but on the basis of current indications, mixtures should be regarded as a potential threat to the health of the environment and humans (Para's 5,13 and 17);
- 1.6 There is increasing awareness that the environment provides ecosystem services which are essential to the survival of human society, and hence chemicals that damage the environment need to be seen in this wider context (Para's 5 and 19);
- 1.7 The procedures by which the European Commission uses science to develop European level policy are basically sound (Para 25–33).

*What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

2. Hundreds of new chemicals are being created, and brought into full scale production every year. The impact of those chemicals upon human health and the environment are usually only poorly understood. The greatest challenge is in identifying the long term effects of these new chemicals.

3. It is now widely recognized that a compound by compound regulatory framework has significant drawbacks, and hence recent efforts have been to understand the effects of multiple stressors, and mixtures of chemicals as one of those stressors. CEH has been commissioned by Defra<sup>33</sup> to re-examine this issue and to develop a better assessment of which chemicals in our rivers are most harmful to wildlife.

4. Current best available analytical technology (LC-MSM) can only determine ethinyloestradiol concentrations reliably to around 0.05ng/L in environmental waters. More advanced analytical methods will need to be developed in order to prove that discharges are giving rise to river concentrations below the proposed EQS of 0.035ng/L.

5. The impact of chemicals upon aquatic ecosystems is still poorly understood. This includes the impact of low concentrations over prolonged periods, mixtures of chemicals, and in combination with other stressors such as abnormal water temperature, pathogens (viruses, parasites, predators, invasive species, etc), and genetic predisposition. With these limitations on existing knowledge, the danger is that Environmental Quality Standards are not set on the basis of proven harm to organisms.

6. The UK Ecosystem Assessment Report highlights the vital dependence of human well being on a healthy environment and the ecosystem services that the natural environment provides. Damage to the environment by chemical pollutants has, therefore, a wider impact upon humankind.

7. Current thinking is, wherever possible, to control pollution at source rather than an end of pipe, high cost, high carbon, ever more complex water treatment. For example, recent legislation has limited the use of phosphorus in detergents. In the case of chemicals such as pharmaceuticals, which are used widely by the general public and provide a societal benefit, control at source is a particular challenge. This is however an area where innovative new approaches may be helpful.

8. EDC's are present in a wide range of products including household cleaners, pesticides, plastics, and industrial by-products. Some EDC's undergo chemical transformations, from benign to active, as they pass through wastewater treatment plants. Where chemicals are not regulated, water companies are not incentivised to remove them from either drinking waters or wastewater discharges. There is no economic incentive for water companies to analyze for un-regulated chemicals—while their possession of hard data on pollutant concentrations in drinking water would leave them open to future class action litigation.

*What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

9. Indications of the adverse effects of chemicals upon human health are often first detected through their effects upon lower organisms, and increasing concentration up the food chain (eg the NERC Predatory Bird Monitoring Scheme and Fish Tissue Archive). There is a need to maintain these early warning schemes and the research and new methods that enable potentially dangerous chemicals to be investigated and identified—ideally before they cause harm.

10. On-going efforts to maintain capacity of key government departments through increased coordination of water quality research needs to be encouraged and strengthened.

11. Recently CEH has developed national scale water quality models that enable policymakers, regulators and industry to identify where high concentrations of pollutants are likely to develop anywhere in the country (See Appendix). This research shows where biological effect thresholds may be exceeded in rivers across the country. These new models include information on demography and water and wastewater treatment type and indicate which rivers will be most affected by pharmaceutical and beauty products used by different groups within the population.

12. Based upon this national scale water quality modelling and other European studies, it can be concluded that England would face the greatest challenge in meeting the proposed controls on water quality. The other European country most exposed (ie with the least available dilution) would be Belgium. What this means is that UK ratepayers (mainly in Thames, Anglian and Severn Trent) would face higher per capita bills than most Europeans. If controls were required, we would argue that its imposition should be based on a rational site by site management strategy allowing for local dilution and its seasonal variation.

13. Short duration, high concentration water pollution events related to accidental spills are usually obvious and attract immediate response from regulators, industry, the media and the public. Long term, low concentration pollution is much more difficult to assess, and establish proof that particular health outcomes are related to exposure to specific single compounds.

14. Concern about the possible adverse health effects of endocrine disrupting chemicals (EDC's) have been widely known for decades. Initially that concern was based on "common sense"—and historical practice of using oestrogen for chemical castration of males. While data in the 1980's showed increasing feminization of fish, decreasing sperm counts in men, and other possible EDC related impacts upon health, it is still difficult to show an unequivocal casual connection between EDC's and adverse impacts on human and environmental health.

<sup>33</sup> Project CB0462—Intelligent ecotoxicology of chemicals and substances in UK rivers—Development of a systems based approach

15. Recent research by CEH and FERA for Defra/DWI has shown that existing raw water treatment processes are effective in removing EDC's from river waters<sup>34</sup> before they enter the drinking water supply system. EDC removal technologies available to the water utilities in the early 2000's were not taken up as there was no regulatory level for waste water discharges.

16. Action on long term, detrimental phenomena often require actions at international level (eg ozone depletion—CFC bans, trans-boundary air pollution, DDT, etc). EU free trade legislation encourages action at EU level to control the content of pollutants within new products.

*Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

17. The issue of controls of new chemicals should not be confined only to pharmaceuticals. There are a whole range of veterinary, nano-materials and synthetic biology products which are now entering the human food chain and the natural environment that might pose such a risk. Innovative new measures are needed to prevent pharmaceuticals being released into wastewater sewer systems or the environment.

18. While it is difficult to remove key active compounds from pharmaceuticals if they are to retain their therapeutic effectiveness—increased efforts (monitoring, research, eco-toxicological trials, etc) are needed to identifying chemicals and mixtures of chemicals, including pharmaceuticals, where long term exposure damages human health and the environment.

19. Further strengthening of requirements for Environmental Impact Assessments for new chemicals could be considered when assessing chemicals to be controlled under the REACH legislation.

*To what extent is innovation in water treatment supported in the UK? How successfully is the innovation shared across the UK and the EU?*

20. The lack of innovation in the water utilities has been the subject of recent government reviews. While this lack of innovation has been attributed to the cyclic nature of the AMP process, a major constraint to innovation in the English utilities is the financial model whereby income, and hence shareholder returns, is linked to capital expenditure on infrastructure. This model has incentivised low risk infrastructure solutions. It remains to be seen whether recent legislation to incentivise competition will significantly change this fundamental characteristic of the business.

21. The different ownership models in Scotland and Wales has enabled a more pro-innovation culture to emerge. In Scotland the high level political support for the Hydro-nation policy has resulted in support for water and wastewater innovation being prioritised across all Scottish government departments. The Welsh government is following a similar trajectory, increasing innovation in water and wastewater in support of a low carbon sustainable Wales.

22. Within the limitations imposed by the financial model of the English utilities, a number of trade associations (eg UKWIR, British Water, Water Industry Forum, SBWWI) are working to facilitate innovation in wastewater treatment. While there are exceptions, efforts to drive innovation from within the English wastewater utilities are fragile.

23. While UK universities play an active role in European wastewater research programmes, greater benefits to the UK economy and society could be realised through more coherent UK government policy, strategy and actions. UK wastewater companies have a disproportionately limited role in industry focussed European water and wastewater programmes such as the EUREKA Acqueau Cluster, the Water Supply and Sanitation Technology Platform (WssTP), and the European Innovation Partnership (EIP) for water. UK research funding organisations play only a minor role in the European Joint Programming Initiative (JPI) for water, or in bilateral actions.

24. The current UK Government Chief Scientist, Sir John Beddington, has sought to highlight water security as one of the greatest threats to the UK economy and society. His efforts to improve coordination and collaboration between UK government funders of water and wastewater research have led to the creation of the UK Water Research and Innovation Partnership (UKWRIP). While progress with this initiative would be greater with stronger political support, the UKWRIP offers a most promising mechanism for driving innovation partnerships between the UK research community, government, industry and the third sector. The UKWRIP or similar process could provide the mechanism through which UK engagement with European wastewater research and innovation activities could be improved.

*Has the European Commission taken an evidence-based approach to the designation of chemicals that present a significant risk to/via the aquatic environment under the Water Framework Directive?*

25. The European Commission seeks to operate a rigorous process to ensure it has the best available evidence to support its policy development.

26. The European Commission undertakes a range of actions to develop the scientific evidence to support its policymaking. These include DG Research and Innovation funding through successive Framework

<sup>34</sup> [http://dwi.defra.gov.uk/research/completed-research/reports/DWI70\\_2\\_231.pdf](http://dwi.defra.gov.uk/research/completed-research/reports/DWI70_2_231.pdf)

Programmes which target water and wastewater policy issues at European scale.<sup>35</sup> The UK government (Defra lead supported by the EA and NERC) provide input on priority topics to be funded by DG Research. DG Research uses expert advisory panels, drawn from industry and leading European research institutions, to provide advice on state of the art science, and research activities at international and Member State level.

27. DG Environment maintains consultation processes that enable stakeholder groups to meet with EC staff to discuss industry concerns, emerging issues and new policy developments. European trade associations play a role in these consultations. DG Environment also takes advice from Member States on wastewater issues through the Working Groups of the WFD Common Implementation Strategy, and other forum.

28. DG Research and DG Environment are collaborating in strengthening the “Science to Policy Interface” (SPI) with initiatives such as SPI-Water, and projects to improve the processes by which the science community can exchange knowledge with policymakers, and vice versa.

29. DG Environment commissions research in the same way as do UK government departments, to prepare independent, state of the art evidence to inform the development of policies. The report by Prof Kortenkamp of Brunel University for the Commission<sup>4</sup>, being a case in point.

30. The European Environment Agency, through its Topic Centre for Water, undertakes reviews of water quality status at EU level. The EU Joint Research Centre undertakes monitoring and research into a topical water quality issues affecting policy and regulation at EU level.

*What likely impacts could the Commission’s proposals have in the UK? How could any adverse effects be mitigated?*

31. Control of pollutants at source remains the most cost effective method to protect human health and the environment.

32. Media and educational campaigns are required to raise public awareness of the costs associated with removing chemicals once they reach wastewater or raw water treatment works.

33. The Commission’s proposals will open up opportunities for innovative companies to create world leading products and services that develop substitutes for damaging chemicals, capture and recycle these chemicals at source, or remediate their adverse effects upon the environment.

*“Because the protection of human health and the environment are goals of equal importance in EU regulations, Europe is uniquely placed to set the agenda world-wide for a truly integrated mixture risk assessment, provided there is the political will”.*<sup>36</sup>

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<sup>35</sup> “ENV.2013.6.2–2 Toxicants, environmental pollutants and land and water resources management”

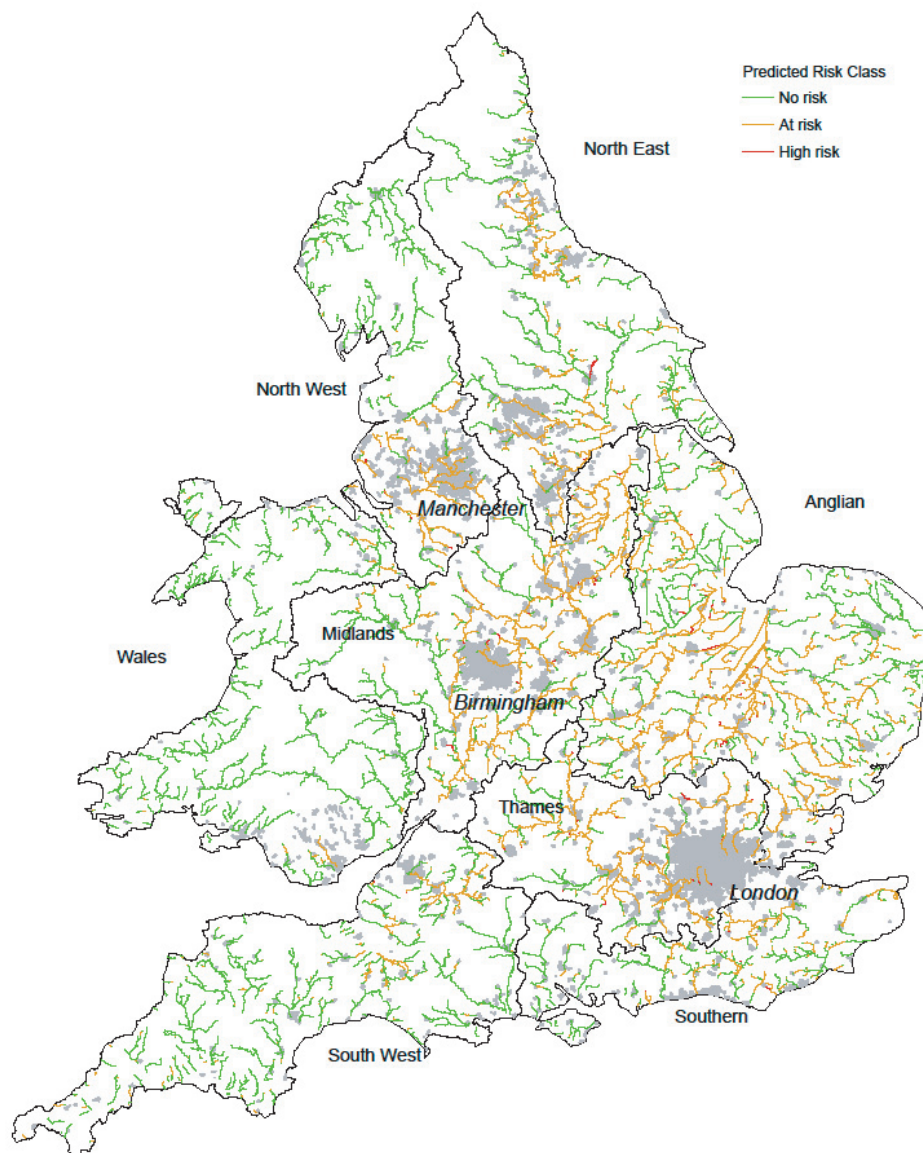
<sup>36</sup> “State of the Art Report on Mixture Toxicity” DG Environment Final Report. 391p.

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**APPENDIX**

Map showing the levels of intersex in male fish in freshwater river reaches of England and Wales, overlain with population census coverage (grey).

No Risk estradiol equivalent (<0.1ng/l), High Risk estradiol equivalent (>10ng/l), At risk between between 1 and 10 these. 1ng/l estradiol equivalent=0.1ng/l ethinylestradiol.



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**Written evidence submitted by the Association of the British Pharmaceutical Industry (ABPI) (WQ06)**
**1. DECLARATION OF INTEREST**

1. The Association of the British Pharmaceutical Industry (ABPI) represents innovative research-based biopharmaceutical companies, large, medium and small.

2. Our industry, a major contributor to the economy of the UK, brings life-saving and life enhancing medicines to patients. Our members supply 90% of all medicines used by the NHS, and are researching and developing over two-thirds of the current medicines pipeline, ensuring that the UK remains at the forefront of helping patients prevent and overcome diseases.

3. The ABPI is recognised by government as the industry body negotiating on behalf of the branded pharmaceutical industry, for statutory consultation requirements including the pricing scheme for medicines in the UK.

**2. OUR RESPONSE**

4. In responding to the inquiry we have set out our views on the individual questions posed by the Committee specifically as they relate to pharmaceutical substances although the general scientific principles underlying our comments on those specific compounds are generally applicable.

5. If the Committee would like clarification of, or expansion on, any of the points we make, we would be more than willing to give this.

**3. ANSWERS TO THE SPECIFIC QUESTIONS POSED BY THE COMMITTEE**

*What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

6. The Water Framework Directive (WFD) is the current European legislation for identifying which chemicals should be subject to control of emissions to the aqueous environment. It does this by designation of certain substances as “priority substances” and the setting of limits, Environmental Quality Standards (EQSs), on their concentration in the aqueous environment. The WFD defines priority substances as substances which “present a significant risk to or via the aquatic environment” and the Directive sets out a number of ways by which significant risk may be identified.

7. It is our view that substances should only be designated as priority substances if there are robust data (ie data from studies that have been conducted according to internationally accepted guidelines to ensure a high quality standard and comparability of results) that indicate a consistent level of detection in water courses in Member States above levels which scientifically based investigations show to present a harm to the environment or, via the environment, to human health. Where control of the levels of substances in the environment involves potential restrictions on use, any environmental benefits from restricted use should be weighed against the benefits of use of that substance—this is particularly so in relation to medicinal products.

8. Thresholds for control should be dependent upon the specific risks posed by any substance and the technical capability of current technology to reduce the levels of those substances in the environment and analytical methodologies sufficiently sensitive, accurate and robust to measure consistently traces of the substance at levels at or below the EQSs.

*What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

9. All stakeholders have an interest and concern in seeking to ensure that the levels of chemicals in the environment are managed effectively to ensure, as far as possible, that there is no adverse impact on the environment or, via the environment, on human health.

10. Regulators have the role of identifying those chemicals that pose a potential risk to the environment and/or human health and, on the basis of sound scientific evaluation, making appropriate proposals for their control.

11. Government has the responsibility to consider any such proposals in the light of a number of other considerations such as weighing the potential loss of societal benefit of such substances against any risks they may pose and the costs and benefits of applying such controls.

12. Regulators and Government between them need to set out legal requirements relating to protection of human health and the environment and to monitor compliance.

13. Industry has a responsibility to seek to minimise the impact of its products and operations on the environment. In relation to manufacturing, this means controlling emissions to water in accordance with regulatory requirements and industry good practices. Industry also has a responsibility, using sound science-based approaches, to evaluate the environmental risk of emissions from use of its products.

14. The public has the role of following guidance on proper use and disposal provided with purchased or supplied substances and materials. Specifically in relation to medicines, the public needs to comply with

prescribed treatment regimes and safely store medicines to prevent inappropriate uses. If medications are not needed, the public needs to ensure that they follow instructions relating to their proper disposal. There need to be safe, efficient and effective processes available for patients to dispose of unused medicines.

15. There is a common stakeholder need and responsibility to continue well-defined research to better understand the effects of chemicals on human health and the environment at environmentally relevant concentrations using meaningful toxicological endpoints (including effects of mixtures and understanding the fate of chemicals in the environment).

*Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

16. As mentioned above, the WFD defines priority substances as substances presenting a significant risk to or via the aquatic environment. A proposal from the European Commission<sup>37</sup> to designate three pharmaceutical substances (ethinlyoestradiol (used in oral contraceptives), oestradiol (used in hormone replacement therapy) and diclofenac (a highly effective anti-inflammatory)) as priority substances is currently the subject of consideration by the European Parliament and the Council of The European Union.

17. *While a number of laboratory studies have postulated potential risks to the environment from pharmaceutical substances, we are not aware of any evidence to date in actual use of any adverse population effect in the environment or of any adverse impact on human health attributable to the extremely low trace levels of pharmaceutical residues found in water.* Specifically, as regards human health, a number of reports including from the UK Drinking Water Inspectorate<sup>38</sup> and, most recently, from the World Health Organisation<sup>39</sup> have come to the same conclusion that it is very unlikely that exposure to the very low levels of pharmaceuticals in drinking-water would result in appreciable adverse impacts on human health.

18. The above, together with the fact that the only evidence considered in the recent WFD prioritisation process was incomplete and inconclusive, leads us to believe that the current proposal to include the three pharmaceuticals as priority substances under the WFD is not substantiated and could necessitate significant, costly and unwarranted intervention by water utility companies.

19. Notwithstanding our comments above, industry accepts that there is a scientific and societal need to seek to understand as fully as possible the significance of pharmaceutical residues in water. To this end industry has consistently engaged collaboratively with other stakeholders to improve the knowledge base in this area and will continue to do so.

20. The proposal for the amendment to the Water Framework Directive includes a proposal for setting up a "Watch List" of substances for further monitoring. This may have some merit but it is difficult to comment on this proposal in the absence of any detail as to how it might operate.

*To what extent is innovation in water treatment supported in the UK? How successfully is innovation shared across the UK and the EU?*

21. In some cases, in-plant treatments, such as granular activated carbon, acid/alkaline hydrolysis and ozonation, have been utilized to treat specific substances to meet either local regulations or meet specific water quality objectives/targets identified by environmental risk assessments when regulatory reference treatment is not sufficient. In many cases, treatment technology information is shared in the development of Best Available Technique (BAT) Reference Documents to set minimum manufacturing treatment standards across the EU.

22. The pharmaceutical industry supports appropriate research into water treatment and its effectiveness, although it must be borne in mind that there are many substances found in water which may require treatment, of which pharmaceuticals is only one small group. We are quite prepared to work in research partnerships to understand better the appropriate treatment technologies and there are already some instances of collaborative research into the behaviour of pharmaceuticals in water treatment plants.

*Has the European Commission taken an evidence-based approach to the designation of chemicals that present a significant risk to/via the aquatic environment under the Water Framework Directive?*

23. It is our view that in relation to the proposal to designate ethinlyoestradiol, oestradiol and diclofenac as priority substances under the WFD, the approach taken by the European Commission lacked the degree of scientific rigour that we believe is appropriate for designating substances as priority substances.

24. Existing scientific data on potential impact on the environment posed by the medicinal use of these substances is limited and inconclusive. The Environmental Quality Standards (EQSs) set by the Commission in its legislative proposal are based on incomplete data, or on information from published literature that describes studies that in a number of cases have not been performed according to accepted national and

<sup>37</sup> Proposal for a Directive of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy Brussels, 31.1.2012 COM(2011) 876 final [http://ec.europa.eu/environment/water/water-dangersub/pdf/com\\_2011\\_876.pdf](http://ec.europa.eu/environment/water/water-dangersub/pdf/com_2011_876.pdf)

<sup>38</sup> Targeted monitoring for human pharmaceuticals in vulnerable source and final waters. Boxall et al. December 2011 [http://dwi.defra.gov.uk/research/completed-research/reports/DWI70\\_2\\_231.pdf](http://dwi.defra.gov.uk/research/completed-research/reports/DWI70_2_231.pdf)

<sup>39</sup> World Health Organization Technical Report, Pharmaceuticals in Drinking Water: 2012 [http://apps.who.int/iris/bitstream/10665/44630/1/9789241502085\\_eng.pdf](http://apps.who.int/iris/bitstream/10665/44630/1/9789241502085_eng.pdf)

international standards of good laboratory practice. This lack of conclusive evidence seems to be confirmed by a proposal from The European Parliament's Environment Committee to delete from the current Commission proposal the EQSs initially proposed. However, the process established to select these three substances for inclusion in the priority substances list in the first place should also be questioned.

25. Leaving the substances on the priority substances list is not the appropriate tool to obtain monitoring data in order to provide information on potential risk related to chemical substances. If there are no robust data (ie data from studies that have been conducted according to internationally accepted guidelines to ensure a high quality standard and comparability of results) that indicate a consistent level of detection in Member States above levels which scientifically robust investigations show to present a harm to the environment, then the substances should not be included in the priority substances list.

26. We are well aware that some pharmaceuticals are, by their very nature, potent; but a rigorous scientific approach to assessing the risk that their use poses should be taken rather than one looking predominantly at the intrinsic hazards of any substance, as we believe has been the case in the current proposal.

27. Furthermore we believe that the Impact Assessment<sup>40</sup> performed by the European Commission was lacking in that it did not take account properly of the societal benefits associated with the pharmaceutical substances in question. There is only a very superficial and, in our view, inadequate consideration of these.

*What likely impacts could the Commission's proposals have in the UK? How could any adverse effects be mitigated?*

28. As regards pharmaceutical compounds, the Commission's proposals, as they were presented, would have the potential to entail the commitment of significant resources (estimated at between £27 billion and £31 billion over 20 years in England and Wales alone) to meet the EQSs proposed for ethinyloestradiol and oestradiol and to address a putative problem which the current evidence suggests does not exist. The action required to meet the standards proposed by the Commission would also have a significant impact on the carbon footprint of utility companies and would completely undermine many years of meticulous work by these enterprises to achieve significant reductions in their carbon footprint.

29. Also, access to medicines could be inappropriately limited due to the Commission's proposals and there is the potential for different measures of the Member States to address the requirements of the Commission proposal to jeopardise the "single market" principle for the substances in question.

30. The current compromise text suggested by the European Parliament would effectively only postpone the implementation of the Commission's proposal in relation to the three pharmaceutical substances and would not address the fundamental question of the lack of robust scientific evidence to support it.

31. The adverse effects of implementation of the Commission's proposals can only be mitigated by a wholesale review, as discussed above, of the scientific basis upon which The Commission made its proposal.

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### Written evidence submitted by Thames Water (WQ07)

#### 1. INTRODUCTION

1.1 European water quality legislation, including the Water Framework Directive, has played an important role in improving the environmental standards of watercourses across Europe. We strongly support the intentions of the Directive, and its daughter legislation, the Priority Substances Directive.

1.2 However, we do not accept that the revisions currently proposed by the European Commission are in the best interests of either the environment or our customers. The case for adding new substances to "the proposals" lacks robust empirical evidence to support its risk assessment; fails to adequately account for the economic cost and all but ignores the environmental harm caused by increased carbon emissions.

1.3 We welcome this opportunity to bring our concerns to the attention of the Science and Technology Committee.

#### 2. EXECUTIVE SUMMARY

- Despite the Commission's assertion that controlling pharmaceutical substances in waste water discharges would protect human health, existing levels found in watercourses pose no threat to drinking water quality.
- The proposals rely on unsubstantiated claims of likely environmental benefit. Critically, the lack of a solid evidential basis has led to proposals for quality standards that cannot be measured, and for which treatment techniques do not exist.

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<sup>40</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy  
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SEC:2011:1547:FIN:EN:PDF>



- The impact assessment provides an inadequate assessment of the costs. Our best conservative estimate identifies the likely impact as an increase in our customers' wastewater bills of £110 per annum taking them close to double the existing level.
- The potential benefits of source control have been overstated. The reality is that the burden of the costs of meeting the proposed revisions would be borne by water customers.
- The changes would drive up the water industry's carbon footprint, eliminating the progress it has made through two decades of investment in green energy.

### 3. HUMAN HEALTH

3.1 The European Commission and some MEPs argue that by setting limits on a range of substances in watercourses, human health will be protected. These substances include diclofenac (an anti-inflammatory drug); E2 (naturally occurring oestrogen) and EE2 (an artificial oestrogen found in the contraceptive pill).

3.2 In the UK, the Drinking Water Inspectorate has undertaken several studies into the potential risks to health from the levels of pharmaceuticals and oestrogenic substances that might be found in sources of drinking water. The regulator has concluded that "the levels of these compounds in drinking water are many orders of magnitude lower than levels that are given to patients therapeutically ... [and] ...do not pose an appreciable risk to health".<sup>41</sup>

3.3 Furthermore, a recent report by the World Health Organization (WHO) similarly contradicts the assertion that existing levels of these substances in the natural environment pose any risk to public health:

"Currently, analysis of the available data indicates that there is a substantial margin of safety between the very low concentrations of pharmaceuticals that would be consumed in drinking-water and the minimum therapeutic doses, which suggests a very low risk to human health. Based on this finding, the development of formal health-based guideline values for pharmaceuticals ...is currently not considered to be necessary."<sup>42</sup>

3.4 The proposals offer no credible evidence that revising the list of priority substances will benefit public health. Given the critical importance of maintaining public confidence in the quality of drinking water, the mere suggestion of risk can exert a disproportionate influence on public policy. Proposed revisions to the Directive must be based on evidence of demonstrable benefits, and judgments of their value should not be influenced by emotive but entirely spurious claims about human health.

### 4. THE EVIDENCE BASE

4.1 The proposals argue for new or revised controls on 15 new substances, but rely frequently on unsubstantiated claims of the "inherent environmental benefit" of reducing them.<sup>43</sup> The benefits of the new controls are vaguely defined in the impact assessment, with cursory estimates and evidence extrapolated from other sources underpinning much of the case for the proposed revisions.<sup>44</sup>

4.2 The evidence base uses third-party scientific studies to draw conclusions about the harm posed by the various candidate substances. The reliability of these studies must, according to the Commission's own criteria, be assessed using the Klimisch Score (a scale between one and four, with one being the most reliable).

4.3 In the case of diclofenac and E2,<sup>45</sup> over 90% of the studies achieved a score of two, which, according to the Klimisch system, should be assigned to those studies "not performed according to Good Laboratory Practice (GLP)".<sup>46</sup> In the case of EE2, the Commission appears not to have reported the outcome of its reliability assessment at all.<sup>47</sup>

### 5. CASE STUDY: CHEMICALS INVESTIGATION PROGRAMME (CIP) ANALYSIS OF DECABROMODIPHENYL ETHERS (BDES)

5.1 The CIP is a £23 million examination of the prevalence, sources and treatment options for many different substances found in the environment, including several Priority Substances. Commissioned by Defra and the Environment Agency, the study has been funded by water companies, with the support of Ofwat. It is the most comprehensive assessment of these Priority Substances to date.<sup>48</sup>

<sup>41</sup> Targeted Monitoring for Human Pharmaceuticals in Vulnerable Source and Final Waters: Executive Summary, Alistair Boxall *et al*, Drinking Water Inspectorate Project No. WD0805, December 2011

<sup>42</sup> World Health Organization Technical Report, *Pharmaceuticals in Drinking Water*: 2012

<sup>43</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy: Case for Cypermethrin: "Benefits to biodiversity"—offered without further explanation.

<sup>44</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy, Page 90 Justification for proposed new substances Priority Substance Directive, Cypermethrin: "Possible benefits to biodiversity and to fisheries and angling"

<sup>45</sup> EQS Dossier, Sub-Group on Review of the Priority Substances List (working Group E), 2011 i) Diclofenac ii) Beta Estradiol

<sup>46</sup> Klimisch H J, Andreae E and Tillmann U (1997). A systematic approach for evaluating the quality of experimental and ecotoxicological data. *Reg.Tox. and Pharm.* 25:1–5 / "How to report weight of evidence—Practical guide 2" European Chemicals Agency, [http://echa.europa.eu/documents/10162/13655/pg\\_report\\_weight\\_of\\_evidence\\_en.pdf](http://echa.europa.eu/documents/10162/13655/pg_report_weight_of_evidence_en.pdf)

<sup>47</sup> EQS Dossier, Sub-Group on Review of the Priority Substances List (Working Group E), 2011: Ethinylestradiol

<sup>48</sup> The CIP was performed by Atkins, an environmental consultancy with extensive experience in water quality science.

5.2 Decabromodiphenyl ethers (BDEs) are brominated fire retardants, found principally in fire-proofed foams in older household furniture. The proposed standard<sup>49</sup> for BDEs ( $4.9 \times 10^{-8} \mu\text{g}/\text{l}^{50}$ ) has been set at a level which, taking into account the concentrations currently found in sewage works effluent, means the great majority of rivers receiving such discharges would fail to comply.

5.3 Critically, the CIP shows that there is no clear evidence that BDEs are harming the aquatic environment, with healthy levels of fish and invertebrates found in rivers with concentrations orders of magnitude higher than the proposed standard. This situation is replicated with proposed standards for other substances, such as oestradiol (E2), and the biocide tributyltin.

5.4 At the heart of this contradiction between theory and practice is the application of the “precautionary principle”<sup>51</sup> upon which EU environmental policy is based. The principle requires that standards are derived from the worst-case-scenario of any data range.

5.5 The broader and less accurate the evidence, the wider the data range and the more stringent the standards.

5.6 The application of the precautionary principle relies on the reliability of the evidence being used to ensure that the resulting standards are proportionate to the risk.

5.7 The lack of accuracy in the evidence, a shortcoming acknowledged within the proposals themselves, has resulted in standards that lack a robust evidential basis. It has also led to proposed standards for substances including BDEs so low that no technology exists to measure their presence at the level being suggested. In the case of BDEs, the lowest detectable level is 12 times below average levels in treated effluent. The proposed standards are 36,820 times below these average levels.

5.8 Even if the proposed standards could be justified, and the presence of BDEs at this level measured, there are no treatment techniques that are likely to be able to reach the suggested level. Given that BDEs have already been banned<sup>52</sup> in the manufacture of furniture the opportunity to remove them via source-control is also diminished, making the delivery of the proposed standard an exclusively “end-of-pipe” challenge.

5.9 We accept the European Commission’s assertion that “not only the costs but also the benefits of applying measures [...] are difficult to quantify”.<sup>53</sup> This is why we continue to advocate the need for significant further study to determine the best solution.

5.10 Our concerns are echoed in the conclusions of the House of Lords EU Sub-Committee D inquiry into EU water policy, to which both we and the European Commission provided written and oral evidence. The report says:

“We see a need for the Government, and the Commission, potentially through its European Innovation Partnership (EIP) on Water, to acquire more knowledge of the risk posed, principally by the pharmaceutical substances being added to the list, and of cost-effective methods of reducing this risk before effluent containing the substances requires wastewater treatment.”

5.11 In addition, Professor Stephen Holgate, Chair of the Hazardous Substances Advisory Committee (HSAC)<sup>54</sup> has written to the Environment Minister, Richard Benyon, to register his concerns regarding the proposal’s evidence base:

“Looking at the EU Scientific Committee SCHER’s...[EU’s Scientific Committee on Health and Environmental Risks]... review of the data it can clearly be seen that there are significant issues on water solubility ranging over three orders of magnitude, which may invalidate many of the tests. SCHER also state that some data is classified as unreliable and say that there is a need for additional chronic fish tests. Hence HSAC is concerned that the evidence base for introducing the EQS for Diclofenac is not justified.”

5.12 HSAC makes clear in its letter that it holds similar concerns surrounding the evidence base for many of the substances proposed in the legislation and, in particular, all the pharmaceuticals.<sup>55</sup>

## 6. THE COST

6.1 The impact assessment accompanying the proposals provides a partial and inadequate assessment of the costs of treating the new substances. It states:

<sup>49</sup> Proposal for a Directive of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy Brussels, 31.1.2012 COM(2011) 876 final

<sup>50</sup> Environmental Quality Standards (EQS) values mentioned in these examples are annual average concentrations in surface freshwaters—other values apply in marine and estuarine waters

<sup>51</sup> As defined by Article 191 of the Treaty on the Functioning of the European Union

<sup>52</sup> Due to their toxicity at levels orders of magnitude higher compared to what is found in the environment that is attributable to wastewater systems

<sup>53</sup> Proposal for a Directive of the European Parliament and of the Council amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy Brussels, 31.1.2012 COM(2011) 876 final: page 49

<sup>54</sup> HSAC is charged with providing the Government with impartial and expert advice on hazardous substances.

<sup>55</sup> Correspondence to Richard Benyon MP Re: Water Framework Directive—Priority Substances Directive Environmental Quality Standards, from Professor Stephen T. Holgate, Chair, HSAC: 6 November 2012 ref: UKCSF/12/25

“It is however not possible to estimate how much end-of-pipe treatment would be needed across the EU.”<sup>56</sup>

6.2 The Commission’s own Impact Assessment Board criticised the evaluation on this point:

“The costs and benefits of the options and the uncertainties around them need to be made more transparent.”<sup>57</sup>

6.3 In the absence of definitive cost estimates in the impact assessment, various attempts have been made to arrive at a credible cost figure. However, with the recent completion of the Chemicals Investigation Programme, a range of between £27 billion and £31 billion, over a 20 year period, has been identified as the cost of treatment of E2 and EE2 alone. This has subsequently been used by the Environment Agency and quoted by the Government in response to a Parliamentary Question on the issue.<sup>58</sup>

6.4 On the basis of this analysis, we are able to estimate that the cost to our customers for treating these two substances alone would be between £60–£70 per year for at least the next 20 years (not adjusted for inflation or financing costs).<sup>59</sup>

6.5 When the cost of treating the additional 13 substances on the proposed new list is considered, and offset against the positive impact in reducing levels of other substances, we estimate a minimum bill increase of £110 per year, over the same period, would be needed to meet the new standards.

6.6 This would have the effect of nearly doubling the wastewater services bill for our customers, at a time when household budgets are already under growing pressure.<sup>60</sup>

6.7 This new cost would be equal to almost a third of the £100 billion invested in the UK industry since privatisation 23 years ago. Investment since privatisation has transformed standards of drinking water quality and wastewater treatment, and, in the case of Thames Water, reduced leakage to near its lowest ever level. Yet it is not possible to show that investing the potential £31 billion needed to meet the proposed revisions (for only two of the substances) would yield any meaningful environmental benefits.

## 7. CASE STUDY: E2 AND SOURCE CONTROL

7.1 E2 is one of the new compounds being added to the list. It is the only substance where indicative treatment costs are outlined by the European Commission. The impact assessment<sup>61</sup> explains, using research from the UK, that the cost of treating this compound to the required level would be approximately €18 per capita. This represents a cost of €1.1 billion to UK water customers alone.

7.2 The impact assessment explains that this cost represents a “worst case scenario”, as the estimates did not include any form of source control. Given that E2 is a naturally occurring substance excreted in urine, it is difficult to envisage a circumstance where source control could be effectively applied.

7.3 The impact assessment also outlines that expenditure to treat E2 would provide the additional benefit of helping to reduce the incidence of nickel, another priority substance. This contradicts our analysis of the treatment processes that would be required to treat these two substances. In fact, nickel will not and cannot be managed by the same measures put in place to reduce E2. This suggests that the impact assessment underestimates the potential costs of the changes. While E2 and EE2 require advanced oxidation (ozonation) or absorption (activated carbon) treatment, neither of these processes could treat nickel to the required level as well.<sup>62</sup>

## 8. SOURCE CONTROL

8.1 We welcome the European Commission’s recognition that more needs to be done to ensure harmful substances do not enter sewer networks, and we continue to work in partnership with industry to encourage best practice in this area.

8.2 However, the potential benefits of source control have been overstated in the impact assessment, as the CIP has clearly shown a domestic origin for most substances.

<sup>56</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

<sup>57</sup> SEC(2011)1545: Opinion—Impact assessment on an EU initiative on priority substances in the field of water policy

<sup>58</sup> Written Parliamentary Question. Hansard citation: HC Deb, 17 December 2012, c514W

<sup>59</sup> By apportioning the lowest estimate for the costs of treating of E2 and EE2 (£27 billion) to our waste water population (13.6 million), the cost to Thames Water customers would be £6.5 billion (based on the population of England and Wales being 56.1 million, according to the 2011 census). The number of households which are liable to be billed (as reported to Ofwat for the 2012–13 period) is 5.45 million. Therefore, the total cost, divided per household, is £1,200. Paid for over the 20 year period the cost to bill papers is £60. If the upper estimate for cost is used the bill increase rises to nearly £70

<sup>60</sup> In figures we are required to report to Ofwat, we stated that our average waste water bill is £137.46

<sup>61</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy: page 49

<sup>62</sup> Nickel in Drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality—WHO/SDE/WSH/05.08/55, Page 15: “6.2 Treatment and control methods and technical achievability”

8.3 We have commented on the impracticalities of using source control for E2 to any significant degree. Similarly, without the withdrawal of artificial oestrogens and diclofenac from the market, it is also difficult to see a role for source control in reducing the prevalence of these substances.

8.4 The impact assessment regards measures to prevent the disposal of drugs via sinks and toilets as a potentially useful form of source control:

“a significant quantity of unused drugs are discarded into the sink or toilet and therefore end up in surface waters”.<sup>63</sup>

8.5 However, the impact of any initiative to prevent drug disposal through wastewater systems is likely to provide only minimal reductions, given the comparatively tiny proportion of substances that enter wastewater systems in this way.

8.6 In the case of EE2, between 52% and 80% of the daily dose passes through the body and is excreted.<sup>64</sup> The impact of a safe drug disposal campaign would do little to reduce overall levels in untreated water. As the European Commission has already conceded that it has no mandate to legislate on limits or propose alternative drugs<sup>65</sup> in order to realise notional environmental benefits, the only possible alternative is end-of-pipe treatment.

8.7 With the exception of E2, which humans excrete naturally, this would result in those who do not discharge these substances subsidising the cost of treatment for those who do.

## 9. CARBON EMISSIONS

9.1 The European Commission acknowledges that climate change is the greatest environmental threat we face.<sup>66</sup>

9.2 The water sector has made significant progress in reducing its carbon emissions. Thames Water, for instance, is on target to reduce its emissions to 20% below 1990 levels by 2020.

9.3 Current estimates show that the very great majority (85%) of sewage treatment works would fail the proposed new standards. In many instances, this could only be addressed through the installation of additional sewage treatment processes. In a large number of cases this would involve the sort of energy-intensive processes normally used to treat drinking water, such as Granular Activated Carbon (GAC) or reverse osmosis, a method typically employed in desalination plants.

9.4 The increased treatment requirements of the proposed revisions would drive up the industry’s carbon footprint for wastewater in the UK by the equivalent annual carbon footprint of 166,000 households.

9.5 It would also eliminate the significant progress the industry has made in reducing its carbon footprint, returning emissions to a point in excess of 1990 levels, despite over two decades of significant investment in energy efficiency and renewable energy generation.

9.6 The increased demand for energy as a result of the proposed changes would, if sourced from the UK’s National Grid supply, cost between £195 million and £310 million per year. In order to protect the progress made in reducing emissions by meeting the requirements through self-generated renewables, the cost would rise to a minimum of £2 billion. These figures have not been factored into cost estimates cited in this note.

## 10. CASE STUDY: CARBON ERRORS

10.1 Although the Commission admits in its impact assessment that the carbon cost of its proposals is significant, the figures presented in the impact assessment underestimate that cost, and incorporate a fundamental error in the interpretation of the data.

10.2 The source material used to calculate the potential carbon impact of the proposals is taken from Water UK’s Sustainability Indicators Report 2010–11.<sup>67</sup> However, it does not calculate the percentage increase in emission and energy consumption for wastewater treatment, as is claimed, but rather as a proportion of the

<sup>63</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy: page 18

<sup>64</sup> *Are Oral Contraceptives a Significant Contributor to the Estrogenicity of Drinking Water?*, Amber Wise, Kacie O’Brien, Tracey Woodruff, Program on Reproductive Health and the Environment, University of California: September 2010

<sup>65</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy: page 49: “it would not be appropriate to propose measures at EU level; measures to influence prescription could in fact only be taken at MS level since there are currently no mechanisms in the EU legislation to do this.”

<sup>66</sup> Manuscript: *Combating climate change: The EU leads the way*, 2007, EC Directorate General for Communications

<sup>67</sup> Data from Sustainability Indicators Report 2010–11, Water UK: Page 17

industry's entire energy use (including clean water treatment and administration emissions).<sup>68</sup> Therefore the figure of a 20% increase, though high, is far lower than the real figure of 33% that accurately reflects the impact through a calculation based on wastewater activities only.

10.3 The impact assessment also states that the carbon emissions created by new treatment would be partially offset by a decreased need for treatment downstream in drinking water treatment plants:

“On the other hand, the technologies used for the enhanced treatment would also eliminate many other pollutants and thus improve the quality of the discharge significantly, making it easier to treat water downstream for the production of drinking water and therefore implying potential savings”<sup>69</sup>

10.4 This is not the case.

10.5 Water companies in the UK and across most of Europe have a duty (and legal requirement) to ensure drinking water meets the required standards in all circumstances.

10.6 Companies already employ treatment processes, including GAC and ozonation, that remove many of the substances listed in the proposals from drinking water. The marginal change in pollutant load would have a negligible impact on the effectiveness or energy consumption of these processes.

10.7 The highly uncertain improvements in water quality that the proposed revisions might bring are likely to be significantly outweighed by the widespread and certain environmental harm that the increased carbon emissions would cause.

## 11. CONCLUSION

11.1 We do not accept that the changes currently proposed within the revisions of the Priority Substances Directive are in the best interests of either the environment or our customers. The case for adding new substances to the list lacks robust evidence; fails to adequately account for the economic cost and all but ignores the environmental harm caused by increased carbon emissions.

February 2013

### Written evidence submitted by Blueprint for Water (WQ10)

#### 1. CHEMICALS THAT SHOULD BE CONTROLLED IN WATER DISCHARGES

1.1 The Blueprint for Water coalition believes that the UK Government should support expanding the EU list of priority water pollutants whose emissions need to be controlled. Our organisations believe that there is a clear and strong case for adding a further 15 substances to the current list, and that this would benefit both people and the environment (see below).<sup>70</sup> These substances have been found to have a wide range of impacts, including toxic and carcinogenic effects on freshwater and marine biota, and the feminization of male fish. There are also risks to human health through consumption of contaminated seafood and drinking water. Failure to address these substances puts at risk the achievement of good ecological status in our rivers (in accordance with the Water Framework Directive) and good environmental status of our coastal waters (in accordance with the Marine Strategy Framework Directive); indeed, these issues apply right across Europe.

1.2 Our organisations welcomed the commitment in the recent Water White Paper that the UK “*must maintain our efforts on such source controls, especially in relation to emerging pollutants*”. We believe that the current EU review of water pollutants provides the perfect opportunity to build on this proposal as it would ensure a level playing field across the EU. In addition, we believe that there are a range of measures that can

<sup>68</sup> Ibid: Total industry energy consumption 9016GWh. Ratio of energy consumption (MWh) to carbon emissions (CO<sub>2</sub>e) = 0.52  
1 million tonne increase in carbon emission = 1800GWh of electricity—19.96% increase on total industry energy consumption. However, energy consumption for waste water treatment in the UK = 5409GWh (based on underlying data in the table shown below):

	Anglian	Dwr Cymru	North Umbrian	Severn Trent	South West	Southern	Thames	United Utilities	Wessex	Yorkshire	Total WASCs
Water	22,710	15,638	15,302	31,100	6,988	10,023	37,824	19,589	6,000	20,611	<b>185,784</b>
Waste	24,637	18,359	10,992	7,700	11,112	17,784	33,022	21,850	11,400	23,071	<b>179,657</b>
<b>Total</b>	<b>47,077</b>	<b>33,997</b>	<b>26,294</b>	<b>38,800</b>	<b>18,100</b>	<b>27,807</b>	<b>70,845</b>	<b>41,439</b>	<b>17,400</b>	<b>43,682</b>	<b>365,441</b>
% water	48.24%	46.00%	58.20%	80.15%	38.61%	36.04%	53.39%	47.27%	34.48%	47.18%	<b>50.84%</b>
% waste	51.76%	54.00%	41.80%	19.85%	61.39%	63.96%	46.61%	52.73%	65.52%	52.82%	<b>49.16%</b>

percentage increase in energy consumption for waste water treatment = 33.21% (WASC = Water and Sewerage Company)

<sup>69</sup> EU Working Document 2011 1547—impact assessment: amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy: page 49

<sup>70</sup> The proposed 15 additional priority substances are:

- Plant protection product substances: Aclonifen, Bifenox, Cypermethrin, Dicofol, Heptachlor, Quinoxifen
- Substances used in biocidal products: Cybutryne, Dichlorvos, Terbutryn
- Industrial chemicals: Perfluorooctane sulfonic acid (PFOS), Hexabromocyclododecane (HBCDD)
- Combustion by-products: Dioxin and Dioxin-Like PCBs
- Pharmaceutical substances: 17 alpha-ethinylestradiol (EE2), 17 beta-estradiol (E2), Diclofenac

be implemented to reduce the emissions of these hazardous substances, both at source (including product substitution) and through catchment management and improved waste water treatment; the cost would clearly be proportionate to the benefits to all concerned.

## 2. BENEFITS ARISING FROM THE DESIGNATION OF THE PROPOSED PRIORITY SUBSTANCES

2.1 The identification of Priority Substances and the setting of associated Environmental Quality Standards will enhance protection of our surface waters and lead to a range of benefits, including: improved health of aquatic biota, and hence improvement in ecological status, including a reduced exposure of fish and other aquatic wildlife to endocrine disrupting chemicals; improved quality of both freshwater and marine commercial fisheries and aquaculture; improved quality of drinking and industrial water sources, yielding a reduction in water treatment costs; and the potential for reduced exposure to risk for consumers of drinking water and the consumption of shellfish.

2.2 Robust quantification of these benefits (including their financial value) is, however, extremely difficult to achieve, since little or no such information currently available. Such quantification becomes even harder with respect to a single substance, particularly given the occurrence of “chemical mixtures” in many of our water bodies and the additive effects they are known to have upon aquatic life, as well as their potentially complex synergistic effects. With respect to human health, potential exposure to trace amounts of a range of pollutants (directly and indirectly) via water may occur over a number of decades, but the scientific understanding of the risk that this may pose remains incomplete. Finally, the value placed upon environmental benefits is—at least in part—a political and societal decision. For example, Swiss studies into additional waste water treatment to remove micropollutants indicate that the costs are justifiable (see below).

2.3 Despite the difficulty in quantifying benefits associated with designation of these proposed priority substances, there are important issues that need to be accounted for in the cost-benefit analysis. These relate to: additional waste water treatment; the use of substitute/alternative substances; and tackling improper disposal of pharmaceuticals.

### 2.4 *Additional waste water treatment*

*Swiss studies into additional waste water treatment measures:* Swiss studies show that a broad spectrum of organic trace substances were successfully eliminated (average elimination was >80%) during trials testing ozonation and activated carbon treatments, with the effects of endocrine disruptors significantly reduced. Additional costs were found to be 5–10% compared to existing conventional treatment for larger waste water treatment plants. Costs per inhabitant per year under various scenarios ranged between 15 and 24 Swiss Francs. Such costs are considered justifiable.<sup>71</sup>

2.4.2 *Additional treatment removes numerous pollutants:* Treatment such as activated carbon removes or reduces a range of micropollutants, some of which may be designated as WFD priority substances in the future, particularly given the interest in a range of emerging substances and the “Watch List” proposal. The evaluation of additional treatment costs should not, therefore, focus upon two or three select substances only but consider the full range of pollutants that would be addressed. Moreover, improvements in the quality of drinking and industrial water supplies should be taken into account, and the consequent reduction in water treatment costs as well as the general improvement in aquatic environment health that would be achieved.

2.4.3 *Phased implementation of additional treatment to spread the cost:* To spread costs over a longer timeframe treatment can be initially targeted at select, large high-load waste water treatment works, whose effluent discharges have significance for drinking water quality and whose discharges are particularly poorly diluted; lower impact discharges could then be addressed in a later phase. Whilst such an approach may still require the use of exemptions, it may be viewed sympathetically by the European Commission and could avoid leaving the UK in a potentially isolated position.

### 2.5 *The use of less harmful substitutes*

2.5.1 *For 17 $\alpha$ -ethinylestradiol (EE2):* Alternatives to the use of EE2 exist, in particular, the progestogen-only pill, whose active hormone undergoes higher removal rates in urban waste water treatment works.

2.5.2 *For Di(2-ethylhexyl) phthalate (DEHP):* A number of alternative plasticisers to DEHP exist. Whilst these vary in their properties, uses, cost and risk to humans and the environment, in some countries and end products such substitutes have already been used for a number of years (eg PVC in Sweden). Replacement can occur at end of life to reduce costs.<sup>72</sup>

### 2.6 *Addressing improper disposal of pharmaceuticals*

2.6.1 Improper disposal of pharmaceuticals can be a significant source of pollution. High amounts of unused Diclofenac, for example, may occur due to various reasons (end of treatment, medication change, non-compliance with prescription or expiry) with their potential to be flushed down toilets and onwards to the

<sup>71</sup> <http://www.bafu.admin.ch/gewaesserschutz/03716/11218/11223/index.html?lang=en>

<sup>72</sup> [http://echa.europa.eu/documents/10162/13640/tech\\_rep\\_dehp\\_en.pdf](http://echa.europa.eu/documents/10162/13640/tech_rep_dehp_en.pdf)

waste water treatment works. Improvement of take-back schemes and the raising of public awareness can play a role in addressing this. Current awareness in the general public of the environmental impact is poor, not only of pharmaceuticals but also of household chemicals and personal care products. Addressing improper disposal will help to reduce the pharmaceutical loading received by wastewater treatment plants.

### 3. BLUEPRINT FOR WATER COALITION

3.1 The Blueprint for Water coalition is a unique coalition of environmental, water efficiency, fishing and angling organisations which call on the Government and its agencies to set out the necessary steps to achieve “sustainable water” by 2015. The Blueprint for Water is a campaign of Wildlife and Countryside Link.<sup>73</sup>

3.2 This response is supported by the following nine organisations:

- Angling Trust.
- Buglife—The Invertebrate Conservation Trust.
- Freshwater Biological Association.
- Marine Conservation Society.
- Salmon & Trout Association.
- The Rivers Trust.
- The Wildlife Trusts.
- Wildfowl and Wetlands Trust.
- WWF-UK.

February 2013

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#### Written evidence submitted by Research Councils UK (RCUK) WQ14

1. Research Councils UK is a strategic partnership set up to champion research supported by the seven UK Research Councils. RCUK was established in 2002 to enable the Councils to work together more effectively to enhance the overall impact and effectiveness of their research, training and innovation activities, contributing to the Government’s objectives for science and innovation. Further details are available at [www.rcuk.ac.uk](http://www.rcuk.ac.uk).

2. This evidence is submitted by RCUK and represents its independent views. It does not include, or necessarily reflect the views of the Knowledge and Innovation Group in the Department for Business, Innovation and Skills (BIS). The submission is made on behalf of the following Councils:

Natural Environment Research Council (NERC), Engineering and Physical Sciences Research Council (EPSRC).

#### EXECUTIVE SUMMARY:

- We consider that the 15 additional water priority substances identified by the Commission, and controlled through the EU Water Framework Directive, are appropriate and that their prioritisation procedure for selection is reasonable.
- Monitoring results would identify rivers at particular risk, such as those with large populations and abstraction for drinking water. Treatments could then be prioritised in those regions with highest contamination.
- There is mounting evidence to suggest that EE2 (17 alpha-ethinylestradiol) causes endocrine disruption in freshwater fish at current levels in some rivers.
- The EE2 proposed 0.035 ng/L standard for quality, in real water samples this would be extremely difficult to reliably measure using current analytical chemistry protocols.
- Current research quality is high, but the UK has the potential to be an international player in water engineering and there is an opportunity to develop research in exciting and innovative directions.
- Led by NERC, UK Research Councils are beginning the process of joining up access to their water-related research to enable businesses to take it up more easily, initially through the Water Security KE Programme, which offers, among other things, a directory of researchers.
- Since the formation of The UK Water Research and Innovation Partnership (UKWRIP), groups of members have taken actions to increase coherence amongst themselves; knowledge has been synthesised; there has been progress on modelling water resources and flooding; substantial new investments have been made in research topics and more is coming on stream; barriers on the road from research to innovation have been identified and these are being lowered (for example by an opportunity for new Doctoral Training Centres).
- Cost implications of water treatment/management, according to recent articles in the journal *Nature*, are probably exaggerated.

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<sup>73</sup> [www.blueprintforwater.org.uk](http://www.blueprintforwater.org.uk)

- The public, industry, regulators and Government are all responsible for ensuring they interact and deliver the funding and expertise to develop the directives that control chemical concentrations in water discharge.

#### BACKGROUND INFORMATION

1. 2011 saw the formation of the cross-council RCUK Water Interest Group (WIG), an informal forum that brings the research councils together, to work collaboratively on water. NERC is leading RCUK activity to engage the water sector with academic research and gather user requirements in order to shape future strategies. This is tied in to the UK Research and Innovation Partnership (UKWRIP)—a forum of research funders from across the private and public sector, and NGOs—see below. Practical examples of this joint working are the water Centres for Doctoral Training (CDT), which have been scoped with users in mind (and involved) and across councils, and the well-received RCUK water research showcase; the first of which was held in March 2012 and the second of which is planned in March 2013.

2. EPSRC currently supports a research portfolio of £37.9 million relevant to *water treatment*. Key highlights in the portfolio are the “Bio-desalination: from cell to tap” research at the University of Glasgow and the “Pennine Water Group (PWG); Urban Water Systems for a Changing World” research platform grant based at the University of Sheffield. In addition, recognising the importance of talented people, EPSRC supports a CDT of £6.4 million value delivering postgraduate leaders for the future. This multi-institutional activity (“Skills Technology, Research, and Management (STREAM) for the UK Water Sector”) draws on leading expertise from five key water centres across the UK.

3. NERC’s Centre for Ecology and Hydrology covers much work on water quality; they are providing a complementary response to this inquiry.

#### WATER QUALITY

4. The following views are submitted under the specific questions requested in the call for evidence.

*What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

5. We consider that the 15 additional water priority substances identified by the Commission, and controlled through the EU Water Framework Directive, are appropriate and that their prioritisation procedure for selection is reasonable.

*What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

6. The decision by the Members of the European Parliament’s environment committee not to, presently, give the three pharmaceuticals environmental quality standards (but to require monitoring) is probably correct. Selective monitoring of threatened areas will afford additional information on those water courses at major risk. (This decision does tend to indicate that the European system is scrutinised and is therefore working).

7. However, there is still relatively little by way of standards for assessing, monitoring and managing water turbidity. This is not just an issue of water colour, or of sewage effluent, but is associated with all kinds of compounds which are transported on/in the particulates. Thus, accelerations of natural particulate sources (field erosion for example by poor land practice of climate change) can have other consequences downstream.

8. It is the responsibility of all parties concerned (ie the public, industry, regulators and Government) to ensure they interact and deliver the funding and expertise to address pressing issues of chemical concentrations in water discharge.

*Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

9. The inclusion of pharmaceuticals appears most controversial to Parliament. There is mounting evidence to suggest that EE2 (17 alpha-ethinylestradiol) causes endocrine disruption in freshwater fish at current levels in some rivers. E2 (17 beta-estradiol), however, is naturally excreted by women and it has been estimated that only approximately 10% results from pharmaceuticals. Hence, potential regulation is more controversial. The inclusion of diclofenac relates to direct toxicity in fish and also to secondary poisoning of birds through its veterinary use.

10. With regard to treatments to reduce pharmaceutical concentrations, research undertaken jointly with PML has demonstrated the efficacy of granular activated charcoal removal. Monitoring results would identify rivers at particular risk, such as those with large populations and abstraction for drinking water. Treatments could then be prioritised in those regions with highest contamination. Alternative treatments (such as sand filtration) could possibly be used at those with lesser contamination.

11. Concerning the EE2 proposed 0.035 ng/L standard for quality, in real water samples this would be extremely difficult to reliably measure using current analytical chemistry protocols.



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*To what extent is innovation in water treatment supported in the UK? How successfully is innovation shared across the UK and the EU?*

12. Current research quality is high, but the UK has the potential to be an international player in water engineering and there is an opportunity to develop research in exciting and innovative directions.

13. The water utilities in the UK are regulated by OFWAT, with the principal aim of maintaining the quality of drinking water supply whilst keeping costs under control. This regime is thought by the majority of stakeholders to inhibit innovation as there is little incentive on the businesses to invest in innovation. There is a significant amount of research and innovation in the research base, with research programmes relating to water amounting to more than £120 million. There is an opportunity for the translation of some of this research and the data which is generated into solutions. For example, the Environmental Science to Services Partnership (ESSP) between the Met Office, Natural Environment Research Council, Environment Agency, Ordnance Survey and Defra, is beginning to develop services for businesses in the water area through the bringing together of different datasets and information. Led by NERC, the seven UK Research Councils are beginning the process of joining up access to their water-related research to enable businesses to take it up more easily, initially through the Water Security KE Programme, which offers, among other things, a directory of researchers.

14. The UK Water Research and Innovation Partnership (UKWRIP) has the following vision:

*By 2030 the UK will be a key contributor in providing integrated solutions in water security and sustainability such that individuals, communities and businesses benefit from productive, equitable water systems and ecosystem services. In consequence, health improves, communities develop, the green economy grows and the environment is protected and enhanced.*

UKWRIP's aim is:

*To provide leadership and facilitation of co-ordination of water research and innovation across the UK and convene representatives and stakeholders from initiatives concerned with UK and global water security, to deliver the above vision.*

15. UKWRIP brings together private, public and third sector representatives under the chairmanship of the GCSA Sir John Beddington to deliver the UKWRIP vision by supporting targeted actions in specific areas, acting as a forum for information exchange, providing strategic leadership and focus, and adding value to actions led by member bodies.

16. Since UKWRIP was formed, groups of members have taken actions to increase coherence amongst themselves; knowledge has been synthesised; there has been progress on modelling water resources and flooding; substantial new investments have been made in research topics and more is coming on stream; barriers on the road from research to innovation have been identified and these are being lowered (for example by an opportunity for new Doctoral Training Centres). Having UKWRIP has also helped members make inputs to issues around making the UK more resilient to extremes of the water cycle such as droughts and floods (where the Defra family and the RCUK family now work closer than ever) and has influenced thinking on the next Climate Change Risk Assessment (which includes water quality).

17. UKWRIP has recently mapped current Research Council and UKWRIP water activities against innovation priorities identified by the Defra/Ofwat water innovation leadership group, to identify gaps in research, innovation and knowledge exchange, and make connections where appropriate. UKWRIP will work with this group going forward to map innovation work done by other parts for the water industry.

18. UKWRIP has links with international bodies such as the EU's Water Innovation Partnership, Water Sanitation and Supply Technology Platform (WssTP). UK is not as well represented on European fora as it could be, however.

19. EPSRC's current water engineering portfolio is small compared to associated areas within the Engineering landscape, yet impacts made by research in this area could be potentially transformative, raising the UK's profile in an international context and contributing to societal challenges. Investment in this area will therefore be grown relative to other areas of the portfolio.

*What likely impacts could the Commission's proposals have in the UK? How could any adverse effects be mitigated?*

20. Cost implications of water treatment/management, according to recent articles in the journal *Nature*, are probably exaggerated. As mentioned above, prioritisation can take place. Also *Nature* was unable to access an explanation of the calculations from Defra, such as the quality limit they applied. Also, finance is already set aside directly for improving water quality (OFWAT suggest £4.1 billion between 2010 and 2015).

21. We believe that transparency of such issues should be enhanced and dialogue extended/broadened.

## Written evidence submitted by the Environmental Industries Commission (WQ15)

### INTRODUCTION

1. The Environmental Industries Commission (EIC), set up in 1995, is an association of around 200 companies operating in the environmental technologies and services sector. The below response was written with the engagement of EIC's specialist Water Management and Environmental Laboratories Working Groups.

2. Should you have any queries relating to this submission, or if you would like further information on any of the points raised, please contact EIC's Deputy Public Affairs Director, Sam Ibbott, on either sam.ibbott@eic-uk.co.uk or 0207 654 9941.

3. EIC has an expert industry membership. We would be very keen to also submit oral evidence to the Committee on this issue, should the opportunity be available.

*What chemicals should be controlled in water discharges, what should the acceptable thresholds be and how are these chemicals currently controlled?*

4. Current legislation covers 33 priority substances through directives 2006/60/EC and 2008/105/EC. This list does not include pharmaceuticals and only a limited range of pesticides and emerging substances. The current proposal to amend the above directives starts to address the lack of monitoring of other potential pollutants by the addition of a further 15 substances with the inclusion of a few other substances including some pharmaceuticals, dioxins, fire fighting foam additives and pesticides.

5. It is EIC's opinion that this list is very brief in relation to the actives that are currently entering the water system, and not enough consultation or investigation has been undertaken to assess what substances should be included in the priority list. The addition of a "Watch List" is a step forward but it is unclear as to how this is going to be populated and who will decide what is included in it.

6. Another area we feel needs addressing is the toxicity of degradation and the reaction products of these substances—in the treatment work's process for example—as the formation of potentially more toxic compounds is a distinct possibility.

7. With regard to the analytical limits of the identified priority substances, there seems to be a lack of understanding on what is currently achievable in terms of operational reporting limits to meet the stated EQS limits. For example the limit for the sum of the six BDE congeners is  $4.9 \times 10^{-8}$  ug/l which is not routinely achievable with current technology. The EQS limits seem to have been derived purely from desk based modelling with the inclusion of large safety factors due to a lack of toxicological data and often not taking into account what is analytically achievable. The only way of getting down to these levels is either by impractical concentration of large volumes of sample, or by using passive sampling media placed in the water body resulting time averaged data.

8. The question arises as to how the Commission intends to address the lack of consultation with laboratories and chemists to avoid publishing EQS limits that are not achievable.

*What are the roles of the public, industry, regulators and Government in ensuring chemicals that pose a risk are effectively controlled?*

9. There needs to be greater involvement of industry in the control of these chemicals as it is industry who can often provide valuable information about specific chemicals which may not be on the government's radar. EIC believes that there should be further industry involvement with the regulators and government to ensure greater buy-in and collaboration. Engagement at an early stage would be seen more favourably, and allow industry to self regulate rather than be forced to comply.

*Should pharmaceuticals in water discharges be better controlled and if so, how could this be achieved?*

10. There is not much that can be done in terms of controlling the release of pharmaceuticals into the wastewater cycle as they are naturally excreted from the human and animal body. The only way of removing them is through the treatment works with the addition of costly treatment technology. However, until we understand the toxicity, bioaccumulation and degradation pathways of these compounds via increased monitoring and toxicological studies it would not be advisable to spend a vast sum of money upgrading the treatment technology if they turn out not to have a detrimental affect on the human population or the aquatic ecosystem. More research needs to be funded to identify which of the many pharmaceuticals pose a threat in terms of toxicity, persistence and bioaccumulation prior to selecting them as priority substances. We know that anti inflammatory drugs, antidepressants and beta blockers are present in waste water but it is not clear if they are posing a long term risk and should therefore be included as a priority substance.

*Has the European Commission taken an evidence-based approach to the designation of chemicals that present a significant risk to/via the aquatic environment under the Water Framework Directive?*

11. The European Commission has tried to take an evidence based approach to the designation of chemicals posing a significant risk under the Water Framework Directive. However, the evidence base is still too small

and sporadic to make a truly informed decision. Many of the chemicals that are posing a threat to the environment and the human population are not being monitored as they form part of many household products and often enter the water system unchecked and unannounced as they leach out of products and goods imported into the UK. For example, in fabrics, wood products, and commodities.

12. We would welcome clarification on how the Commission proposes to keep track of these chemicals. One option could be to set up a working group, in conjunction with industry, to highlight and discuss potential emerging substances.

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**Written evidence submitted by Marine Conservation Society (MCS) (WQ09)**

1. The Marine Conservation Society (“MCS”) is the UK charity dedicated to the protection of the UK’s seas, shores and wildlife. MCS campaigns for clean seas and beaches, sustainable fisheries, protection of marine life and their habitats, and the sensitive use of our marine resources for future generations. MCS produces the annual Good Beach Guide, the Good Fish Guide on sustainable seafood, organises volunteer projects and surveys such as Beachwatch, the Beachwatch Big Weekend and Basking Shark Watch and works closely with the UK Government and devolved administrations on the development and implementation of marine laws and policies.

2. MCS strongly believes that microplastics should be included in this inquiry due to their potential adverse effects on marine wildlife and human health.

3. Microplastics (defined as plastic particles smaller than 5mm), consist of microbeads from the cosmetics industry, plastic pellets produced by chemical companies for use in the plastics manufacturing industry and the degradation products of larger plastic items.

4. Microplastics in the marine environment can carry two types of organic micropollutants. Firstly, compounds incorporated into plastics during production as plasticizers and their degraded products such as nonylphenols (an endocrine disruptor), and secondly pollutants adsorbed from seawater such as Polychlorinated biphenyls (PCBs) and Dichlorodiphenyldichloroethylenes (DDEs).

5. Marine wildlife ingest these products and there is the potential risk that these toxins may bioaccumulate up the food chain, ultimately to ourselves as sea food consumers.

6. The plastic beads used in some cosmetic preparations, hand cleansers and industrial air blast cleaning media reach the marine environment through foul water and sewerage systems. Please see the attachment on this subject by Dr. H Leslie of the Institute of Environmental Studies, Free University of Amsterdam.

7. Unilever has recently stated that there is no place for microplastic beads in their products and has agreed to remove microplastics from their products in the Netherlands by 2013, in Europe in 2014 and worldwide in 2015, sooner if possible. Lush in the UK have also removed all plastic particles from their products.

8. MCS together with other environmental NGOs believe that the simplest way to stop the use of microplastics in personal care products is by introducing a Europe wide ban and we are campaigning strongly on this front. We believe the best way to implement such a ban may be through the Water Framework Directive.

ATTACHED

1. Micro plastics in personal care products—Joint NGO Position Paper.<sup>74</sup>

2. MICROPLASTICS: an emerging pollutant in municipal wastewater treatment plants.<sup>75</sup>

*February 2013*

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**Written evidence submitted by Professor Richard C. Thompson (WQ17)**

Marine debris, and in particular plastic debris, is fragmenting in the environment. Much of the debris collected during survey trawls consists of tiny particles or “microplastic” (Law et al. 2010; Thompson et al. 2004). This material was first described by Thompson et al. in 2004 (Figure 1) who identified microscopic fragments on shorelines and in the water column. The definition has since been refined by NOAA in the USA to include pieces or fragments less than 5 mm in diameter (Arthur et al. 2009). The abundance of microplastics is increasing in the oceans (Goldstein et al. 2012; Thompson et al. 2009a). A horizon scan of global conservation issues identified microplastic as one of the top global emerging issues (Sutherland et al. 2010) and a recent review for the Convention on Biological Diversity has shown that around 10% of all reported encounters between marine debris and marine organisms are with microplastics (GEF 2012).

<sup>74</sup> Not printed. <http://www.mcsuk.org/downloads/pollution/positionpaper-microplastics-august2012.pdf>

<sup>75</sup> Not printed

Figure 1

- (A) MARINE DEBRIS ON A STRANLINE WHERE IT FRAGMENTS INTO SMALLER PIECES  
 (B) A FRAGMENT OF MICROPLASTICS NEXT TO A GRAIN OF SAND FOUND ON A BEACH IN CORNWALL, UK  
 (C) SCANNING ELECTRON MICROSCOPE IMAGE OF MICROPLASTIC FRAGMENTS



Source: R C Thompson.

Microplastic is formed by the physical, chemical and biological fragmentation of larger items, or from the direct release of small pieces of plastic. This includes, for example, industrial spillage of pre-production pellets and powders, microscopic plastic particles that are used as abrasive scrubbers in domestic cleaning products (Fendall & Sewell 2009; Gouin *et al*, 2011) and industrial cleaning applications such as shot blasting of ships and aircraft (Barnes *et al*, 2009). Plastic items fragment in the environment because of exposure to UV light and abrasion, such that smaller and smaller particles form. Some plastics are even designed to fragment into small particles, but the resulting material does not necessarily biodegrade (Roy *et al*, 2011). Microplastics are known to have accumulated in the water column, on coastal and estuarine shorelines and in subtidal sediments worldwide (Andrady 2011; Barnes *et al*, 2009; Thompson *et al*, 2004; Zarfl *et al*, 2011). However there is limited information on their abundance in freshwater habitats including lakes and rivers or from the terrestrial environment (Rillig 2012).

Microplastics have a relatively large surface area to volume ratio and are therefore have greater capacity to facilitate the transport of contaminants. Fragments as small as 2  $\mu\text{m}$  have been identified from marine habitats (Ng & Obbard 2006), but due to limitations in analytical methods, the abundance of smaller fragments is unknown. As a consequence of the fragmentation of larger items and the direct release of small particles, the quantity of fragments is expected to increase in the seas and oceans (Andrady 2011; Thompson *et al*, 2009). It is therefore recognised that there are important questions that should be investigated regarding the emissions, transport and fate, physical effects, and chemical effects of microplastics (Zarfl *et al*, 2011).

Due to their small size microplastics have the potential to be ingested by a diverse range of organisms. Laboratory experiments have shown they are readily ingested by filter feeders, deposit feeding worms and detritivores (Thompson *et al*, 2004). Work with the common mussel (*Mytilus edulis*) has shown that after a single pulse exposure ingested microplastics can be retained for periods in excess of 48 days (Browne *et al*, 2008). Microplastics have also been reported in natural populations of commercially important crustaceans (Murray & Cowie 2011) and fish (Lusher *et al*, 2012) as well as in sea birds (van Franeker *et al*, 2011). It has been suggested that ingestion could lead to direct physical harm and may also facilitate the transport of chemicals to organisms.

Plastics contain a variety of potentially toxic chemicals incorporated during manufacture (monomers and oligomers, bisphenol-A (BPA), phthalate plasticisers, flame retardants and antimicrobials) (Lithner *et al.*, 2011), which can be released into the environment. These chemicals can be transferred to humans through, for example, plastic containers used for food and drink, plastic used in medical applications, and plastic toys (Koch & Calafat 2009; Lang *et al.*, 2008; Meeker *et al.*, 2009; Talsness *et al.*, 2009). Hence, a hazard could exist if plastic fragments containing these chemicals are ingested by marine organisms (Oehlmann *et al.*, 2009; Teuten *et al.*, 2009). Research has shown that chemicals used in plastics, such as phthalates and flame retardants are present in fish, mammals, and molluscs, raising concerns about subsequent toxic effects (STAP 2011). There is limited evidence to confirm a direct link between the chemical characteristics of marine debris and adverse effects on marine life (Besseling *et al.*, 2013). However, experimental studies have shown that phthalates and BPA affect reproduction in all study species, impairing development in crustaceans and amphibians, and generally inducing genetic aberrations (Oehlmann *et al.*, 2009). If these impacts were identified in the natural environment it would pose a substantial problem, as no option exists for remediation due to the nature of the accumulation of debris within the marine environment (GESAMP 2010; Thompson *et al.*, 2009b). It is therefore concerning that concentrations of these substances in the marine environment have been found to match those identified as harmful in laboratory studies, inferring that they could be impacting natural populations (Oehlmann *et al.*, 2009).

In addition to the potential for release of additive chemicals, plastic debris can adsorb persistent, bioaccumulative and toxic substances, including persistent organic pollutants (POPs) that are present in the oceans from other sources. Within a few weeks these substances can become orders of magnitude more concentrated on the surface of plastic debris than in the surrounding water column (Hirai *et al.*, 2011; Mato *et al.*, 2001; Rios *et al.*, 2010; Teuten *et al.*, 2009). This presents a second mechanism that may facilitate the transport of chemicals to biota upon ingestion. Laboratory studies have shown that very small quantities of plastic (ppm) have the potential to increase the transport of sorbed contaminants to marine organisms. However the role of plastics as a vector is context dependant and is influenced by the availability of other particulates, in particular carbon. The potential for chemical transport varies according to the polymer type (eg PE >> PP > PVC) (Teuten *et al.*, 2007). However, the influence of the surrounding physical environment for example the effect of temperature, salinity and competition with other particulates is not clear (Bakir *et al.* 2012). Hence our understanding of the extent to which plastic particles facilitate the transport of contaminants in the natural environment is uncertain, and more work is required to establish the relative importance compared to other pathways.

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