



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 I***

*Report, together with formal minutes*

*Oral and written evidence is contained in  
Volume II*

*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.

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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).

### Contacts

All correspondence should be addressed to the Clerk of the Science and Technology Committee, Committee Office, 7 Millbank, London SW1P 3JA. The telephone number for general inquiries is: 020 7219 2793; the Committee's e-mail address is: [scitechcom@parliament.uk](mailto:scitechcom@parliament.uk).

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## Summary

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Chemical pollutants can poison aquatic organisms, accumulate in the ecosystem, damage habitats, and threaten human health. Substances which pose a risk to, or via, the aquatic environment are regulated at EU level under the Water Framework Directive as priority substances. Member States have a responsibility to control the concentrations of these substances in the aquatic environment so that they do not exceed standards set by the European Commission. As part of its responsibility to periodically update the list of chemicals designated as priority substances, the European Commission published a draft Directive in 2012. It proposed that 15 chemicals should be added to the priority substances list and outlined the concentrations to which they should be reduced.

The inclusion of two oestrogen-based pharmaceutical products amongst the suggested new priority substances caused particular controversy. These substances have been shown to affect the health of aquatic animals through the feminisation of male fish. However, their consequent influence on populations of aquatic organisms is less clear and their removal from water would require significant effort. We therefore consider that, whilst these substances do present cause for concern, further evidence on their environmental impact should be gathered. However, their regulation in the future should not be ruled out.

The water industry has told us that drinking water-type treatment of wastewater would be necessary to meet the Commission's proposed environmental standards and as a result water bills would increase by £100 per customer per year. These cost estimates appear speculative at best. In addition, water companies seem to have neglected the potential to develop innovative new treatment methods, which could treat water at lower cost and with lower carbon emissions. We are not convinced that the industry is giving appropriate priority to innovation. It seems content instead to pass the burden of increased costs to its customers.

Priority substances constitute a relatively small part of water policy. However, the issues these proposals have raised—monitoring of emerging pollutants, the importance of innovation and the need for political support—are important for ensuring water security more broadly. The Government should not forget the message Sir John Beddington promoted during his term as Government Chief Scientific Adviser of a “perfect storm” of pressures on natural resources, including water, in the context of a changing climate. A more strategic approach to address such issues and promote UK water security is needed.



# 1 Introduction

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## Water quality

1. Pollution by chemicals, such as pesticides, flame retardants or metal compounds, is a threat to the health of the aquatic environment.<sup>1</sup> Such pollutants can poison aquatic organisms, accumulate in the ecosystem or food chain, cause the loss of habitats or biodiversity, and may threaten human health. Chemical pollution of the aquatic environment is a cause of concern for citizens across the EU. For example, in a 2012 survey, 75% of Europeans considered that the EU should propose additional measures to address water pollution from industry and agriculture.<sup>2</sup>

2. The EU's Water Framework Directive sets out measures to reduce chemical pollution of surface waters through the identification and regulation of certain chemicals, known as priority substances,<sup>3</sup> which are of EU-wide concern.<sup>4</sup> Member States are required to control the presence of these chemicals in the aquatic environment, so that their concentration does not exceed the level determined to be that at which they would threaten the environment or human health.<sup>5</sup> The European Commission reviews which chemicals should be considered priority substances at least every four years.<sup>6</sup> In 2012 it published draft proposals, which suggested a number of changes to the existing list of priority substances.<sup>7</sup> These changes included: adding new chemicals to the priority substances list; reclassifying some chemicals that were already listed; introducing a watch list to monitor potential new chemical threats; and changing the acceptable environmental concentrations for some substances.<sup>8</sup>

## Our inquiry

3. We launched our inquiry in December 2012. We sought evidence about:

- the Commission's approach to the regulation of chemicals under the Water Framework Directive;
- whether the concentration of pharmaceutical products in surface waters should be controlled; and
- the role of Government or industry in controlling harmful chemicals and support for innovation in the UK water industry.<sup>9</sup>

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<sup>1</sup> COMM 2011 (876) p2

<sup>2</sup> <http://ec.europa.eu/environment/water/eurobarometer.htm>

<sup>3</sup> The European Commission defines priority substances as those which present a risk to or via the aquatic environment.

<sup>4</sup> <http://ec.europa.eu/environment/water/water-dangersub/index.htm#prior>

<sup>5</sup> Known as their environmental quality standard

<sup>6</sup> Q 136 [Peter Gammeltoft]

<sup>7</sup> COMM 2011 (876) p3

<sup>8</sup> [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>9</sup> We concentrate in this report on chemical pollution of surface waters.

We received 19 submissions of written evidence and held three oral evidence sessions, during which we heard from industry, conservationists, academics and Richard Benyon MP, Parliamentary Under-Secretary of State for Natural Environment, Water and Rural Affairs. During our call for evidence we also received written submissions highlighting the impact of micro-plastic waste on the aquatic environment.

4. The suggested addition of fifteen new chemicals to the priority substances list was the focus of much of the evidence we received. This was largely due to the inclusion among them of three pharmaceutical products. In this Report we therefore focus on the addition of pharmaceuticals to the priority substances list as the most controversial element of these proposals, noting that during the course of this inquiry it was announced that these substances would not be added to the priority substances list, but the twelve others that were proposed would be added. We then comment on the water industry's response to potential regulation of these chemicals and the role of innovation to improve water quality. Finally, we highlight micro-plastics as an emerging pollutant.



## 2 Priority substances?

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### European Commission proposals

5. The European Commission's latest review of priority substances has suggested that fifteen additional chemicals should be considered a risk to the aquatic environment. If these proposals had been agreed to in full, Member States would be required to control discharges or emissions of all 15 chemicals to surface waters.<sup>10</sup> Peter Gammeltoft, Director: Water Marine Environment and Chemicals, European Commission, spelled out the benefits of this change:

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.<sup>11</sup>

6. There was broad agreement from witnesses regarding the need to control most of the fifteen chemicals suggested by the Commission.<sup>12</sup> However, the inclusion of three pharmaceutical products has caused controversy, due to questions about the extent of environmental damage they cause and the costs of treating wastewater to remove them. The pharmaceuticals suggested for designation are: ethinyl oestradiol (EE2), used in oral contraceptives, oestradiol (E2), used in hormone replacement therapy, and diclofenac, an anti-inflammatory.<sup>13</sup> Concerns about the effects of diclofenac on wildlife have grown since studies demonstrated its toxic effect upon fish and bird populations.<sup>14</sup> However, the two hormone-based pharmaceuticals (ethinyl oestradiol and oestradiol) have caused greater concern.<sup>15</sup>

### Pharmaceuticals as priority substances

7. Ethinyl oestradiol and oestradiol were suggested for control through priority substances legislation as a result of their role in the development of female reproductive characteristics in male fish. In 2004, the Environment Agency found that 86% of male fish sampled at 51

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<sup>10</sup> At time of evidence gathering, the proposals were being considered by the European Parliament, European Council and European Commission.

<sup>11</sup> Q 156 [Peter Gammeltoft]

<sup>12</sup> Q 39 [Andrew Johnson], Q 100 [Nick Cartwright], Q 189 [Richard Benyon]

<sup>13</sup> Association of the British Pharmaceutical Industry (ABPI) WQ 06

<sup>14</sup> Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC) WQ 14 para 9

<sup>15</sup> See, for example: Thames Water WQ 07; Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC) WQ 14

sites around the UK could be classified as intersex, as a result of displaying these characteristics.<sup>16</sup> The development of intersex characteristics has a detrimental effect upon fish health and reproductive capability and increasing the risk that fish populations could decline.<sup>17</sup>

8. Witnesses did not dispute that the effects of oestrogen on male fish have been demonstrated but it seems the extent to which this affects fish population dynamics is less clear. For example, Mike Murray, Technical Affairs Manager, Association of the British Pharmaceutical Industry (ABPI), told us that he was “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 environment”.<sup>18</sup> Professor Johnson, Centre for Ecology and Hydrology (CEH), explained that these chemicals are:

undoubtedly having effects on wildlife – on fish. The question is to what degree we consider those effects particularly harmful. [...] 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 our judgment on what the severity of that effect is.”<sup>19</sup>

Indeed, generally speaking, an “unequivocal link between a specific chemical in the environment and harm to wildlife populations has been demonstrated in a mere handful of cases”.<sup>20</sup>

9. Despite concerns about the effect of these pharmaceuticals on fish health, we heard queries about the strength of the evidence base supporting their regulation. Potential priority substances are usually identified by the Commission through a “detailed and rigorous”<sup>21</sup> technical review carried out by a range of experts and reviewed by the Scientific Committee on Health and Environmental Risks. However, a different process exists for potential pharmaceutical priority substances. Instead of being identified through a technical review, pharmaceuticals are nominated through a separate procedure,<sup>22</sup> which was allegedly “less rigorous”.<sup>23</sup> The Minister told us he believed that “the proposal for these three chemicals came slightly out of left field”.<sup>24</sup> As a result, he could not “be confident that they pose a risk of equivalent concern to the other 12” chemicals proposed.<sup>25</sup>

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<sup>16</sup> <http://www.nature.com/news/drug-pollution-law-all-washed-up-1.11854>

<sup>17</sup> <http://www.nature.com/news/drug-pollution-law-all-washed-up-1.11854>

<sup>18</sup> Q 3 [Mike Murray]

<sup>19</sup> Q 40 [Professor Johnson]

<sup>20</sup> <http://www.nature.com/news/water-wars-1.11852>

<sup>21</sup> Q 194 [Dr Whalley]

<sup>22</sup> Q 100 [Nick Cartwright], Q 194 [Dr Whalley]

<sup>23</sup> Q 101 [Nick Cartwright]

<sup>24</sup> Q 210 [Richard Benyon]

<sup>25</sup> Q 189 [Richard Benyon]

10. Following publication, the Commission's proposals were considered by the European Parliament's Environment, Public Health and Food Safety Committee.<sup>26</sup> Its subsequent report suggested that the regulations which would determine acceptable environmental concentrations of these chemicals should be delayed whilst further data was collected to establish what constituted a safe level of exposure.<sup>27</sup> In April 2013, following further negotiations on the proposals, the EU Presidency announced that agreement had been reached with the European Parliament to amend the priority substances proposals.<sup>28</sup> The three pharmaceuticals would not be added to the priority substances list. They would instead be included on a watch list to gather further information about their environmental impact before regulations were put in place.<sup>29</sup> This watch list would be updated in two years.<sup>30</sup>

**11. There is clearly cause for concern about the presence of the pharmaceutical substances ethinyl oestradiol, oestradiol and diclofenac in the aquatic environment. These chemicals have been shown to affect the health of aquatic organisms. However, a link to wider population-level effects is difficult to establish for any chemical so we agree that the watch list should be used to gather further evidence on their environmental impact. The Government must consider whether the burden of proof it expects to support designation of these chemicals as priority substances is reasonable. These substances may not be appropriate for designation as priority substances at this time, but their regulation in future should not be ruled out. *We recommend that the UK Government should contribute to the collection of further information regarding the environmental impact of these pharmaceuticals on the aquatic environment. The Government should set out how it intends to provide the evidence necessary to clarify the environmental harm caused by these chemicals in the UK in its response to this report. The Government should reconsider adding these three pharmaceuticals to the priority substances list in two years, when the watch list is due to be updated.***

## Costs

12. The cost of treating wastewater to remove pharmaceutical products has been one of the main objections to these proposals. Such objections focused primarily on the cost of removing the two oestrogen-based chemicals.<sup>31</sup> We heard from the water industry that the new standards proposed by the European Commission could only be achieved if wastewater was treated in the same way as drinking water.<sup>32</sup> The Environment Agency has estimated that upgrading wastewater treatment plants to remove the ethinyl oestradiol

<sup>26</sup> <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-%2f%2fEP%2f%2fTEXT%2bREPORT%2bA7-2012-0397%2b0%2bDOC%2bXML%2bV0%2f%2fEN&language=EN>

<sup>27</sup> <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-%2f%2fEP%2f%2fNONSGML%2bCOMPARL%2bPE-492.914%2b01%2bDOC%2bPDF%2bV0%2f%2fEN>

<sup>28</sup> <http://www.eu2013.ie/news/news-items/20130417enviprioritywatertrialoguepr/>

<sup>29</sup> <http://www.eu2013.ie/news/news-items/20130417enviprioritywatertrialoguepr/>

<sup>30</sup> <http://www.neurope.eu/article/agreement-priority-substances-water>

<sup>31</sup> Costs have been calculated mainly on the basis of removing ethinyl oestradiol, as modelling reportedly showed that sites failing as a result of high levels of oestradiol formed a subset of those failing on the basis of ethinyl oestradiol (REF).

<sup>32</sup> Thames Water WQ 07 para 9.3

alone would cost £27–31 billion over the next twenty years in England and Wales.<sup>33</sup> Richard Aylard, External Affairs and Sustainability Director, Thames Water, told us these costs “would be reflected in customers’ bills, which could go up by as much as £100 a year”.<sup>34</sup> He added that the costs of removing ethinyl oestradiol:

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.<sup>35</sup>

13. However, the accuracy of these estimates has been questioned. For example, *Nature* has reported suspicions that “the calculations aim for the highest possible cost in order to portray the rules as financially unrealistic” and suggested the UK was “applying an overly stringent standard”<sup>36</sup> to estimate the costs.<sup>37</sup> This allegation was supported by other witnesses.<sup>38</sup> In addition, there have been complaints about the transparency of how cost estimates have been derived; as according to *Nature*:

The UK government’s Department for Environment, Food and Rural Affairs has not responded to repeated requests from *Nature* to explain its calculations. [...] Britain’s estimate also assumes that all plants would need to be fitted with the most advanced—and most expensive—treatment technology, which uses granular activated carbon to absorb pharmaceuticals from the water. But such measures will not be necessary at every plant [...] low-cost improvements to existing wastewater treatments, such as sand filters, may be sufficient in some cases.<sup>39</sup>

The Natural Environment Research Council (NERC) agreed that these cost implications were “probably exaggerated”.<sup>40</sup> Indeed, Mr Aylard, Thames Water, acknowledged that there were ways in which costs could be reduced. For example, if improvements were carried out “as works were upgraded, that would have some reduction in costs”.<sup>41</sup>

14. Cost estimates from elsewhere in Europe have given different results, using different measures, and adding to confusion regarding the true cost of the proposals. For example, Swiss studies suggested that oestrogen-based compounds could be removed at a cost of approximately 15 to 24 Swiss Francs per inhabitant of Switzerland per year.<sup>42</sup> The Commission’s estimates were also expressed differently. Peter Gammeltoft, European Commission, told us that:

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<sup>33</sup> Department for Environment, Food and Rural Affairs WQ 00 para 38

<sup>34</sup> Q 2 [Richard Aylard]

<sup>35</sup> Q 12 [Richard Aylard]

<sup>36</sup> <http://www.nature.com/news/water-wars-1.11852>

<sup>37</sup> <http://www.nature.com/news/drug-pollution-law-all-washed-up-1.11854>

<sup>38</sup> Q 155 [Peter Gammeltoft]

<sup>39</sup> <http://www.nature.com/news/drug-pollution-law-all-washed-up-1.11854>

<sup>40</sup> Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC) WQ 14

<sup>41</sup> Q 16 [Richard Aylard]

<sup>42</sup> Blueprint for Water WQ 10 para 2.4.1. At time of publication 15 Swiss Francs was equivalent to £10

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.<sup>43</sup>

15. We also heard about potential carbon costs associated with the Commission's proposals. Mr Aylard told us that treating waste water to remove these pharmaceuticals would increase industry's carbon emissions from wastewater treatment by a third.<sup>44</sup> As a result, there was a risk that the water industry's goal of reducing carbon emissions would be placed in conflict with the need to improve water quality.

16. **Despite the financial cost of improving water treatment being a key element of the arguments presented against the European Commission's proposals, we have not seen a clear estimate of what this cost would be. Different sources have provided different estimates, which have been expressed in different terms, for example per household or per inhabitant. Allegations that official estimates deliberately over-state the cost, through gold-plating the regulations or failing to consider alternative treatment methods, are troubling and the Government should seek to address this. In addition, it is concerning that estimates have focused solely on the cost implications of removing pharmaceuticals from wastewater, despite there being twelve other substances which will be designated as priority substances. The Government has a responsibility to inform the public if these proposals, as negotiated by the EU Presidency, are likely to significantly increase water bills. *We recommend that in its response to this report, the Government produces a clear explanation of the costs associated with these proposals, both for the pharmaceuticals and the other 12 proposed substances. The Minister should make a statement clarifying the cost of the proposals adopted by the Commission, the impact this would have on household water bills and the Government's estimate of the extent to which the costs could be reduced through, for example, the development of alternative treatment methods.***

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<sup>43</sup> Q 155 [Peter Gammeltoft]

<sup>44</sup> Q 12 [Richard Aylard]

## 3 Innovation in the water industry

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17. Water companies have insisted that removing pharmaceuticals from water in order to meet the requirements of the Commission's proposals on priority substances would require wastewater to be treated by methods currently used to provide drinking water. However, Professor Johnson, Centre for Ecology and Hydrology (CEH), stated that:

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.<sup>45</sup>

18. The water industry's approach to innovation in England has been criticised in a number of Government reviews.<sup>46</sup> For example, in 2009 the Council for Science and Technology concluded

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 waste water and sewage treatment. There is an urgent need for a step-change. Investment in research and development is low for the sector generally.<sup>47</sup>

Shortly after publication of the Council for Science and Technology's review, Professor Martin Cave's review of competition and innovation in water markets [*Independent Review of Competition and Innovation in Water Markets*] stated:

While many companies see research and development as an important driver of their business, support for such activity is very variable and ranges from 0.02 per cent to 0.66 per cent of turnover. A minority of companies characterise themselves as followers, relying on others to test and implement new technologies. Comparisons of international data suggests that the UK is responsible for fewer innovations per capita than other countries such as Australia, Germany, the Netherlands, Spain and the United States.<sup>48</sup>

Professor Cave's review also concluded that most innovation in the industry has been driven by tougher regulatory standards.<sup>49</sup>

19. These criticisms persisted in evidence to this inquiry. When we asked Mr Gammeltoft, European Commission, about performance in terms of innovation in the water industry across the EU, England was notably absent from the top performers.<sup>50</sup> We also heard that

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<sup>45</sup> Q 52 [Professor Johnson]

<sup>46</sup> Q 51 [Neil Runnalls]

<sup>47</sup> <http://www.bis.gov.uk/assets/cst/docs/files/whats-new/09-1632-improving-innovation-water-industry-p3>

<sup>48</sup> <http://archive.defra.gov.uk/environment/quality/water/industry/cavereview/documents/cavereview-finalreport.pdf> p6

<sup>49</sup> Q 117 [Ian Barker] see also Q 52 [Andre Johnson] and Q 132 [Regina Finn] for similar points

<sup>50</sup> Q 174 [Peter Gammeltoft] The top performers were the Netherlands, Spain, Germany, Scandinavia and France

the UK is under-represented in European-wide efforts to improve innovation in the water sector. There is, for example, only one UK representative on the European Innovation Partnership on water, which has “better representation from Bulgaria”.<sup>51</sup> The Centre for Ecology and Hydrology contrasted this with a more “pro-innovation” culture in the Scottish water industry.<sup>52</sup> It explained 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.<sup>53</sup>

20. Regina Finn, Chief Executive, Ofwat, agreed that “there is a need for this sector to become more innovative”.<sup>54</sup> However, she explained that recent and upcoming changes to the regulatory framework for the water industry should allow companies “freedom to innovate”.<sup>55</sup> The Minister also told us provisions in the planned water bill would “introduce innovation into the provision of water services, remove barriers to competition and encourage new entrants and new technologies”.<sup>56</sup>

21. Mr Aylard, Thames Water, insisted that Thames Water was “not putting profits ahead of technological innovation” and the regulatory framework provided “lots of incentive to innovate”.<sup>57</sup> Yet we have not seen evidence that innovative solutions to challenges such as priority substances are being developed. It may be that it is too early to tell whether recent changes have influenced the industry’s approach to innovation, as Neil Runnalls, Centre for Ecology and Hydrology, explained:

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.<sup>58</sup>

**22. We have not seen evidence to suggest that the water industry’s approach to innovation has improved significantly since the Council for Science and Technology’s 2009 review described it as “highly variable”. It may be that strict regulatory standards, such as those suggested by the European Commission, are required to drive innovation in this sector. Given that the expected changes to the priority substances list will take time to implement, and the regulation of pharmaceuticals in wastewater has now been delayed further, the water industry should take this opportunity to start developing innovative approaches to address this issue. *We are disappointed that there has not been***

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<sup>51</sup> Q 62 [Neil Runnalls]

<sup>52</sup> NERC Centre for Ecology & Hydrology WQ 02 para 21

<sup>53</sup> NERC Centre for Ecology & Hydrology WQ 02 para 20

<sup>54</sup> Q 128 [Regina Finn]

<sup>55</sup> Q 128 [Regina Finn]

<sup>56</sup> Q 213 [Richard Benyon]

<sup>57</sup> Q 22 [Richard Aylard]

<sup>58</sup> Q 51 [Neil Runnalls]



*more progress in encouraging innovation within the water industry since the Council for Science and Technology's report. We have seen no evidence that the "urgent need for a step-change" recommended in the report has been attempted, let alone delivered, and the Government should address this lack of progress. The Government should take further steps, in conjunction with Ofwat, to address this lack of progress. We recommend that the Government works with Ofwat to evaluate the measures they have taken to encourage innovation in the water industry and the outcomes expected from each of these measures. The Government should update in the Committee in a year's time regarding progress to achieving these outcomes.*



## 4 Micro-plastics

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### Micro-plastic waste

23. Although not the main focus of our inquiry, we have included micro-plastic waste in this report because of concerns about “their potential adverse effects on marine wildlife and human health”.<sup>59</sup> The presence of plastic waste in the aquatic environment has been a concern for decades.<sup>60</sup> However, micro-plastics, which are plastic particles smaller than 5mm in length, pose a relatively new threat to marine wildlife.<sup>61</sup> They enter the aquatic environment from two main sources:

- fragmentation of larger pieces of plastic waste, due to abrasion or exposure to ultra violet light; or
- direct release of small plastic beads from industrial or consumer products, such as micro-beads in exfoliants from the cosmetics industry, or pellets, used by chemical companies in plastics manufacturing.<sup>62</sup>

24. There is evidence that micro-plastics can be ingested by a range of marine organisms and concern about the type of physical harm that organisms could suffer as a result of ingesting these particles.<sup>63</sup> There is also the possibility of toxicological harm following ingestion, as micro-plastics can carry chemical pollutants incorporated during manufacture or absorbed from seawater after they have been released into the marine environment.<sup>64</sup> Professor Thompson, Plymouth University, told us that:

Micro-plastics 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. [...] over 10% of the encounters that are reported between wildlife and plastic debris are now with micro-plastics. The trends are increasing and these are persistent materials. They are going to remain 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.<sup>65</sup>

### Government and industry action

25. Previous efforts by industry to encourage the use of more environmentally friendly plastics have had mixed results. For example, we heard that the development of

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<sup>59</sup> Marine Conservation Society WQ 09 para 2

<sup>60</sup> For example, there have been relatively high profile campaigns on the impact of plastic bags on wildlife See, for example, <http://www.bbc.co.uk/news/magazine-17027990>

<sup>61</sup> Q 73 [Professor Thompson]

<sup>62</sup> Q 75 [Dr Kinsey]

<sup>63</sup> Q 86 [Professor Thompson]

<sup>64</sup> Marine Conservation Society WQ 09 para 4

<sup>65</sup> Q 86 [Professor Thompson]

biodegradable plastic bags may in fact have contributed to the accumulation of micro-plastics in the environment. Professor Thompson told us that:

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 [legislation] 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.<sup>66</sup>

26. Witnesses agreed that reducing the release of micro-plastics at source would be the most effective way of preventing their accumulation in the marine environment.<sup>67</sup> We heard that in many cases there were alternatives to their use, especially in cosmetics, or there was “no need for these items to be there in the first place”.<sup>68</sup> In some cases, industry has already started taking action to address this issue. For example, in early 2013, Unilever announced that:

The issue of plastics particles in the ocean is an important issue and we have reviewed the use of micro beads in our portfolio (both current products and those in the pipeline). We have decided to phase out the use of plastic micro beads as a ‘scrub’ material in all of our personal care products. We expect to complete this phase out globally by 2015.<sup>69</sup>

The cosmetics company Lush UK has also made a similar announcement.<sup>70</sup>

27. Whilst industry seemed to be taking steps to address this issue, the Minister cautioned that “Government action to limit micro-plastics could be very premature”.<sup>71</sup> He stated:

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.<sup>72</sup>

However, the Minister was unclear about what that work would be.<sup>73</sup> **We welcome announcements by Unilever and Lush UK to phase out micro-plastics from their products by 2015. The Government should engage with industry to ensure that similar action to that taken by Unilever and to help industry maintain momentum towards phasing out micro-plastics from their products. We expect the Government to publish**

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<sup>66</sup> Q 79 [Professor Thompson]

<sup>67</sup> Q 77

<sup>68</sup> Q 86 [Professor Thompson]

<sup>69</sup> <http://www.unilever.com/sustainable-living/Respondingto stakeholderconcerns/microplastics/>

<sup>70</sup> <https://www.lush.co.uk/content/view/7772>

<sup>71</sup> Q 222 [Richard Benyon]

<sup>72</sup> Q 223 [Richard Benyon]

<sup>73</sup> Q 224 [Richard Benyon]

*updated data in six months and to encourage other countries to help eradicate this problem.*

## 5 Conclusions

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28. Water quality in the UK has improved significantly in recent decades.<sup>74</sup> However, there are a number of emerging pollutants of concern, such as pharmaceuticals, which are reflected in the European Commission's proposed changes to the priority substances list. The European Commission is required to review this list periodically. So even though the three pharmaceuticals included in the Commission's initial proposals will not be designated following this review, their regulation in the future should not be ruled out. The water industry should be aware that control of these substances in the future is likely and use these proposals as a warning and an opportunity to start developing solutions for improved water treatment, rather than assuming they will simply pass costs on to consumers.

29. We are concerned that we were unable to find an accurate, or agreed, estimate for the impact of the Commission's priority substances proposals on household water bills. The figures provided by the Government focused solely on the cost of removing the oestrogen-based pharmaceuticals, yet these substances have not been selected for designation at this time.<sup>75</sup> However, twelve other substances have been selected, and the Government has not provided a clear answer on what the costs of removing these chemicals from wastewater would be. **The Government must be more pro-active in providing Parliament with sufficient information to effectively scrutinise EU legislation before it is agreed to, particularly when such legislation could result in significant additional costs for UK taxpayers. There needs to be sufficient time given to ensure that the European Scrutiny Committee and our Committee can thoroughly examine progress in this important field.**

30. Regulation of priority substances is a relatively small part of water policy. However, some of the issues raised here, such as the monitoring of emerging pollutants and development of effective water treatment methods, feed into a much larger issue of water security. Water resources are under increasing pressure, in terms of both quality and availability.<sup>76</sup> By the 2050s "average summer flows in many of our rivers will reduce by between 50% to 80%",<sup>77</sup> which will place further pressure resources. Sir John Beddington, former Government Chief Scientific Adviser, has tried to highlight the importance of water security with his discussions of a "perfect storm" in which:

It is predicted that by 2030 the world will need to produce around 50 per cent more food and energy, together with 30 per cent more fresh water, whilst mitigating and adapting to climate change. This threatens to create a 'perfect storm' of global events. [...] Science has contributed greatly in the past to finding solutions, and it can do so into the future if the investments are made. A new greener revolution can be built on the foundations of the first green revolution, but we will need to fully explore the

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<sup>74</sup> [http://www.rgs.org/NR/rdonlyres/4D9A57E4-A053-47DC-9A76-BDBEF0EA0F5C0/RGSIBGPolicyDocumentWater\\_732pp.pdf](http://www.rgs.org/NR/rdonlyres/4D9A57E4-A053-47DC-9A76-BDBEF0EA0F5C0/RGSIBGPolicyDocumentWater_732pp.pdf) p9

<sup>75</sup> <http://www.eu2013.ie/news/news-items/20130417enviprioritywatertrialoguepr/>

<sup>76</sup> Q 116 [Ian Barker]

<sup>77</sup> Q 116 [Ian Barker]

range of science and technology opportunities at our disposal in the 21<sup>st</sup> century in order to overcome the greater constraints. This vital contribution from science will not happen by default.<sup>78</sup>

31. To help the UK avoid this “perfect storm”, water policy needs to be a political priority. We were therefore concerned to hear that the UK lags behind other European countries in its approach to water policy and innovation in the water industry. It seems that a more strategic approach to this policy area is needed, which brings together industry, academia and Government, to prevent the UK being “shredded” in policy negotiations in Europe.<sup>79</sup> Sir John Beddington has tried to kick start such collaboration in the UK.<sup>80</sup> However, further political support and engagement with industry and the EU on water policy issues is needed if these are to be successful. We invite Sir Mark Walport, current Government Chief Scientific Adviser, to develop the important work start by his predecessor in this field.

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<sup>78</sup> <http://www.bis.gov.uk/assets/goscience/docs/p/perfect-storm-paper.pdf>

<sup>79</sup> Q 54 [Neil Runnalls]

<sup>80</sup> For example, he established the UK Water Research and Innovation Framework, <http://www.bis.gov.uk/assets/goscience/docs/t/11-1416-taking-responsibility-for-water-summary.pdf>

# Conclusions and recommendations

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## C&R Sub heading

1. There is clearly cause for concern about the presence of the pharmaceutical substances ethinyl oestradiol, oestradiol and diclofenac in the aquatic environment. These chemicals have been shown to affect the health of aquatic organisms. However, a link to wider population-level effects is difficult to establish for any chemical so we agree that the watch list should be used to gather further evidence on their environmental impact. The Government must consider whether the burden of proof it expects to support designation of these chemicals as priority substances is reasonable. These substances may not be appropriate for designation as priority substances at this time, but their regulation in future should not be ruled out. We recommend that the UK Government should contribute to the collection of further information regarding the environmental impact of these pharmaceuticals on the aquatic environment. The Government should set out how it intends to provide the evidence necessary to clarify the environmental harm caused by these chemicals in the UK in its response to this report. The Government should reconsider adding these three pharmaceuticals to the priority substances list in two years, when the watch list is due to be updated. (Paragraph 11)
2. Despite the financial cost of improving water treatment being a key element of the arguments presented against the European Commission's proposals, we have not seen a clear estimate of what this cost would be. Different sources have provided different estimates, which have been expressed in different terms, for example per household or per inhabitant. Allegations that official estimates deliberately over-state the cost, through gold-plating the regulations or failing to consider alternative treatment methods, are troubling and the Government should seek to address this. In addition, it is concerning that estimates have focused solely on the cost implications of removing pharmaceuticals from wastewater, despite there being twelve other substances which will be designated as priority substances. The Government has a responsibility to inform the public if these proposals, as negotiated by the EU Presidency, are likely to significantly increase water bills. We recommend that in its response to this report, the Government produces a clear explanation of the costs associated with these proposals, both for the pharmaceuticals and the other 12 proposed substances. The Minister should make a statement clarifying the cost of the proposals adopted by the Commission, the impact this would have on household water bills and the Government's estimate of the extent to which the costs could be reduced through, for example, the development of alternative treatment methods. (Paragraph 16)
3. We have not seen evidence to suggest that the water industry's approach to innovation has improved significantly since the Council for Science and Technology's 2009 review described it as "highly variable". It may be that strict regulatory standards, such as those suggested by the European Commission, are required to drive innovation in this sector. Given that the expected changes to the priority substances list will take time to implement, and the regulation of

pharmaceuticals in wastewater has now been delayed further, the water industry should take this opportunity to start developing innovative approaches to address this issue. We are disappointed that there has not been more progress in encouraging innovation within the water industry since the Council for Science and Technology's report. We have seen no evidence that the "urgent need for a step-change" recommended in the report has been attempted, let alone delivered, and the Government should address this lack of progress. The Government should take further steps, in conjunction with Ofwat, to address this lack of progress. We recommend that the Government works with Ofwat to evaluate the measures they have taken to encourage innovation in the water industry and the outcomes expected from each of these measures. The Government should update in the Committee in a year's time regarding progress to achieving these outcomes. (Paragraph 22)

4. We welcome announcements by Unilever and Lush UK to phase out micro-plastics from their products by 2015. The Government should engage with industry to ensure that similar action to that taken by Unilever and to help industry maintain momentum towards phasing out micro-plastics from their products. We expect the Government to publish updated data in six months and to encourage other countries to help eradicate this problem. (Paragraph 27)
5. The Government must be more pro-active in providing Parliament with sufficient information to effectively scrutinise EU legislation before it is agreed to, particularly when such legislation could result in significant additional costs for UK taxpayers. There needs to be sufficient time given to ensure that the European Scrutiny Committee and our Committee can thoroughly examine progress in this important field. (Paragraph 29)

# Formal Minutes

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**Wednesday 5 June 2013**

Members present:

Andrew Miller, in the Chair

Stephen Metcalfe  
David Morris  
Stephen Mosley  
Sarah Newton

Graham Stringer  
David Treddinnick  
Roger Williams

Draft Report (*Water quality: priority substances*), proposed by the Chair, brought up and read.

*Ordered*, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 31 read and agreed to.

Summary agreed to.

*Resolved*, That the Report be the First Report of the Committee to the House.

*Ordered*, That the Chair make the Report to the House.

*Ordered*, That embargoed copies of the Report be made available, in accordance with the provisions of Standing Order No. 134.

Written evidence was ordered to be reported to the House for printing with the Report.

[Adjourned till Wednesday 12 June at 9.00 am



# Witnesses

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## Wednesday 27 February 2013

**Richard Aylard**, 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

**Neil Runnalls**, CEH Business Development Manager, Natural Environment Research Council (NERC), **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

**Dr Sue Kinsey**, Marine Litter Policy Officer, and **Professor Richard Thompson**, Plymouth University

## Monday 4 March 2013

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

## Wednesday 6 March 2013

**Peter Gammeltoft**, Head of Unit, ENV.D1 Protection of Water Resources, European Commission

## Wednesday 13 March 2013

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

## List of printed written evidence

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(published in Volume II)

- 1 Department for Environment, Food and Rural Affairs (WQ 00 and 00a)
- 2 Environment Agency (WQ 16)
- 3 Ofwat (WQ 18)
- 4 NERC Centre for Ecology & Hydrology (CEH) (WQ 02)
- 5 Association of the British Pharmaceutical Industry (ABPI) (WQ 06)
- 6 Thames Water (WQ 07)
- 7 Blueprint for Water (WQ 10)
- 8 Natural Environment Research Council (NERC) and the Engineering and Physical Sciences Research Council (EPSRC) (WQ 14)
- 9 The Environmental Industries Commission (WQ 15)

## List of additional written evidence

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(published in Volume III on the Committee's website [www.parliament.uk/science](http://www.parliament.uk/science))

- 1 Water UK (WQ 01)
- 2 The Cancer Prevention and Education Society (CPES) (WQ 03)
- 3 Chemical Industries Association (WQ 04)
- 4 National Farmers Union (WQ 05)
- 5 Royal Society of Chemistry (WQ 08)
- 6 Marine Conservation Society (WQ 09)
- 7 Severn Trent Plc (WQ 11)
- 8 British Generic Manufacturers Association (WQ 12)
- 9 Geological Society (WQ 13)
- 10 Professor Richard C Thompson (WQ 17)

# List of Reports from the Committee during the current Parliament

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The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

## Session 2013–14

First Special Report	Educating tomorrow's engineers: the impact of Government reforms on 14–19 education: Government Response to the Committee's Seventh Report of Session 2012–13	HC 102
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## Session 2012–13

First Special Report	Science in the Met Office: Government Response to the Committee's Thirteenth Report of Session 2010–12	HC 162
First Report	Devil's bargain? Energy risks and the public	HC 428 (HC 677)
Second Report	Pre-appointment hearing with the Government's preferred candidate for Chair of the Medical Research Council	HC 510–I
Second Special Report	Engineering in government: follow-up to the 2009 report on Engineering: turning ideas into reality: Government Response to the Committee's Fifteenth Report of Session 2010–12	HC 511
Third Report	The Census and social science	HC 322 (HC 1053)
Fourth Report	Building scientific capacity for development	HC 377 (HC 907)
Fifth Report	Regulation of medical implants in the EU and UK	HC 163 (Cm 8496)
Sixth Report	Proposed merger of British Antarctic Survey and National Oceanography Centre	HC 699 (HC 906)
Third Special Report	Devil's bargain? Energy risks and the public: Government Response to the Committee's First Report of Session 2012–13	HC 677
Fourth Special Report	Building scientific capacity for development: Government and UK Collaborative on Development Sciences Response to the Committee's Fourth Report of Session 2012–13	HC 907
Fifth Special Report	Proposed merger of British Antarctic Survey and National Oceanography Centre: Natural Environment Research Council Response to the Committee's Sixth Report of Session 2012–13	HC 906
Seventh Report	Educating tomorrow's engineers: the impact of Government reforms on 14–19 education	HC 665 (HC 102, Session 2013–14)
Eighth Report	Bridging the valley of death: improving the commercialisation of research	HC 348
Sixth Special Report	The Census and social science: Government and Economic and Social Research Council (ESRC) Responses to the Committee's Third Report of Session 2012–13	HC 1053

**Session 2010–12**

First Special Report	The Legacy Report: Government Response to the Committee's Ninth Report of Session 2009–10	HC 370
First Report	The Reviews into the University of East Anglia's Climatic Research Unit's E-mails	HC 444 (HC 496)
Second Report	Technology and Innovation Centres	HC 618 (HC 1041)
Third Report	Scientific advice and evidence in emergencies	HC 498 (HC 1042 and HC 1139)
Second Special Report	The Reviews into the University of East Anglia's Climatic Research Unit's E-mails: Government Response to the Committee's First Report of Session 2010–12	HC 496
Fourth Report	Astronomy and Particle Physics	HC 806 (HC 1425)
Fifth Report	Strategically important metals	HC 726 (HC 1479)
Third Special Report	Technology and Innovation Centres: Government Response to the Committee's Second Report of Session 2010–12	HC 1041
Fourth Special Report	Scientific advice and evidence in emergencies: Government Response to the Committee's Third Report of Session 2010–12	HC 1042
Sixth Report	UK Centre for Medical Research and Innovation (UKCMRI)	HC 727 (HC 1475)
Fifth Special Report	Bioengineering: Government Response to the Committee's Seventh Report of 2009–10	HC 1138
Sixth Special Report	Scientific advice and evidence in emergencies: Supplementary Government Response to the Committee's Third Report of Session 2010–12	HC 1139
Seventh Report	The Forensic Science Service	HC 855 (Cm 8215)
Seventh Special Report	Astronomy and Particle Physics: Government and Science and Technology Facilities Council Response to the Committee's Fourth Report of Session 2010–12	HC 1425
Eighth Report	Peer review in scientific publications	HC 856 (HC 1535)
Eighth Special Report	UK Centre for Medical Research and Innovation (UKCMRI): Government Response to the Committee's Sixth Report of session 2010–12	HC 1475
Ninth Report	Practical experiments in school science lessons and science field trips	HC 1060–I (HC 1655)
Ninth Special Report	Strategically important metals: Government Response to the Committee's Fifth Report of Session 2010–12	HC 1479
Tenth Special Report	Peer review in scientific publications: Government and Research Councils UK Responses to the Committee's Eighth Report of Session 2010–12	HC 1535
Tenth Report	Pre-appointment hearing with the Government's preferred candidate for Chair of the Technology Strategy Board	HC 1539–I
Eleventh Special Report	Practical experiments in school science lessons and science field trips: Government and Ofqual Responses to the Committee's Ninth Report of Session 2010–12	HC 1655
Eleventh Report	Alcohol guidelines	HC 1536 (Cm 8329)

Twelfth Report	Malware and cyber crime	HC 1537 (Cm 8328)
Thirteenth Report	Science in the Met Office	HC 1538
Fourteenth Report	Pre-appointment hearing with the Government's preferred candidate for Chair of the Engineering and Physical Sciences Research Council	HC 1871-I
Fifteenth Report	Engineering in government: follow-up to the 2009 report on Engineering: turning ideas into reality	HC 1667 (HC 511, Session 2012-13)