



House of Commons
Environmental Audit Committee

UK Progress on Reducing Nitrate Pollution

Eleventh Report of Session 2017–19

*Report, together with formal minutes relating
to the report*

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Environmental Audit Committee

The Environmental Audit Committee is appointed by the House of Commons to consider to what extent the policies and programmes of government departments and non-departmental public bodies contribute to environmental protection and sustainable development; to audit their performance against such targets as may be set for them by Her Majesty's Ministers; and to report thereon to the House.

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Contents

Summary	3
1 Introduction, Nitrogen Pollution, Air and Water Quality and its Regulation	5
Introduction	5
The Nitrogen Cycle	6
Nitrogen as a Pollutant	6
Sources of Nitrogen Pollution	7
Phosphorous	7
The Regulatory Regime for Water Quality, Nitrates and Air Quality.	8
Water Quality and Nitrates	8
Air Quality	9
2 Water Quality	10
The Status of Water Bodies	10
Penalties for Polluting Water	10
Progress on Achieving Good Water Quality	10
How the UK Compares to the Rest of the EU on Water Quality	13
Drinking Water	17
Urban Waste Water	18
Bathing Water	19
The UK's Nitrate "Time Bomb"	21
Performance on Reducing Nitrates	21
The Cost of Water Quality and Dealing with Nitrate pollution	24
Progress on reducing Phosphorous in Surface Waters	25
River Basin Management Plans and Collaborative Catchments	27
The Role of Water Companies in Water Catchment Management	28
Making More Progress on the Good Ecological Status of Water Bodies	30
3 Air Quality	33
Nitrogen as an Air Pollutant: Ammonia and Nitrogen Oxides	33
Sources of Ammonia, Nitrous Oxide and Nitrogen Oxides	33
Air Quality Regulation	34
Performance on Reducing Nitrogen Oxides and Ammonia Emissions	35
Nitrogen Oxides	35
Ammonia	37
The Environment, Food and Rural Affairs Committee Air Quality Report (2016)	39
The Government's Clean Air Strategy	39

Reaction and Comment on the Clean Air Strategy	40
4 Agriculture and Nitrogen Pollution	42
The Nitrates Directive	42
Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions	44
The New Farming Rules for Water	45
Progress on Reducing the use of Artificial Nitrogen Fertiliser	46
Nitrogen and Phosphorous Surpluses in Soil	46
The Role of Anaerobic Digestion	49
Future Pressures on UK Agriculture and its implications for Water Pollution	50
5 Monitoring, Enforcement and Resourcing Issues	51
Monitoring Nitrate Pollution and Water Quality	51
Enforcement, Compliance and Resourcing Issues	53
6 Monitoring, Compliance and Enforcement after the UK Leaves the EU	57
EU Regulatory Transposition Issues	57
Holding the Government to Account for Environmental Outcomes	58
The 25 Year Environment Plan versus the Water Framework Directive	59
Health and Harmony and the Agriculture Bill	61
Northern Ireland and The Republic of Ireland: Regulatory Alignment	63
Conclusions and recommendations	66
Annex 1: Nitrogen Pollution: Sources and Impact	72
Annex 2: Water Quality Directives	75
Annex 3: Air Quality Directives	79
Formal minutes	81
Witnesses	82
Published written evidence	83
List of Reports from the Committee during the current Parliament	85

Summary

High levels of nitrates in water are a problem because they cause oxygen depletion which is harmful to humans and biodiversity. Nitrates are connected to wider nitrogen pollution because of the nitrogen cycle, including nitrogen oxides and ammonia, powerful airborne air pollutants which when deposited in water and soil can raise acidity levels. Key sources of nitrate pollution are farming (artificial fertilisers and animal waste leaching into water) and domestic and industrial sewage. Farming is the main source of ammonia and nitrous oxide emissions. Regulation of water and air quality is based on EU legislation and mainly devolved.

The UK has high drinking water standards. It is not doing as well on bathing water status, has been criticised by the European Court of Justice on the treatment of sewage and 86% of English rivers have not reached good ecological status. Historic over use of artificial fertiliser has led to nitrate pollution in many of our groundwater sources. On air quality, the UK has seen reductions in overall nitrogen oxide levels, but it has been subject to EU infringement proceedings on nitrogen dioxide levels while ammonia levels have begun to rise, threatening the UK's ability to meet its obligation under the Gothenburg Protocol to reduce ammonia emissions by 8 per cent by 2020.

Leaving the EU presents the UK with challenges and opportunities. We have warned elsewhere about the dangers of 'a governance gap, whereby zombie' EU legislation would be transposed into UK law but remain divorced from EU institutions that monitor, update, administer and ensure compliance. We are particularly concerned that existing standards are not weakened and there appears a danger that this will happen to the EU goal of all water bodies reaching a good status by 2027. The Government have said that they will replace the current Common Agricultural Policy with a new regime based on payments for the delivery of public goods. However, it is important that the polluter pays principle is not undermined and use of public money is effectively scrutinised. We await the Government's proposals to resolve the issue of water and air quality alignment between Northern Ireland and the Republic of Ireland.

We believe that leaving the EU offers an opportunity for a joined-up approach, which aligns water, air and soil quality regulations and regulators, goes further than existing standards wherever possible, under a new single powerful independent environmental watchdog filling the gap left by the European Commission, European Environment Agency and European Court of Justice. We hope this is reflected in the Environment Bill to be published before the end of 2018. We also believe that joined-up policies can deliver better environmental outcomes. For example, supporting farmers to invest in infrastructure and processes to reduce artificial fertiliser application, increase better storage and use of animal waste, can simultaneously reduce nitrate and phosphorus leaching and nitrous oxide and ammonia emissions.

1 Introduction, Nitrogen Pollution, Air and Water Quality and its Regulation

Introduction

1. We decided to look at the issue of nitrate pollution for several reasons. One was the continuing problem of water quality. For instance, in October 2015, it was reported that the majority of water bodies in England were failing to achieve good status and that the Environment Agency was struggling to bring them into compliance with European legislation, despite the UK having a derogation that moved the target for compliance from 2015 to 2027.¹ While there has been some improvements in the quality of bathing water,² the poor ecological status of water systems continues to be problematic for our wildlife and pollution of groundwater sources affects a major source of our drinking water.³ Nitrates are one of the key nutrients involved in the pollution of rivers and streams and are the main pollutant in groundwater sources. They are predicted to worsen for some time to come.⁴ We also considered the related issue of air quality, particularly ammonia and nitrogen oxide emissions.⁵ These are related to nitrates, because ammonia and nitrogen oxides are part of the wider nitrogen cycle and emissions largely emanate from the same agricultural sources as nitrates.⁶ Ammonia and nitrogen oxides can also damage ecosystems, especially water ecosystems.⁷

2. We were therefore keen to investigate how the Government was addressing the related issues of nitrate pollution and water and air quality. We looked at the implementation of current regulations, the role of the Environment Agency, the Rural Payments Agency and Natural England in monitoring progress and enforcing compliance, and how stakeholders, such as water companies and farmers, fitted in. We also wanted to assess some of the Government's initiatives, such as its new Farming Rules for Water (introduced in April 2018) and its Clean Air Quality strategy (published in July 2018), and other measures it might consider.

3. EU Directives and their transposition into UK law are central to the regulation of water and air quality standards and addressing specific pollutants such as nitrates, ammonia and nitrogen oxides. They are also key to the UK meeting several of the United Nations' Sustainable Development Goals, particularly on Clean Water and Sanitation, Climate

1 Rachel Salvidge, Tackling Water Quality at Source, ENDS Report, (26 October 2017).

2 See for example: BBC News, [England bathing waters improving, Defra claims](#), (5 November 2015).

3 Rachel Salvidge, EA: Potential threats to water quality include fracking pesticides', (19 February 2018).

4 See for instance: British Geological Survey, Predicting the arrival of peak nitrate concentrations at the water table, (accessed 21 July 2018); BBC News, [Scale of 'nitrate timebomb' revealed](#), (10 November 2017).

5 Nitrogen oxides refer to a group of gases made up of varying amounts of oxygen and nitrogen molecules. The two most common and hazardous nitrogen oxides are nitric oxide and nitrogen dioxide, while nitrous oxide is a powerful greenhouse gas. See: Scottish Environment Protection Agency, [The chemistry of air pollution](#), (accessed 7 August 2018).

6 See for example: Defra, [New guide for farmers to help reduce air pollution from ammonia](#), (August 2018); Ghaly AE* and Ramakrishnan VV, Nitrogen Sources and [Cycling in the Ecosystem and its Role in Air, Water and Soil Pollution: A Critical Review](#), *Journal of Pollution Effects & Control*, February 2015.

7 See Defra, [State of the Environment: Air Quality](#), (February 2018), p 7. It discusses "nitrogen disposition" and "acid disposition" whereby nitrogen (e.g. ammonia and nitrogen oxides along with other pollutants) when making contact with water, soil or plants can lead to deleterious effects. See also: Defra, [Biodiversity 2020: A strategy for England's wildlife and ecosystem services Indicators](#), (July 2018), pp 145–147.

Action, Life Below Sea and Life on Land.⁸ EU funding to UK farms through the Common Agricultural Policy (CAP) is contingent on a mechanism of cross-compliance that links direct payments to compliance by farmers with basic standards including those for the environment and water quality.⁹ EU institutions, such as the European Environment Agency provide administrative support and advice, while the European Commission and European Court of Justice monitor and enforce compliance and penalise Member states when they do not comply.¹⁰ This Report follows our previous Inquiries, such as those into fluorinated gases and the regulation of chemicals, and explores what impact leaving the EU would have on policy areas that are dependent on EU regulation, oversight, compliance and enforcement mechanisms, and examines the Government's proposals for the system that will replace these mechanisms. We also considered the particular challenges that a post-EU system will pose for Northern Ireland and the Republic of Ireland, who share several water bodies and who may, in future, have divergent policies on water and air quality.

The Nitrogen Cycle

4. Nitrates are produced as part of a wider nitrogen cycle. Understanding this cycle and its interaction with human activities, such as farming, sewage and transport and industrial emissions, is important if one is to tackle nitrogen as both a water and atmospheric pollutant.¹¹ The nitrogen cycle is the biochemical cycle by which nitrogen is converted into its multiple forms as it circulates among the atmospheric, terrestrial and marine ecosystems. There are two main forms of nitrogen - organic and inorganic. Organic nitrogen is found in proteins and is continually recycled by plants and animals,¹² including tens to hundreds of thousands of compounds that make up dissolved organic nitrogen and dissolved particulate nitrogen.¹³ Inorganic nitrogen occurs as nitrogen (N_2) nitrate (NO_3^-), nitrite (NO_2^-), ammonia (NH_3) and ammonium (NH_4^+).¹⁴

Nitrogen as a Pollutant

5. Within certain levels, nitrogen is beneficial to animals, plants and the wider environment. It is needed for processes such as the production of amino acids, proteins and human DNA and required to make chlorophyll in plants which drives photosynthesis.¹⁵ However, if nitrogen - in the form of ammonia, one of the gaseous nitrogen oxides,¹⁶ or nitrates or nitrites - is highly concentrated, it can have a damaging impact on ecosystems

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- 8 See United Nations, [17 Goals to Transform Our World](#), (accessed 21 September 2018). See also House of Commons Library, [Sustainable Development Goals](#), (November 2016).
- 9 See: European Commission, [Agriculture and rural development](#), (accessed 21 July 2018).
- 10 We covered these issues in EAC, [The Future of the Natural Environment after the EU Referendum](#), (HC 599; January 2017), pp 15–18.
- 11 See Professor Penny Johnes NO30026 for an explanation of how gaseous, water and soil-based forms of nitrogen interact with each other, such as the acidification of water from ammonia and nitrogen oxides.
- 12 See: N O G Jorgenson, Organic Nitrogen, in Gene E Likens (Ed), *Encyclopaedia of Inland Waters*, (2009), pp 832–851.
- 13 Professor Johnes (Q11).
- 14 David Crohn, Nitrogen mineralization and its importance in organic waste recycling, (2004).
- 15 See for example: P.Cabello et al., 'Nitrogen Cycle' from Moselio Schaechter (Ed.), *Encyclopaedia of Microbiology*, (2009), pp 299–321. See NFU NO30012.
- 16 Nitrogen oxides are a group of seven gases and compounds composed of nitrogen and oxygen. The two most common and hazardous nitrogen oxides are nitric oxide and nitrogen dioxide. Nitrous oxide, commonly called laughing gas, is a greenhouse gas that contributes to climate change.

and the organisms that depend on them.¹⁷ In water bodies this can lead to eutrophication, whereby an excessive richness of nutrients including nitrates can cause a dense growth of plant life and algae. This depletes the oxygen in the water body, which can result in reduced biodiversity.¹⁸ Nitrates can also reduce oxygen in drinking water, which can be harmful to people; for example, causing methaemoglobinaemia ('blue baby syndrome').¹⁹ In the form of ammonia and nitrous oxides, nitrogen can become a toxic air pollutant, greenhouse gas and can lead to the acidification of water sources. For more detail on the impact of nitrogen pollution see Annex 3.

Sources of Nitrogen Pollution

6. Agriculture is a key source of nitrate pollution,²⁰ ammonia emissions,²¹ and nitrous oxides emissions.²² Manufactured fertiliser containing urea, ammonium and nitrate applied to the land can leach from soils into nearby water sources, especially if soil health is poor and nitrates are not retained.²³ Animal waste, either slurry, manure or applied as an organic fertiliser, can also leach into water sources or break down into ammonia and nitrous oxides that can be released into the atmosphere. Nitrates and other pollutants such as phosphates can also be released from domestic and industrial sewage into water sources, which may cause eutrophication. Nitrogen oxides, ammonia and particulate matter can also be released from road transport, industrial processes and the energy sector. For a detailed overview of the sources of nitrogen pollution see Annex 1.

Phosphorous

7. Though phosphorous is not part of the nitrogen cycle it has similarities with nitrates as a pollutant. It is an essential building block of life and an irreplaceable part of modern agriculture.²⁴ It is a constituent of plant cells, essential for cell division and development of the growing tip of the plant; without it, plant growth is retarded.²⁵ However, losses

17 Professor Penny Johnes NO30026.

18 For eutrophication, its causes and consequences for ecosystems see: Chislock, M. F et al, [Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems](#). *Nature Education Knowledge*, (2013), vol. 4, no. 4, p 10; European Environment Agency, [Eutrophication](#), (accessed 21 May 2018); National Ocean Service, [What is eutrophication?](#), (accessed 21 May 2018).

19 For the symptoms of methemoglobinemia see: Lorna Fewtrell, [Drinking-Water Nitrate, Methemoglobinemia, and Global Burden of Disease: A Discussion](#), *Environmental Health Perspectives*, vol. 112, no 4, (2014), pp 1371–1374; Sally Bradberry, [Complications of poisoning: Methemoglobinemia](#), *Medicine*, vol. 40, Issue 2, (February 2012), pp 59–60.

20 Generally, nitrates are the main pollutant in ground and coastal waters, while phosphates are the main pollutant in rivers. In 2015, 37% of groundwater bodies in England were failing because of nitrate and 69% were at risk of failing mainly because of nitrate. See Defra NO30049.

21 Around 88% of ammonia emissions in the UK come from agriculture. See: Defra, [Code of Good Agricultural Practice \(COGAP\) for Reducing Ammonia Emissions](#), (July 2018).

22 The agriculture sector dominates emissions of nitrous oxide: emissions from agricultural soils in 2016 account for 53% of total UK emissions, and other agricultural sources add another 13%. Other important sources in recent years include road transport, other fuel combustion sources and waste processes. See National Atmospheric Emissions Inventory, [About Nitrous Oxide](#), (accessed 15 July 2018).

23 See for example: WWF, Angling Trust and The Rivers Trust, [Saving the Earth: A sustainable future for soils and water](#), (April 2018), who make the link between poor soil health and the loss of nutrients, such as nitrates, and organic matter into rivers and other water sources which cause pollution. See also: Environmental Audit Committee, [Soil Health](#), (HC 180; June 2016).

24 See for example: European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Consultative Communication on the Sustainable Use of Phosphorus, COM(2013) 517 final, (July 2013), p 2.

25 See for New South Wales Department of Primary Industries (Agriculture), [Why phosphorous is important](#), (accessed 1 June 2018).

from agricultural fields can cause eutrophication and ecological deterioration of surface waters.²⁶ The main sources of phosphorous in surface waters are sewage and effluent, and run-off from agricultural land, with the latter usually highest in winter when water levels are higher.²⁷ Generally speaking, phosphorous is more of a pollutant in rivers and less of an issue in groundwater sources, though this depends on local geology. We were told that water quality was affected by a combination of different pollutants, including nitrogen and phosphorous, and that the cycle of both nutrients and their interaction with each other needed to be understood to improve the ecological status of water sources.²⁸

The Regulatory Regime for Water Quality, Nitrates and Air Quality.

Water Quality and Nitrates

8. Water quality across the EU is regulated by several Directives. The key Directive is the Water Framework Directive, established for the assessment, management, protection and improvement of water quality.²⁹ It stipulates that EU member states should aim to achieve good status of water in all bodies of surface and ground water by 2015, or 2027 by the latest. It is supported by Directives on drinking water, bathing water, urban waste water and nitrates. An overview of the various directives is provided in Annex 2 of this Report.

9. The Directives are transposed into UK law mostly by secondary legislation and complemented by guidance. The Environment Agency is the principal regulator in England for breaches of water quality regulation. The Agency states that its enforcement approach is to take a proportionate and appropriate response to each situation; that its first response is usually to give advice and guidance or issue a warning to bring an offender into compliance where possible; and that it will normally consider all other options before considering criminal proceedings.³⁰ Penalties include: fixed or variable fines; compliance notices; restoration notices; stop notices; enforcement undertakings. The Rural Payments Agency ensures that land managers receiving payments from the EU's Basic Payment Scheme (BPS) or a stewardship scheme adhere to cross-compliance rules in areas such as water and soil quality. It can impose penalties, such as reducing or stopping future payments.³¹ Natural England have a role as an executive non-departmental public body, sponsored by Defra, to advise on water quality, biodiversity and ecosystems, land management and farming issues.³² The Drinking Water Inspectorate offers independent

26 Fien Amery and Oscar Schoumans, [Agricultural phosphorus legislation in Europe](#), Merelbeke, ILVO, (2014), p 1. See also Dr Paul Kay, University of Leeds NO30006.

27 See Natural Environment Research Council, [Phosphorus river pollution traced back to sewage](#), (2010); Environment Agency, [The State of the Environment: Water Quality](#), (February 2018), p 5; and Environment Agency, [The State of the Environment: Water Quality](#), (February 2018), p 5; M E Stuart and D J Lapworth, [Macronutrient status of UK groundwater: nitrogen, phosphorus and organic carbon](#), Natural Environment Research Council, (2016), p 9. The latter note sources of phosphorous include; agricultural soils (arable and grassland); septic tanks and leaking sewers; water treatment works; leaking water pipes (orthophosphate dosing for plumbosolvency); earth-lined slurry lagoons and manure heaps.

28 Professor Johnes Q19 and Q34 and Professor Jarvie Q19.

29 See: European Commission, [The EU Water Framework Directive - integrated river basin management for Europe](#), (accessed 16 July 2018).

30 For a general overview of the EA's enforcement and sanctions policy see: EA, [Environment Agency enforcement and sanctions policy](#), (May 2018).

31 See: Defra et al., [Cross compliance 2018](#), (May 2018); Rural Payments Agency and Defra, [Basic Payment Scheme \(BPS\)](#), (August 2018).

32 See: <https://www.gov.uk/government/organisations/natural-england>.

oversight to ensure that water companies in England and Wales supply safe drinking water that meets the standards set down in law.³³ The UK Water Framework Directive Technical Advisory Group (UKTAG) chaired by the Environment Agency brings together conservation and environmental agencies to provide advice on the scientific and technical elements of the WFD, such as monitoring progress and setting objectives.³⁴

Air Quality

10. There are a series of EU Directives that focus on air quality,³⁵ which concentrate on key pollutants including nitrogen oxides and ammonia. The Directives are transposed by secondary legislation, supported by guidance, such as on the management of animal waste on farms to reduce ammonia emissions.³⁶ Air quality is monitored across the UK by the Environment Agency.³⁷ The Government has developed plans setting out UK air quality standards and for reducing levels of health-threatening pollutants, especially nitrogen oxides.³⁸ However, it is subject to infraction proceedings for breaching the EU Ambient Air Quality Directive for failing to produce an adequate National Plan to reduce nitrogen dioxide pollution.³⁹ Nitrous oxide, a type of nitrogen oxide, is also treated as a greenhouse gas and monitored by the Committee on Climate Change.⁴⁰ Members of the public and organisations can take legal action in UK courts or report the UK Government to the European Commission for breaches of both water and air quality Directives.⁴¹ For more detail on Air Quality Directives see Annex 3.

33 See: Drinking Water Inspectorate, [What we do](#), (accessed 20 July 2018).

34 See: UKTAG, [About UKTAG](#), (accessed 27 July 2018). The Joint Agencies Groundwater Directive Advisory Group (JAGDAG) reviews assessments made by the agencies and comprises the Environment Agency (EA), the Scottish Environment Protection Agency (SEPA), the Northern Ireland Environment Agency (NIEA), the Environmental Protection Agency Ireland (EPA), Health Protection Agency (HPA), Department of Environment, Food and Rural Affairs (Defra), Welsh Government (WG) and industry representatives. See: UKTAG, [JAGDAG](#), (accessed 27 July 2018).

35 For the full list of Directives see: European Commission, [Air Quality - Existing Legislation](#), (accessed 20 July 2018).

36 See for example: Defra, [New guide for farmers to help reduce air pollution from ammonia](#), (July 2018).

37 See: Defra, [Monitoring Networks](#), (accessed 20 July 2018).

38 For the most recent plan to reduce nitrogen oxides see: Defra, [Air quality plan for nitrogen dioxide \(NO₂\) in UK \(2017\)](#), (March 2018).

39 See: European Commission, [Air quality: Commission takes action to protect citizens from air pollution](#), (17 May 2018); BBC News Online, [UK referred to Europe's top court over air pollution](#), (17 May 2018)..

40 Committee on Climate Change, [Reducing UK Emissions: 2018 Progress Report to Parliament](#), (June 2018), p 184 -188.

41 For example, in May 2017 the European Court of Justice ruled against the UK Government for breaches of the Urban Waste Water Directive. See: IEMA, [ECJ rules against UK for wastewater failings](#), (May 2017).

2 Water Quality

11. The UK's water quality regulation is underpinned by EU Directives and is implemented primarily through secondary regulation and guidance. This Chapter sets out how this regulation is implemented and the progress that is being made in meeting the requirements and targets set out in this legislation.

The Status of Water Bodies

12. As mentioned above, the Water Framework Directive (WFD) requires EU Member States to achieve good status in all bodies of surface and groundwater by 2015 unless there are grounds for derogations in specific and limited circumstance whereby the achievement of good status can be extended to 2021 or 2027 at the latest.⁴² The WFD is supported by the Groundwater Directive and an amending Directive (2014/80/EU), which sets baseline groundwater quality standards. More detail on the WFD, the Groundwater Directive and their transposition into UK legislation is provided in Annex 2 of this Report.

Penalties for Polluting Water

13. The main water pollution offences in England and Wales are set out in the Environmental Permitting (England and Wales) Regulations 2016 (as amended). It is an offence to cause or knowingly permit a water discharge activity or groundwater activity, except under and to the extent it is authorised by, an environmental permit. The maximum penalty for an individual on conviction in a magistrates' court is a fine up to £50,000 or 12 months imprisonment; if convicted in a Crown Court an unlimited fine or imprisonment of up to 5 years (or both).⁴³ Large companies, such as water companies, can face fines of up to 100% of their pre-tax net profits for the year.⁴⁴

Progress on Achieving Good Water Quality

14. Defra's Single Departmental Plan, published in May 2018, includes an objective to "ensure clean and plentiful water". More specifically, it said it would: safeguard and improve the quality of surface and ground waters through an effective and modern framework of protection and tools; reach or exceed objectives in our river basin management plans for rivers, lakes coastal and ground waters that are specially protected; protect bathing waters, shellfisheries, protected sites for wildlife and marine water quality.⁴⁵

15. In February 2018, the Environment Agency published the State of the Environment Report: Water, which found there has been a decline in the condition of English rivers⁴⁶ The Report found that 86% of English rivers had not reached good ecological status in

42 For further details regarding exemptions see: House of Commons Library, [Water Framework Directive: achieving good status of water bodies](#), (2015), pp 14–15 and House of Commons Library, [Water Quality](#), (July 2018), pp 7–8. Derogations include considering if achieving the deadline would be disproportionately expensive or if a natural event (e.g. extreme flooding) temporarily negated achieving it. However, specific conditions must be met for each derogation and no further deterioration can occur.

43 House of Commons Library, [Water Quality](#), (July 2018), p 21.

44 As above.

45 Defra, [Single Departmental Plan](#), (May 2018), para 2.2.

46 Environment Agency, [State of the Environment Report: Water](#), Feb 2018.

2016, up from 79% in 2014, with phosphorous, and to a lesser extent nitrates, the main factors.⁴⁷ It also reported that water quality issues were the cause of 38% of all fish test failures and 61% of invertebrate test failures in 2015.

16. The State of Water Report also stated that in 2016 there were 314 serious pollution incidents. In July 2017, the Parliamentary Under-Secretary (Department for Environment, Food and Rural Affairs) provided historic figures regarding the number of serious water pollution incidents, less serious incidents and prosecutions since 2007:⁴⁸

The table below provides details of the numbers of water pollution incidents as well as the numbers of successful prosecutions and accepted Enforcement Undertakings for water pollution offences.

Year	Number of Category 1 & 2 Serious water pollution incidents	Total water pollution incidents - impact levels 1-3	Successful prosecutions in relation to water pollution	Enforcement Undertakings Accepted
2007	444	8282	145	-
2008	378	7770	117	-
2009	430	8285	111	-
2010	336	8583	113	-
2011	360	8504	98	0
2012	293	8265	82	1
2013	376	8485	54	3
2014	361	7274	45	3
2015	326	6363	22	1
2016	314	6414	42	14

Prosecutions or enforcement undertakings are normally considered for the more serious Category 1 and 2 incidents. Prosecutions are undertaken where there is a public interest in doing so and where there is a reasonable likelihood of obtaining conviction. Enforcement Undertakings have been available as an enforcement option since 2011.

The prosecution of water pollution offences or decision on enforcement undertakings does not necessarily occur in the same year in which the incidents took place. There are cases for offences which took place in earlier years which are currently still in progress.

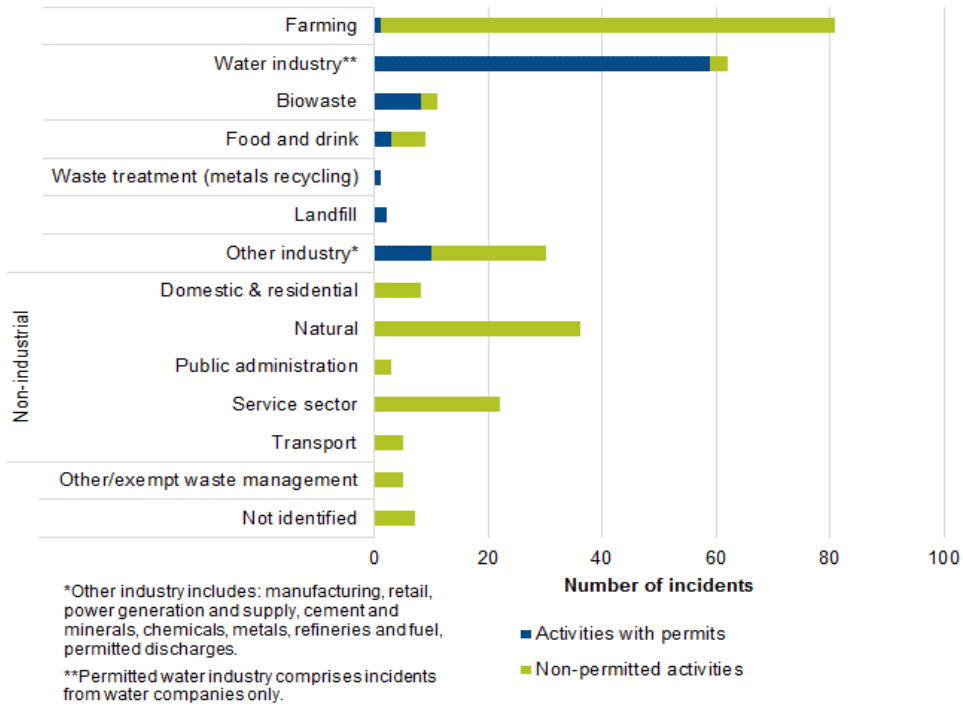
17. The figures show that, overall, the number of serious incidents has reduced since 2007, though they have remained above 300 incidents a year since 2013. Less serious incidents have shown a more marked decline, while successful prosecutions have also declined significantly, which as we discuss in Chapter 5, might reflect the Environment Agency's view that prosecutions are to be seen as a last resort. The most recent analysis of water pollution incidents, published by the Environment Agency in December 2017, indicates that farming and the water industry are the biggest sources of major water pollution incidents:⁴⁹

47 Wildlife and Countryside Link NO30029 stated that 62% of the UK's sensitive ecosystems suffer from high levels of nitrogen deposition, rising to 96% for England only which is not expected to significantly decrease until 2025.

48 HC Hansard, 11 July 2017, [Written Question 4156](#).

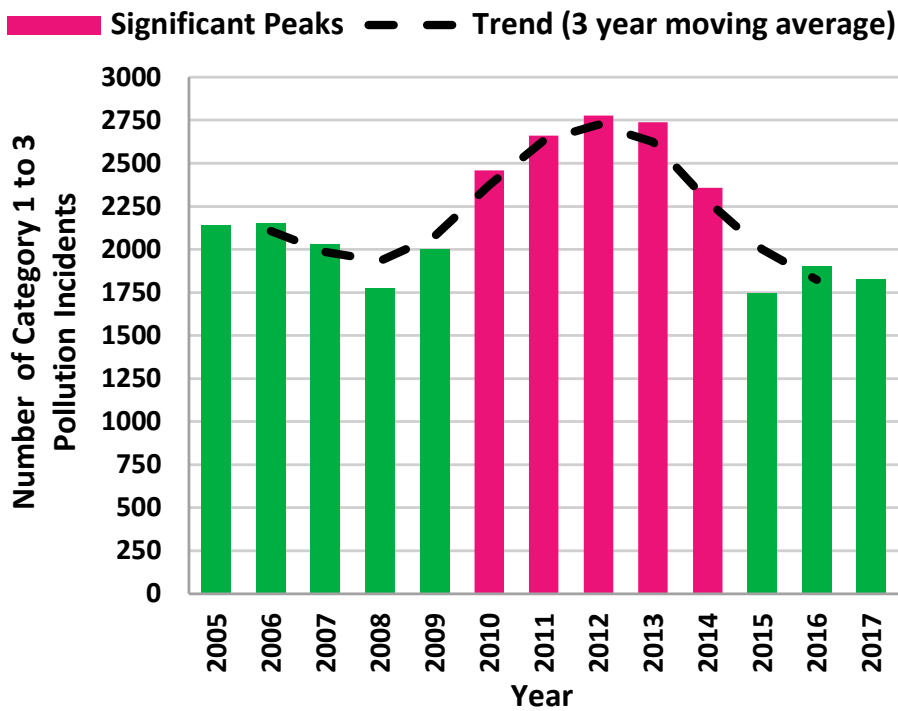
49 Environment Agency, [Pollution incidents 2015 evidence summary September 2016](#), (December 2017), p 5.

Sectors causing serious pollution incidents affecting water in England, 2015



18. In July 2018, the Environment Agency published the performance of the nine largest water companies in England. In terms of overall serious incidents, progress has plateaued in recent years after higher levels between 2010 and 2014:⁵⁰

Figure 2. Numbers of category 1 to 3 pollution incidents and trend for the 9 water companies 2005 to 2017



50 Environment Agency, [Water and sewerage companies' performance: 2017 summary](#), (July 2018), p 7.

19. However, the most serious incidents (category one incidents) increased from 9 incidents in 2016 to 11 in 2017.⁵¹ The Environment Agency said that water companies had not done enough to tackle pollution in rivers and streams.⁵² In 2017, water companies were fined a total of £21.6m for offences.⁵³ Several water companies were singled out for poor performance. South West Water was told that it needed to make “significant improvements to their environmental performance”. The company reported 169 sewage related incidents in 2017 and for one incident was fined £142,524 after it was found to have allowed inadequately treated effluent to enter rivers at two locations. Northumbrian Water was the worst for permit compliance in 2017 in relation to rules surrounding the discharge of treated waste water.⁵⁴ Thames Water received the largest fine: a record £20.3m in March 2017 after they were found guilty of dumping 1.4bn litres of raw sewage into the river Thames between 2012 and 2014.⁵⁵ The Environment Agency have, however reported that since 1995, pollutant loads from water industry discharges have declined by up to 70%.⁵⁶

20. In August 2017, the Guardian reported the nature of some of the agricultural water pollution offences that occurred between 2010 and 2016. Offences included pollution of waterways and land by slurry, the inappropriate burial of carcasses, and the emission of noxious fumes, the majority of which involved dairy farms, mainly in the south-west and Midlands. Some of the serious incidents had been linked to megafarms, housing hundreds of thousands of chickens or thousands of pigs.⁵⁷

21. In June 2018, the Secretary of State wrote to the Chair of the Environmental Audit Committee stating that it had become clear that it would “be very challenging for most member states to achieve good status for all waters”, a key target in the WFD, due to the “sheer pressure from human populations, industry and agriculture”. As a result, he said it was “likely that member states and the EU Commission will need to consider extending the WFD deadline in some way or revising water quality objectives looking beyond 2027”.⁵⁸ The view that the UK would struggle to meet the 2027 target had been expressed in 2012, when the then Parliamentary Under-Secretary of State, Richard Benyon, told the House of Lords Sub-Committee on Agriculture, Fisheries and the Environment that the disproportionate cost and technical feasibility of reaching 100% good status meant that “we would probably get to something like 75% by 2027”.⁵⁹

How the UK Compares to the Rest of the EU on Water Quality

22. Looking at the EU as a whole, the European Environment Agency (EEA) reported that groundwaters generally had the best status, with 89 % achieving good quantitative

51 As above.

52 BBC News Online, [Major sewage pollution incidents increase](#), (July 2018). See also: Conor McClone, ‘Serious water pollution incidents ‘on the rise’ says EA’, [ENDS Report](#), (July 2018); Gill Plimmer, Water companies warned on failure to reduce pollution incidents, [Financial Times](#), (February 2018).

53 Environment Agency, [Water and sewerage companies’ performance: 2017 summary](#), (July 2018), p 12.

54 Gill Plimmer, ‘Water industry taken to task on serious pollution incidents’, [Financial Times](#), (July 2018).

55 See Environment Agency, [Thames Water ordered to pay record £20 million for river pollution](#), (March 2017); Gill Plimmer, Thames Water fined record £20m for sewage dump, [Financial Times](#), (March 2017).

56 Environment Agency, [State of the Environment Report: Water](#), Feb 2018.

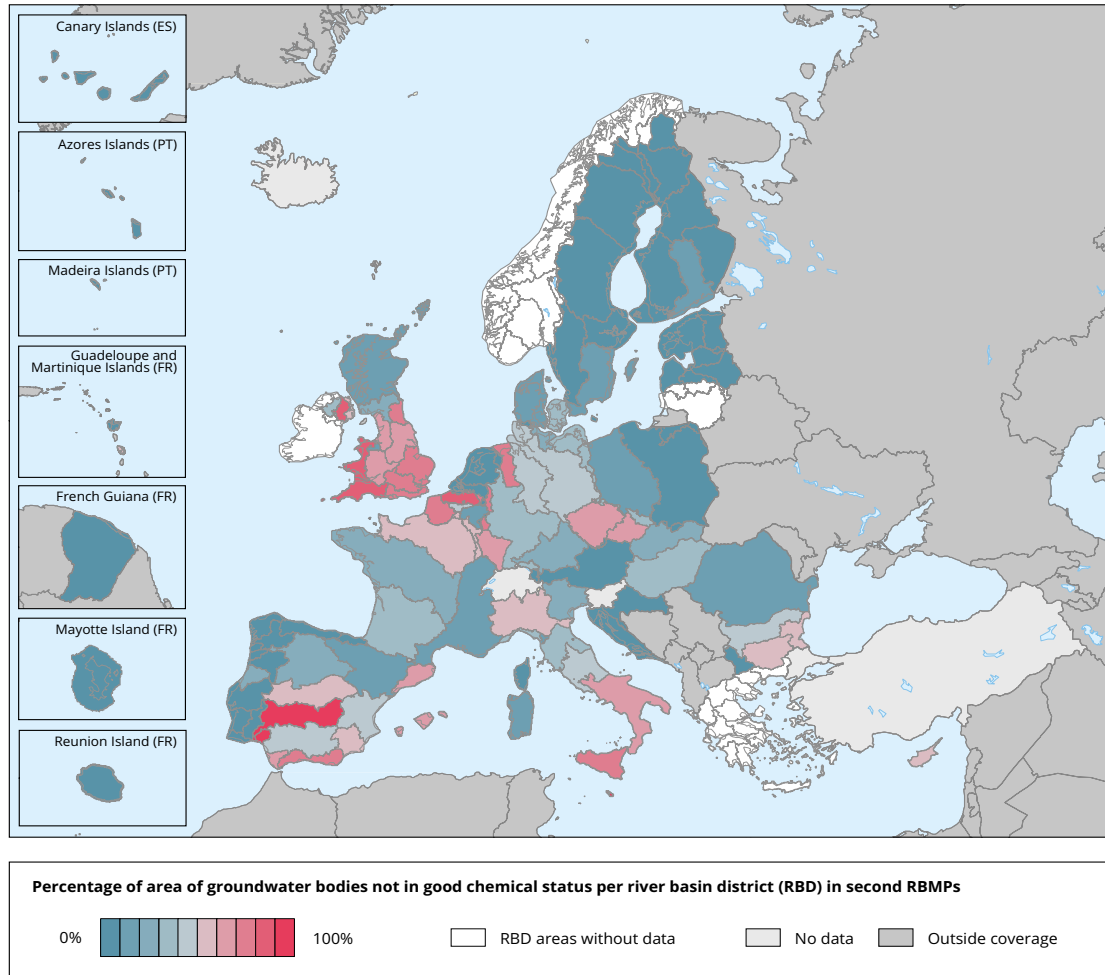
57 Andrew Wasley, Fiona Harvey and Madlen Davies, [Serious farm pollution breaches rise in UK – and many go unprosecuted](#), [Guardian](#), (August 2017).

58 Rachel Salvidge, ‘Gove: EU Water Quality Objectives ‘Could be Revised’’, [ENDS Report](#), June 2018.

59 House of Lords European Union Select Committee, [An Indispensable Resource: EU Freshwater Policy](#), (HL 296; May 2012), para 39.

status,⁶⁰ and 79% good chemical status, with nitrates the main cause for EU ground water not reaching good chemical status.⁶¹ The map below indicates how the UK performs against other EU countries in terms of the chemical status of its groundwater:

Map 4.1 River basin groundwater chemical status



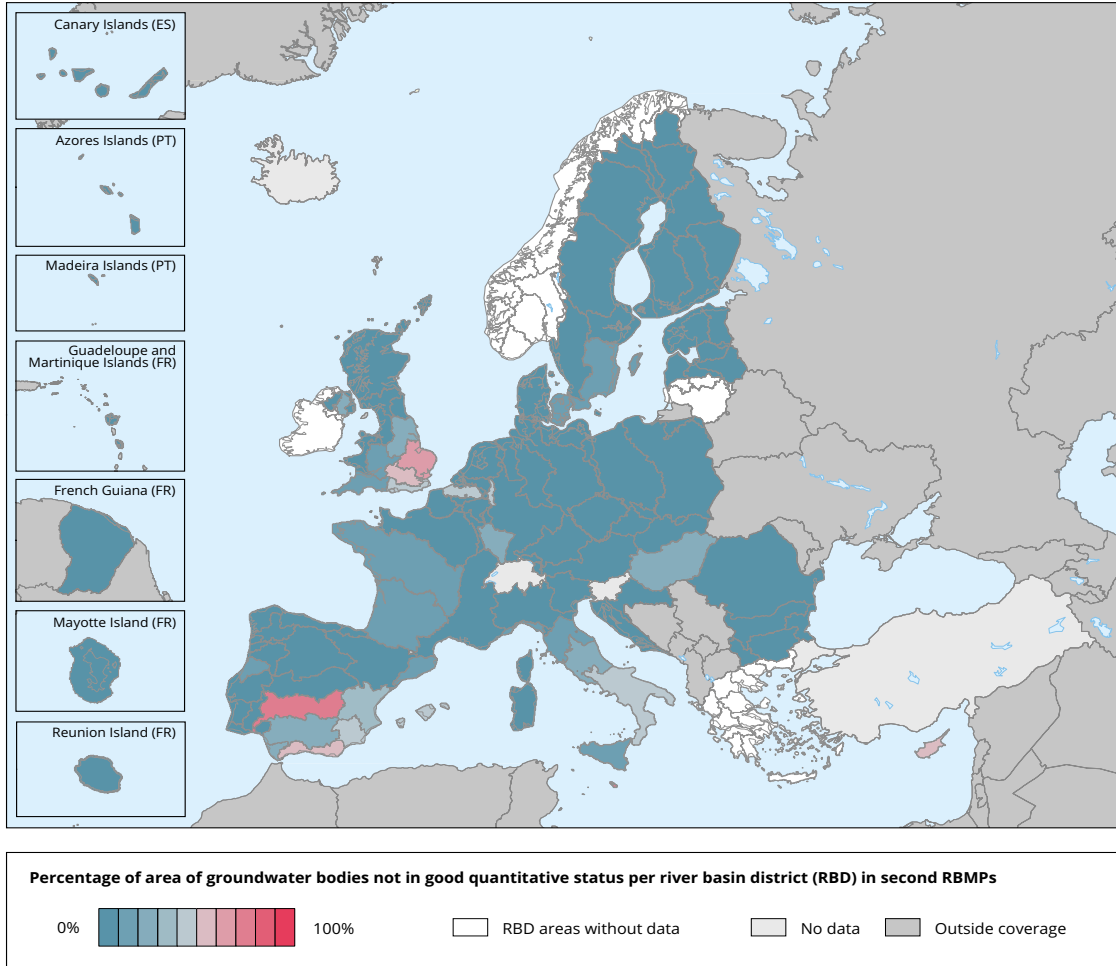
Source: European Environment Agency, [European Waters Assessment of Status and Pressures 2018](#), (2018), p 51.

60 Good ground quantitative status refers to available groundwater source not being exceeded by the long-term annual rate of abstraction and groundwater levels not: diminishing the ecological status of surface water linked with groundwater; causing significant damage to groundwater-dependent ecosystems; leading to saline or other intrusions.

61 Good groundwater chemical status refers to water that: shows no sign of saline intrusion; where concentrations of pollutants (e.g. nitrates) do not exceed those permitted by applicable groundwater quality standards or threshold values; where concentrations of pollutants do not result in a failure to achieve ecological or chemical status in associated surface waters not cause damage to associated dependent terrestrial ecosystems.

This map indicates how the quantitative status of the UK's groundwater compares with the rest of the EU:

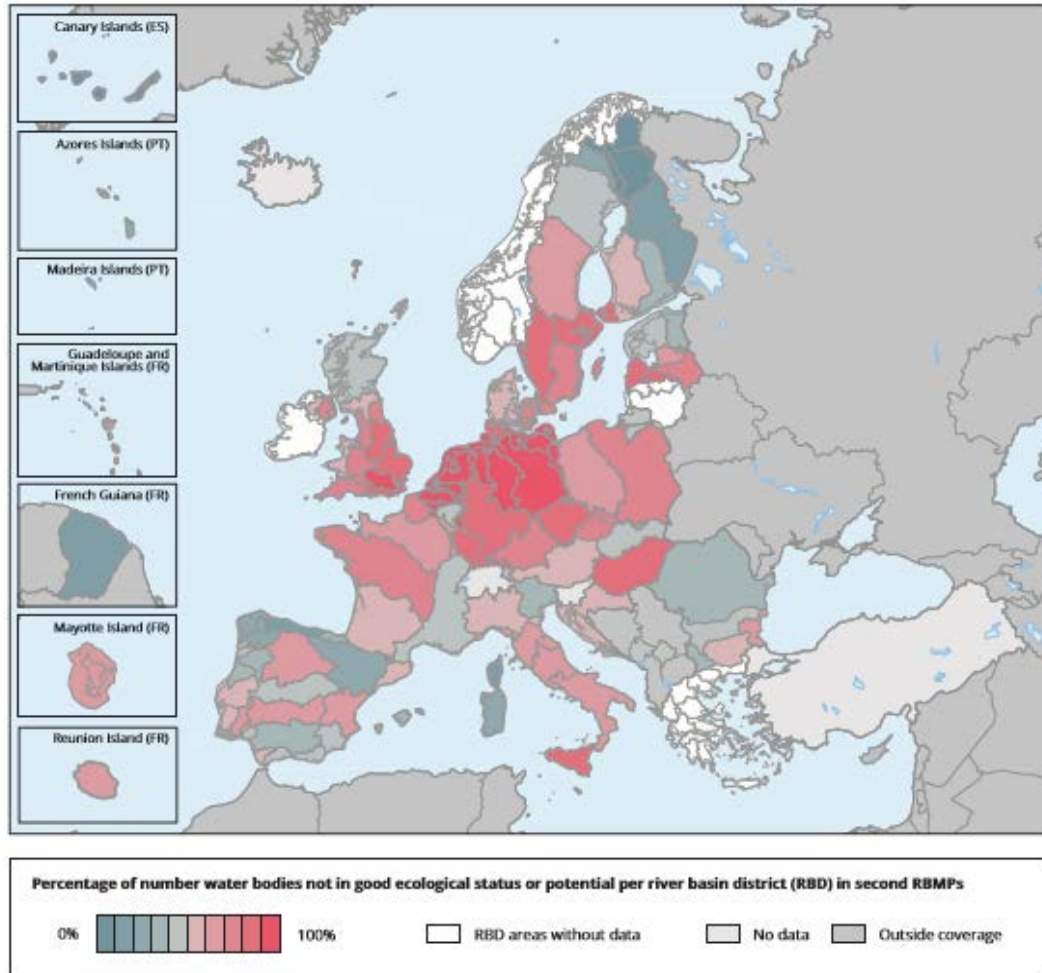
Map 5.1 Percentage of the area of groundwater bodies not in good quantitative status in Europe's RBDs in the second RBMPs



Source: European Environment Agency, [European Waters Assessment of Status and Pressures 2018](#), (2018), p 58.

23. In terms of surface water, around 40 % of EU surface waters (rivers, lakes and transitional and coastal waters) have good ecological status or potential, with 38 % having good chemical status.⁶² The map below indicates how the UK compares with other EU countries in terms of water bodies that have good ecological status/potential:

Map 2.1 Percentage of water bodies in Europe's RBDs that are not in good ecological status/potential: second RBMPs



Source: European Environment Agency, [European Waters Assessment of Status and Pressures 2018](#), (2018), p 26.

24. It is a cause for concern that 86% of English rivers did not reach good ecological status in 2016, which is lower than the EU average, and that the UK is also performing badly compared to many of its European neighbours in terms of the chemical status of its ground waters. It is particularly worrying that the UK may not hit the 2027 target set in the Water Framework Directive for all water bodies to have a good ecological status.

25. This is having a negative impact on our ecosystems and the organisms that live in them. We note that there were 314 serious pollution incidents in 2016 and that this level of incidents has persisted for nearly a decade, which suggests that more needs to be done to reduce pollution in both surface waters and groundwaters. The figures also show that the Government is rightly concentrating on agriculture and the water industry as the major polluters.

62 European Environment Agency, [European waters Assessment of status and pressures 2018](#), (2018), p 6.

Drinking Water

26. The EU's Drinking Water Directive (98/83/EC), working in conjunction with the WFD, seeks to protect human health from "adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean". An overview of the Directive and relevant transposing legislation is provided in Annex 2 of this Report.

27. Tap water supplied by water companies in England and Wales is regulated by the Drinking Water Inspectorate (DWI) to ensure it meets the required drinking water quality standard.⁶³ In Scotland, this is the responsibility of the Drinking Water Quality Regulator for Scotland and in Northern Ireland, the Drinking Water Inspectorate based with the Northern Ireland Environment Agency⁶⁴ In terms of drinking water in England the table below summarises provisions from both public and private sources:⁶⁵

Public supplies		Private supplies	
Population supplied	55,535,874	Population supplied	572,107
Water supplied (l/day)	13,863 million	Water supplied (l/day)	382million
Abstraction points	2,125	Approximate number of private water supplies*	
Treatment works	1,101	Total number of local authorities	365
Service reservoirs	3,802	Number of local authorities with private supplies	256
Water supply zones	1,497		
Length of mains pipe (km)	315,110	Water composition	
Water composition		Surface influenced supplies	21%
Surface sources	64.5%	Groundwater sources	60%
Groundwater sources	30%	Mains water	15%
Mixed sources	5.5%	Unknown	4%

28. The Drinking Water Inspectorate reported that in 2017, 99.6% of publicly supplied water in England complied with the WFD; the level of compliance has remained largely unchanged since 2004.⁶⁶ **We are reassured that regulators are reporting high levels of drinking water quality. But as we note elsewhere in this report, the costs of delivering this in terms of mitigating nitrate pollution, especially in groundwater sources, are high. Such costs are ultimately passed on to the consumer.**

63 For further information on the role of the Drinking Water Inspectorate (DWI), see: DWI, [What we do](#), (accessed 12 June 2018).

64 See: Drinking Water Quality Regulator for Scotland (DWQR), [What does the DWQR do](#), (accessed 12 June 2018). The Drinking Water Inspectorate (DWI) is a unit within the Northern Ireland Environment Agency (NIEA) responsible for regulating drinking water quality in Northern Ireland for both public and private supplies. See DWI, [Duties of the Drinking Water Inspectorate \(DWI\)](#), (accessed 12 June 2018).

65 Drinking Water Inspectorate, [Drinking water 2017: Summary of the Chief Inspector's report for drinking water in England July 2018](#), (July 2018), p 3.

66 Same as above, p 7.

Urban Waste Water

29. The [Urban Waste Water Treatment Directive \(91/271/EEC\)](#) seeks to protect the water environment from the adverse effects of discharges of urban waste water and from certain industrial discharges, including sensitive areas and their catchments which might be vulnerable to eutrophication.⁶⁷ Further details regarding the Directive and relevant transposing legislation can be found in Annex 2 of this Report.

30. In 2009, the European Commission began infringement proceedings against the UK for breaching the Urban Waste Water Directive, after complaints from the public. In 2014, the Commission referred the UK to the European Court of Justice (ECJ), for its continued failure to comply with the Directive.⁶⁸ In May 2017, the ECJ ruled against the UK. The UK was not fined but will have to pay costs.⁶⁹ This related to breaches in: the Gowerton and Llanelli agglomerations in Wales; Gibraltar, which has no urban wastewater treatment plant; Banchory and Stranraer in Scotland, and Ballycastle in Northern Ireland; and the Tiverton, Durham, Chester-le-Street, Islip, Broughton Astley, Chilton, Witham and Chelmsford agglomerations in England. The breaches included sewage spills in areas under various designations, including the Birds Directives with evidence that shellfish had been contaminated with *E. coli* bacteria. The UK was criticised for starting remedial work too late to ensure compliance and for not providing data in many of the areas to confirm compliance.⁷⁰ Defra informed us that all the sites in England covered by the judgment were compliant by January 2016 and improvement works at the one site in breach in Northern Ireland had recently been completed. The Welsh Government plans to deliver compliance at the sites in Wales by 2020.⁷¹ HM Government of Gibraltar have informed us that they recently awarded a contract to construct the necessary treatment works and expects the works to be completed by the end of 2020.⁷² Cases have been brought against other EU countries for breaches of the Directive, including: [Portugal](#); [Greece](#); [Belgium](#); [Italy](#); [Luxembourg](#); [Spain](#). **We are disappointed that the Government was slow in addressing UK breaches of the Urban Water Directive in 2009 which led the ECJ ruling against the UK 2017. We have seen similar problems elsewhere in relation to air quality and nitrogen dioxide emissions. The fact that the UK was slow to respond to these breaches even after the intervention of the European Commission and European Court of Justice does not inspire us with confidence about maintenance of water standards once the UK leaves their jurisdiction. This underlines why a powerful**

67 For more detailed information on sensitive areas see: Defra, *Waste water treatment in the United Kingdom – 2012: Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EECA*, (2012), pp 11–15. For an up-to-date list of UK sensitive areas see: Defra, [Sensitive areas currently identified in the UK under the Urban Waste Water Treatment Directive since 1994](#), (accessed 12 June 2018).

68 European Commission, [Commission takes the United Kingdom to Court over power plant emissions](#), (May 2015). See: BBC News, [Burry Inlet sewage European court case looms](#), (November 2015); BBC News, [Ballycastle: Government in court over breach of EU sewage rules](#), (April 2015).

69 InfoCuria (Case Law of the Court of Justice), [Failure of a Member State to fulfil obligations—Directive 91/271/EEC—Articles 3 to 5 and 10—Annex I, Sections A, B and D—Urban waste-water treatment—Collecting systems—Secondary or equivalent treatment—More stringent treatment of discharges into sensitive areas](#), (4 May 2017).

70 InfoCuria (Case Law of the Court of Justice), [Failure of a Member State to fulfil obligations—Directive 91/271/EEC—Articles 3 to 5 and 10—Annex I, Sections A, B and D—Urban waste-water treatment—Collecting systems—Secondary or equivalent treatment—More stringent treatment of discharges into sensitive areas](#), (4 May 2017). See also Defra and the Environment Agency NO30053 for an outline of the cases and the UK's response

71 Defra and the Environment Agency NO30053.

72 HM Government of Gibraltar NO30052.

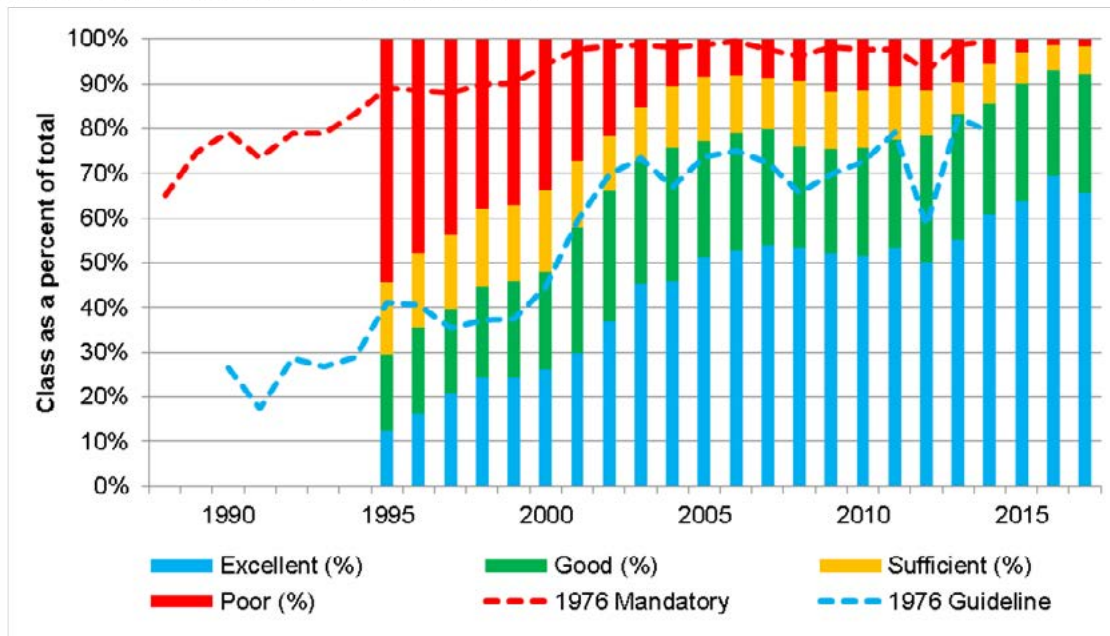
environmental watchdog will be needed after the UK leaves the EU and particularly in the event of leaving without a deal. This body will need to set, monitor and evaluate targets to reduce pollution incidents and improve water quality.

Bathing Water

31. The [Bathing Water Directive \(2006/7/EC\)](#) requires Member States to protect and monitor bathing water areas. Further detail regarding the Directive and transposing legislation is provided in Annex 2 of this Report. Oversight is provided by the Environment Agency.⁷³

32. The Environment Agency found that 65% of UK bathing sites had an excellent status in 2016, 25% a good status and 6.5% had sufficient quality. This position has improved over time:⁷⁴

Trend in bathing water classification 1995 to 2017 (with comparison to historic data)

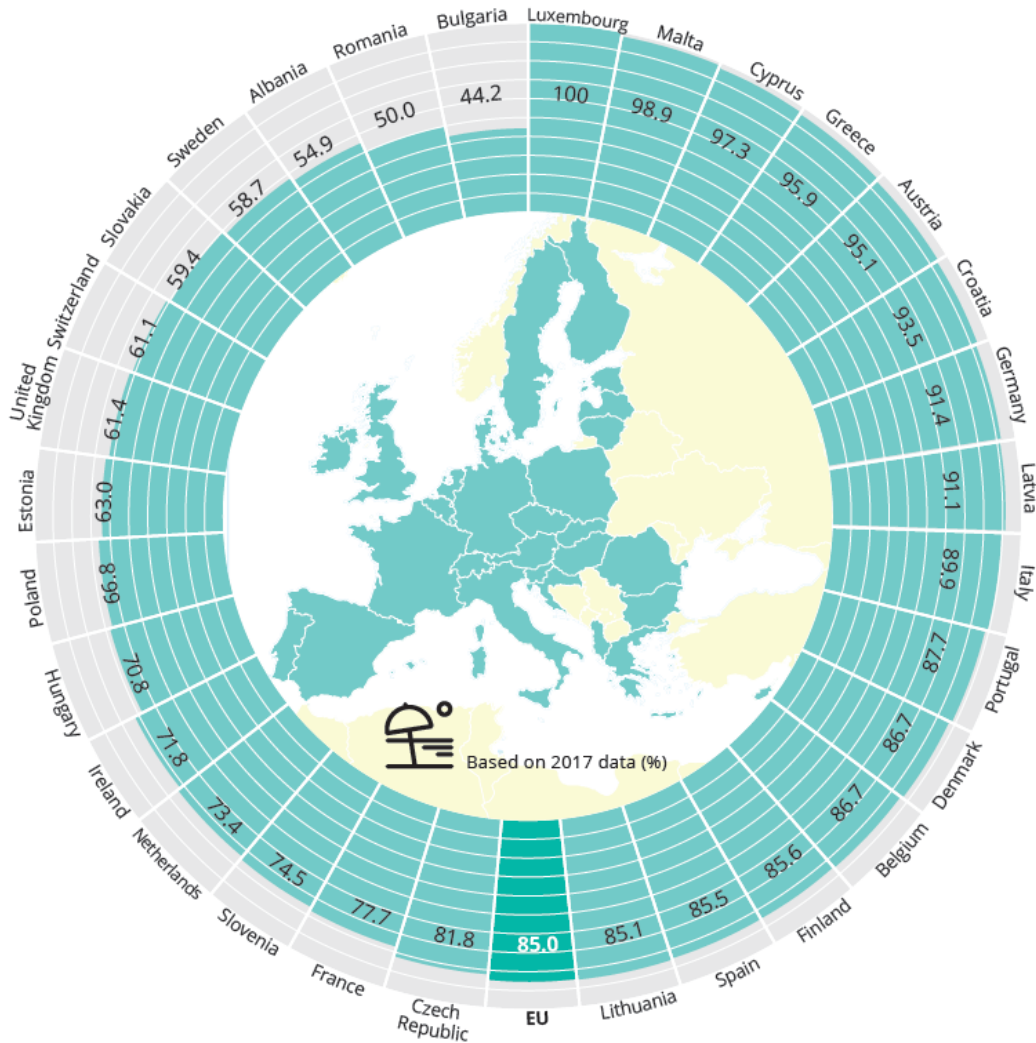


73 See: Environment Agency, [Bathing Water Quality](#), (accessed 13 June 2018). For a list of designated bathing waters in England see: Defra, [Designated bathing waters in England 2018](#), (May 2018).

74 Environment Agency, [State of the Environment Report: Water](#), Feb 2018.

33. However, the UK is well below the EU average of 85% of beaches achieving excellent status and ranking 24th out of 30 European countries (see the chart below):⁷⁵

Proportion of Bathing Water Sites with Excellent Water Quality in European Countries



34. Though there has been an improvement in the quality of UK bathing waters over the past 25–30 years, the UK is still 7th from the bottom of the scale. The European Environment Agency notes that nitrate pollution from diffuse pollution is a major cause of bathing water not reaching excellent status and that steps taken to address this will have the added benefit of also addressing phosphate pollution. It is crucial that the Government continues to enforce the various initiatives to control nitrate pollution and improve water quality if our beaches are to move into the upper tier of EU bathing quality. The new system of farm payments, linking payments to provision of public goods should look at reducing nitrate pollution from agriculture as a key public good.

75 European Environment Agency, [Good news for holiday makers: excellent water quality at vast majority of European bathing sites](#), (May 2018). The chart includes 28 EU Member states and Switzerland and Albania.

The UK's Nitrate “Time Bomb”

35. We received evidence from the British Geological Survey (BGS) and heard from Dr Ward of BGS about the problems associated with what has become known as the “nitrate time bomb”. This is a phenomenon caused by historic high applications of artificial fertilisers that had not filtered through into groundwater aquifers because the geology in some parts of the UK, especially chalk and thick saturated zones, had slowed it down.⁷⁶ Dr Ward warned that it might take 60 years for levels of nitrate to peak and that in the worst-case scenario it might take a century to peak.⁷⁷ The Minister acknowledged this issue: “For years we are still going to be suffering the consequences of overuse of synthetic fertilisers”.⁷⁸ The Environment Agency said that the Government could not tackle the nitrate that is already in the groundwater and could only stop additional nitrate reaching it.⁷⁹

Performance on Reducing Nitrates

36. Defra submitted evidence on average nitrate levels for surface waters (i.e. rivers and lakes) and groundwaters 2012–2015, showing the percentage of water bodies with different concentrations of nitrate per litre of water, ranging from less than 2 mg to greater than 50 mg per litre.

Table 1³. Mean nitrate concentrations (mg NO₃/L) in rivers and lakes: 2012-2015 (per cent of monitoring points)

	Per cent of monitoring points (mg nitrate / L)					
	0 to 2	>2 to 10	10 to 25	>25 to 40	>40 to 50	> 50
England	6.0	22.0	36.0	24.0	6.0	6.0
Wales	23.0	54.0	20.0	2.0	0.7	0.3
Scotland	35.8	36.5	20.0	7.4	0.2	0.0
Northern Ireland	24.9	64.4	10.7	0.0	0.0	0.0

37. This indicates that higher levels of nitrates occur in English surface waters, than in Wales, Scotland and Northern Ireland. However, Defra told us that since the late 1990s nitrate levels had declined and that it expected this trend to continue due to regulatory measures, declining fertiliser use and reduced livestock numbers.⁸⁰

76 British Geological Survey NO30019. The BGS noted that In England and Wales it has been estimated that between 800 and 1700 kilotonnes (kt) of nitrate is stored in the unsaturated zone, which is between 2.5 and 6 times the estimates of nitrate stored in the saturated zone. See also: H. Headworth, ‘Contamination of Groundwaters from farming activities’ in J.G. Jones (ed.), *Agriculture and the Environment*, (1993). See also Wessex Water NO30008.

77 Dr Robert Ward Q3-Q10 and Q15. See also British Geological Survey NO30019.

78 George Eustice MP Q205.

79 Helen Wakeham Q210–211.

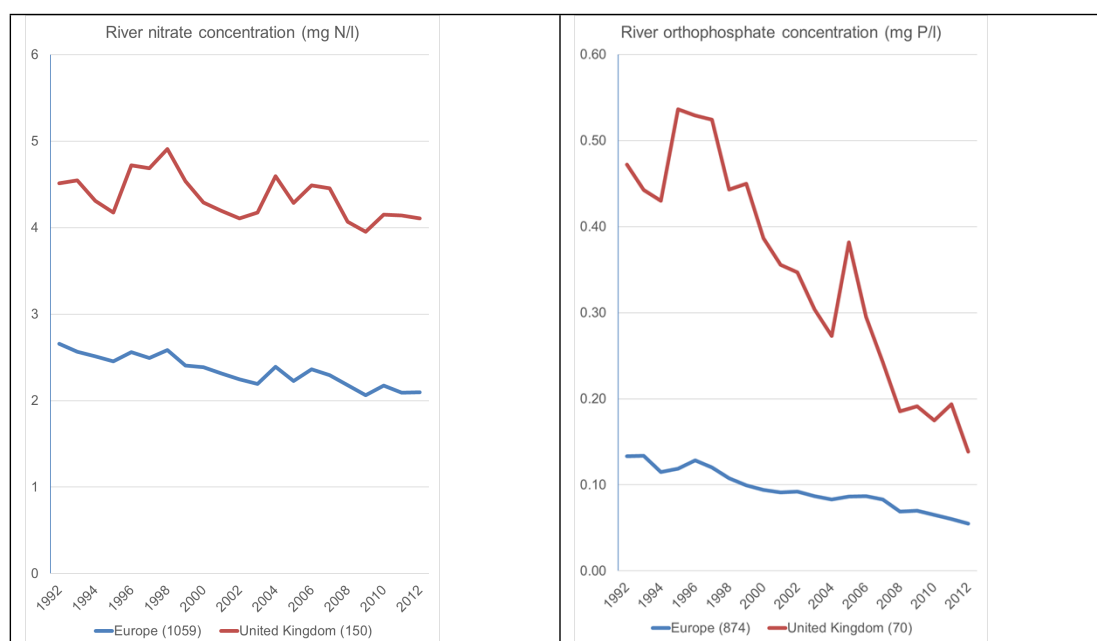
80 Defra NO30049

38. Defra and the Minister accepted that the scale and extent of nitrate pollution was much higher for groundwater. In 2015, 37% of groundwater bodies in England were failing their objectives and 69% were at risk of failing mainly because of nitrate.⁸¹

Table 24. Mean nitrate concentrations (mg NO₃/L) in groundwaters: 2012-2015 (per cent of monitoring points)

	Per cent of monitoring points mg nitrate / L			
	< 25	>= 25 to 40	>= 40 to 50	>50
England	59.00	19.00	8.00	14.00
Wales	84.00	8.00	3.00	5.00
Scotland	60.50	18.20	9.20	12.10
Northern Ireland	98.21	0.00	0.00	1.79

39. The European Environment Agency (EEA) also submitted evidence to our inquiry concerning nitrate and phosphate concentrations in UK rivers:⁸²



40. The EEA noted that within this overall UK data, there were some of the lowest and highest concentrations in Europe. The lowest concentrations were in Scotland and Northern Ireland and the highest in eastern England and the Thames Region.⁸³ The European Commission published a review of the Nitrates Directive in 2018, which set out average nitrates concentrations in all surface waters (i.e. lakes and rivers) 2012–2015, which indicated that average nitrate levels in the UK were at the higher end of the EU spectrum:⁸⁴

81 As above. See also: George Eustice MP Q205 and Helen Wakeham Q210–211.

82 NO30050, European Environment Agency.

83 European Environment Agency NO30050. See also Wildlife and Countryside Link NO30029.

84 European Commission, [REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2012–2015](#), (May 2018), p 7.

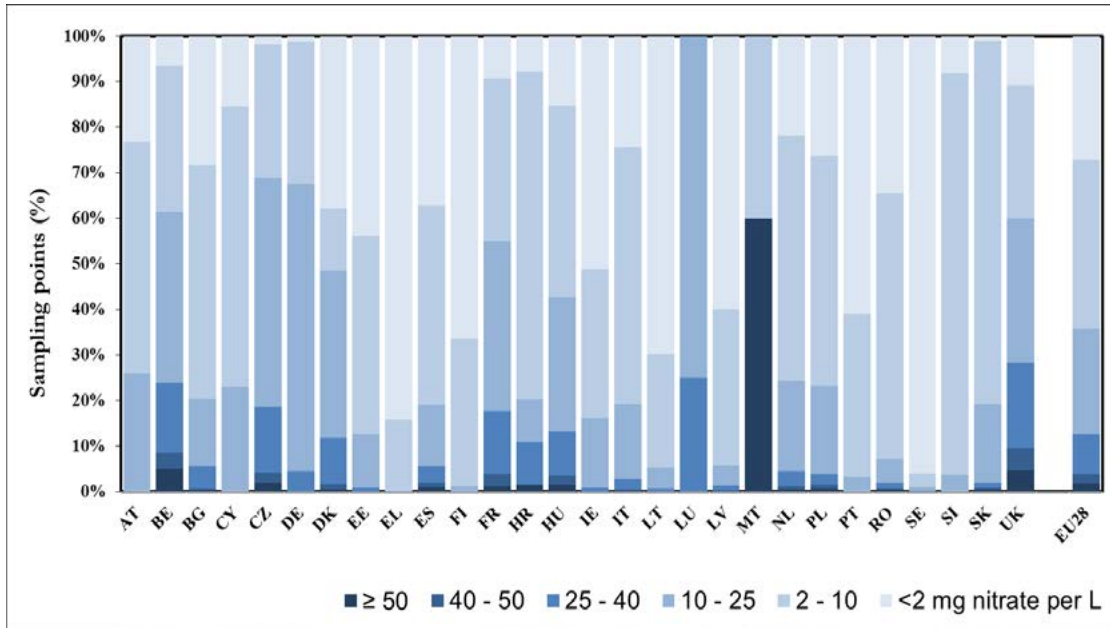


Figure B. Frequency diagram of annual average nitrate concentrations in fresh surface waters (rivers and lakes)

41. The Review also included average nitrate levels for ground waters:⁸⁵

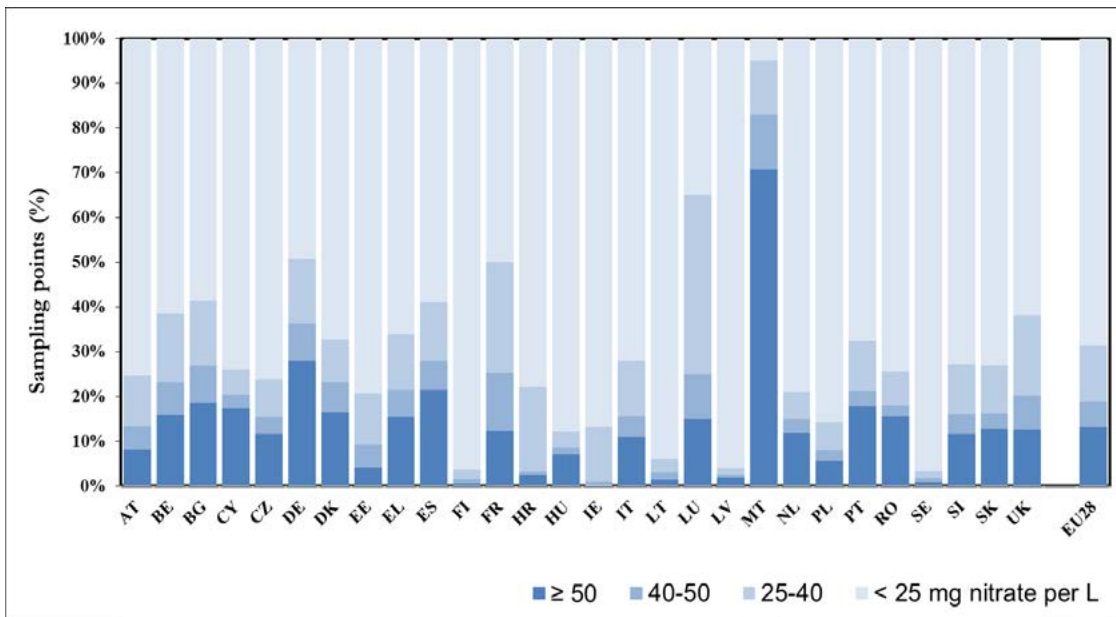


Figure A. Frequency diagram of annual average nitrate concentrations in groundwater²⁷. Results are presented for all groundwater stations at different depths.

In terms of breaching the Nitrates Directive, on 7 December 2000 the European Court of Justice criticised the United Kingdom for failing to identify its nitrate-polluted waters and to designate nitrate vulnerable zones in accordance with the Directive.⁸⁶ This centred on the UK not drawing up action plans for three Nitrate Vulnerable Zone (NVZ) areas in

85 As above, p 6.

86 European Commission, [Water pollution by nitrates: Commission takes legal action against United Kingdom for non-compliance with Court Judgement](#), (October 2001).

Northern Ireland and for failing to designate a Scottish River.⁸⁷ The Commission followed up with a Letter of Formal Notice,⁸⁸ in October 2001 to remind the United Kingdom of its obligation to complete the identification of all its nitrate-polluted waters following on from the Court's judgement.⁸⁹ In 2017, the European Commission launched a Pilot Investigation on the UK's Nitrate Action Plan, in which it questioned whether measures set out in UK legislation were sufficient to meet the objectives of the Directive. The UK Government provided information regarding the measures and drew attention to recent scientific evidence which investigated their efficiency. The Government is still engaging with the Commission on this issue.⁹⁰

The Cost of Water Quality and Dealing with Nitrate pollution

42. Defra estimated in 2015 that in England, businesses, the third sector and public sector jointly spent about £5 billion a year to protect the water environment (to prevent deterioration) and protect public health and wellbeing. This included:

- water industry operating costs to collect and treat sewage of approximately £3 billion;
- industry and businesses investment of around £1 billion to mitigate their potential impact on the water environment and meet basic regulatory requirements;
- £450 million by agriculture to meet basic regulatory requirements and further reduce impacts on the water environment, including payments under the Common Agricultural Policy and voluntary industry initiatives;
- expenditure by government and the voluntary sectors to mitigate historic damage and provide water related benefits for people and wildlife.⁹¹

43. Professor Johnes, from Bristol University, suggested that the annual costs of fertiliser loss in UK lowland farming could be £10,000-£20,000 per km², while studies reported that the total loss across the EU from nitrogen pollution could be up to €18bn.⁹² We heard that water companies have had to invest significantly in facilities to 'blend' polluted water with water from a low nitrate source or in processing plants to remove nitrate.⁹³ Anglian Water

87 European Commission, [Water pollution by nitrates: Commission takes further legal steps against Luxembourg, Finland, Portugal and United Kingdom](#), (April 2000).

88 A letter of Formal Notice is the first step in the EU's infringement procedure. It requests further information from the country concerned, which must send a detailed reply within a specified period, usually 2 months. The second step is a Reasoned Opinion: a formal request to comply with EU law. It explains why the Commission considers that the country is breaching EU law. It also requests that the country inform the Commission of the measures taken, within a specified period, usually 2 months. The third step is referral of the matter to the Court of Justice. Most cases are settled before being referred to the court. If an EU country fails to communicate measures that implement the provisions of a directive in time, the Commission may ask the court to impose penalties. If the court finds that a country has breached EU law, the national authorities must take action to comply with the Court judgment. See: European Commission, [Infringement procedure](#), (accessed 21 August 2018).

89 European Commission, [Water pollution by nitrates: Commission takes legal action against United Kingdom for non-compliance with Court Judgement](#), (October 2001).

90 House of Lords European Energy and Environment Sub-Committee, [Letter from Minister of State for Agriculture, Fisheries and Food to the Chair of the Committee](#), (July 2018).

91 Defra, [Impact assessment for the updated river basin management plans \(2015\): evidence base](#), (October 2015) p 2.

92 Professor Johnes NO30024. The Centre for Ecology and Hydrology (NO30033) thought that the overall cost of lost nitrogen fertiliser across the EU was in the region of €14bn a year.

93 Mark Morton (Yorkshire Water Services Ltd) Q92.

told us that they had invested £100m in equipment to deal with groundwater sources that had high nitrate levels.⁹⁴ Wessex Water spent £12m to build a nitrate removal plant at Poole sewage treatment works in 2008, which costs nearly £1m a year to run, and £4m on a plant at Blandford.⁹⁵ Treating water for nitrate pollution is also energy intensive.⁹⁶ The water companies acknowledged that investment in such facilities bore a cost for their customers.⁹⁷ Wessex Water stated that “this cost goes back to water company’s bills”.⁹⁸

44. Though progress has been made in reducing nitrates in surface waters, levels are high in some areas, especially in parts of England, and we still lag behind a number of our European neighbours. We are particularly disturbed to hear of the high levels of nitrate pollution in some of our groundwater sources, which supply nearly a third of our drinking water, which might not peak for another 60 years. Water companies are having to invest substantial sums of money in nitrate removal and water blending plants, the costs of which are being passed on to customers through water bills.

Progress on reducing Phosphorous in Surface Waters

45. The Urban Wastewater Treatment Directive in 1991 set a maximum limit of 2mg of phosphorous per litre of water for larger water treatment works or those discharging into sensitive waters, while the Water Framework Directive in 2000, with its focus on continuous improvement and achieving ‘good’ status for all watercourses, has led to 0.5–1.0 mg/l limits being typically imposed by the Environment Agency.⁹⁹ This has led to a significant drop in phosphorous levels in UK rivers:¹⁰⁰

46. The reductions have been achieved through reduced use of detergents containing phosphates,¹⁰¹ the introduction of phosphorus reduction treatment at sewage treatment works and falling fertiliser use and livestock numbers.¹⁰² However, we heard that phosphorous was still the main challenge in terms of pollution in surface waters and rivers,¹⁰³ and the main problem in Northern Ireland, in terms of eutrophication.¹⁰⁴ Analysis suggests that further major reductions to achieve the WFD phosphorous standards for good ecological status will be challenging.¹⁰⁵ This is because of the cost of chemical treatments to remove more phosphorous and unwanted by-products.¹⁰⁶ However, a programme of trials of phosphorus-removing technologies is taking place, supervised

94 Dr Lucinda Gilfoyle Q96.

95 Wessex Water NO30007.

96 Yorkshire Water Services Ltd NO30021.

97 Mark Morton (Yorkshire Water Services) Q109 and Q119; Dr Lucinda Gilfoyle Q111 to Q113 and Q126. Both noted that investment in collaborative catchment management would be cheaper than expensive extraction or blending plants, which would mean cheaper bills for customers.

98 Wessex Water NO30007.

99 Waste Water and Treatment, [Phosphorus removal: How low can you go?](#), (December 2016).

100 Environment Agency, [The State of the Environment: Water Quality](#), (February 2018), p 5

101 This was achieved by several EU regulations and transposed by UK secondary legislation. See: Health and Safety Executive, [Detergents](#), (accessed 21 July 2018).

102 Environment Agency, [Pressure narrative: Phosphorus and freshwater eutrophication](#), (2015).

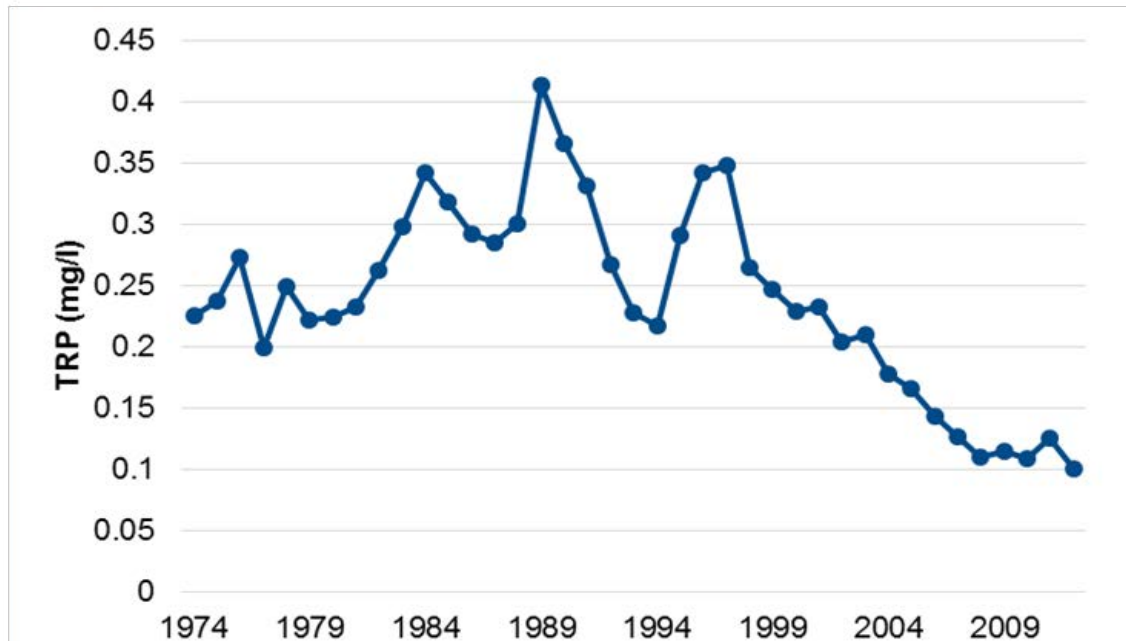
103 George Eustice MP Q282. See also: Environment Agency, [The State of the Environment: Water Quality](#), (February 2018), p 5.

104 Aileen Lawson (Ulster Farmers Union) Q135; Northern Ireland Freshwater Taskforce NO30039.

105 See: Simon Leaf, [Taking the P out of pollution: an English perspective on phosphorus stewardship and the Water Framework Directive](#), *Water and Environment Journal*, (July 2017); Environment Agency, [Pressure narrative: Phosphorus and freshwater eutrophication](#), (2015); Waste Water and Treatment, [Phosphorus removal: How low can you go?](#), (December 2016).

106 One of the main chemicals that can be used to achieve higher reductions is ferric sulphate which is expensive but also can lead to unwanted elevated iron levels in water. See: Waste Water and Treatment, [Phosphorus removal: How low can you go?](#), (December 2016).

Annual average concentration of total reactive phosphorus in rivers, 1974 to 2012



by the Environment Agency and involving UK Water Industry Research (UKWIR). These trials are focusing on the use of filtration through reed beds, filtration using ferric salts and enhanced biological phosphorus removal using bacteria.¹⁰⁷ Anglian Water is constructing a £500,000 wetland in Norfolk to remove further phosphates after filtering from its treatment works, which it is hoped will be an approach can be used elsewhere.¹⁰⁸

47. **Though significant progress has been made in reducing levels of phosphorous in rivers over the last 20 years, which we welcome, it remains the main cause of eutrophication and an obstacle to our surface waters achieving good ecological status. The Government should continue to invest in new technologies and natural infrastructure approaches that can reduce phosphorous levels further. This should include encouraging water companies and landowners to trial such measures and rolling them out if they are cost-effective.**

River Basin Management Plans and Collaborative Catchments

48. The Water Framework Directive requires Member States to produce River Basin Management Plans (RBMPs) for each river basin district lying within its territory. RBMPs set statutory objectives for water bodies and summarise the measures needed to achieve them. In England and Wales water bodies are grouped into 100 management catchments, which are in turn grouped into river basin districts.¹⁰⁹ This collaborative approach delivers multiple benefits for partner organisations and the local community, reducing flood risk whilst also cleaning up pollution, protecting drinking water resources, improving

107 As above.

108 Rachel Salvidge, 'Anglian Water £500,00 wetland treatment facility', ENDS Report, (July 2017).

109 The River Basin Districts for England include: Anglian; Humber; Northumbria; North West; Severn (cross-border with Wales); South East; South West; and Thames. In Wales they include the Dee and Western Wales river basin districts. Scotland includes the Scotland river basin district and the Solway Tweed river basin district which is jointly managed by the Environment Agency and SEPA. Northern Ireland includes: North Eastern (wholly in NI), North Western and Neagh Bann (cross-border with the Republic of Ireland) and Shannon (cross-border with the Republic of Ireland (RoI) but almost entirely within RoI and therefore managed by authorities in RoI).

biodiversity and improving health and recreation for local communities. It also allows partners to share the cost burden whilst meeting their own objectives.¹¹⁰ It is also a way of dealing with diffuse pollution which could not be traced to one source and for promoting a better understanding of the environment because it requires an integrated approach from all stakeholders to address the relevant pressures on a catchment.¹¹¹

49. Objectives for river basins were first set out in RBMPs for the period 2009–2015.¹¹² States must review and update them every six years as part of the river basin planning process. Defra updated RBMPs for England in 2016 for the period up until 2021 and included new ecological standards for rivers, lakes, estuaries and coastal waters, which had been benchmarked with corresponding standards used by other European countries. Each RBMP also includes a summary of the measures needed for water dependent Natura 2000 sites and site improvement plans to capture any new measures required.¹¹³ This included improved biological standards for different water bodies and levels of pollutants in rivers (e.g. phosphorous) and groundwater sources, such as nitrates.¹¹⁴ However, the overall standard set in the WFD - all rivers to achieve good status by 2015 and 2027 by the latest, still drives overall water quality policy. In England, the updated RBMPs cover eight river basins, covering over 9,320 miles of our rivers and set out how a minimum of 680 (14%) of waters will improve over the next six years with around £3 billion investment.¹¹⁵ Funding for delivering catchment measures was made available under the Catchment Restoration Fund, which ran from 2011 to March 2015, which provided £24.5m of support for 42 projects that improved over 300 bodies of water.¹¹⁶

The Role of Water Companies in Water Catchment Management

50. Water companies play an important role in water catchment management and investment in improving water quality. For instance, in June 2018, Thames Water, Yorkshire Water and Anglian water signed a water catchment declaration which aims to reach and exceed current quality objectives for rivers, lakes and coastal and ground waters in terms of biodiversity and drinking water by working with farmers to make more efficient use of fertiliser and improving soil quality.¹¹⁷ The role of water companies in this area is also reflected in the regulatory framework. Ofwat's five year cycle of price review (PR) and setting Asset Management Plans (AMPs) for water companies include a duty to meet environmental objectives alongside protecting customers and ensuring

110 See: Catchment Based Approach (CABA), [Catchment Planning](#), (accessed July 2018).

111 House of Commons Library, [Water Framework Directive: achieving Good Status of Water Bodies](#), (November 2015), pp 21–22.

112 These initial plans can be found on the Defra [website](#).

113 House of Commons Library, [Water Quality](#), (July 2018), p 20. The site improvement plans for each RBMP can be found at: Natural England, [Site Improvement Plans by region](#), (accessed 31 July 2018).

114 Defra and Welsh Government, [Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment](#), (2014).

115 The plans cover the Anglian, Humber, Northumbria, North West, Severn, South East, South West and Thames river basin districts. The plans can be found on the Defra [website](#). Natural Resources Wales (NRW) manage the Western Wales RBD. NRW and the Environment Agency jointly manage the Dee and Severn RBDs. See the RBMPs for Western Wales and Dee on the NRW [website](#). The Scottish Environment Protection Agency (SEPA) and the Environment Agency jointly manage the Solway Tweed RBD. See the Solway Tweed RBMP on the SEPA [website](#).

116 House of Commons Library, [Water Quality](#), (2018), p 26. The projects were aimed at not-for-profit community groups and charities to restore natural features in and around watercourses; reduce the impact of man-made structures on wildlife in watercourses; and reduce the impact of diffuse pollution from rural and urban land use.

117 Cambridge University Institute for Sustainability Leadership, [Catchment management: the declaration](#), (June 2018).

more efficient use of water resources.¹¹⁸ The package for 2015–2020 (PR14 or AMP6¹¹⁹) involves developing more than 100 catchment management schemes, including working with farmers and landowners to improve drainage and control pollution, and action to improve water quality at over 50 beaches.¹²⁰ Water UK, the body which represents UK water companies, estimate that by 2020 water companies will have invested £25bn in environmental work since 1995.¹²¹ Ofwat is currently working on the price review for 2019 (PR19) and the associated AMP7, which will set wholesale price controls for water and sewerage companies for 2020 to 2025 alongside key environmental objectives.¹²² A key part of the agreements reached for the AMPs are the Water Industry National Environment Programme (WINEP) and the Water Industry Strategic Environmental Requirements (WISER). WINEP sets out: the actions that companies will need to complete to meet their environmental obligations; the drivers for investment for measures for protected areas; improvements to meet River Basin Management objectives and other local environmental priorities.¹²³ WISER is a joint Environment Agency and Natural England strategic steer to water companies on environment issues, resilience and flood risk.¹²⁴ It also includes statutory obligations and non-statutory requirements.

51. In June 2018, the Environment Agency published the latest WINEP which will see up to £5 billion of investment by water companies in the natural environment from 2020 to 2025, which will address some of the “biggest challenges facing the water environment, from the spread of invasive species and low flows to the effects of chemical and nutrient pollution”. The Government stated it would help it deliver its 25 Year Environment Plan and in exceptional circumstances would consider extending the 2020–2025 timeframe if measures facilitate long term sustainable outcomes and maximise environmental benefits.¹²⁵ This came after the Environment Secretary stated in March 2018 that while some water companies deserved particular praise for their environmental leadership, others had paid almost all of their profits to shareholders, “at the expense of consumers and the environment”.¹²⁶

52. Water companies told us that they were focusing on catchment management as contained within the RBMPs and engaging with the agricultural community, the Environment Agency, Natural England and independent agricultural advisers. This was because working in collaboration they could support initiatives which could tackle nitrate pollution at source rather than dealing with it downstream by way of expensive nitrate

118 Ofwat, [Setting price controls for 2015–20: Overview](#), (December 2014), p 6.

119 AMP6 is the sixth Asset Management Plan since the water industry was privatised.

120 As above, p 7.

121 Water UK, [Improving the environment, increasing trust](#), April 2018.

122 Ofwat, [Price reviews](#), (accessed 23 July 2018).

123 Environment Agency, [Water Industry National Environment Programme \(WINEP\)](#), (September 2017).

124 Expectations to improve the environment include: water body status; bathing waters; shellfish waters; biodiversity and ecosystems; sustainable fisheries; invasive non-native species (INNS); urban waste water; drinking water protected areas (DrWPA); chemicals. It also includes expectations on climate change and water resilience. See Environment Agency and Natural England, [Water industry strategic environmental requirements \(WISER\)](#), (2017).

125 Defra and Environment Agency, [£5 billion investment by water companies to benefit the natural environment](#), (15 June 2018). The investment will include protecting and improving at least 6000km of waters, 24 Bathing Waters, 10 Shellfish sites, 800 hectares of protected nature conservation sites and enhancing nearly 900km of river and 4276 hectares through wider biodiversity improvements.

126 Defra, [A water industry that works for everyone](#), (March 2018).

removal and water blending plants.¹²⁷ Anglian Water told us that this approach delivers cleaner water but also other wider benefits such as biodiversity, amenity and habitat.¹²⁸ Wessex Water, Yorkshire Water Services, and Anglian Water told us they have been helping farmers fund measures such as using cover crops during the winter to retain nitrogen and protect soils and had their own teams of advisers to help farmers ensure that where possible they could make decisions that reduced or mitigated nitrate and other forms of pollution.¹²⁹ The water companies told us that they saw funding for such measures and initiatives as means of “sharing the risk with farmers to explore different ways of managing land”.¹³⁰ We were told that such funding was not a case of paying the polluter for doing things they should be doing anyway but more of “looking to ... push them beyond best practice”.¹³¹ The water companies suggested that they would prefer a longer-term approach than the 5-year periods agreed between the Government and OFWAT because that would allow longer term investment in catchment strategies which could often take 20 years or so to deliver.¹³²

53. The collaborative catchment approach was supported by other witnesses.¹³³ Yorkshire Water said that catchment management at a local level was required to introduce measures that went beyond the measures stipulated in NVZs and make more progress on water quality.¹³⁴ The Wildlife and Countryside link said that a partnership approach within a local river catchment was the best way of identifying and managing the various sources of nitrate pollution, and that the best partnerships were those driven by data, evidence and partnership and where there was a “common understanding of the issues within their catchment”.¹³⁵ The Green Alliance thought that the catchment approach provided more carrots to encourage farmers and others to go further, which was needed if good ecological standards were to be achieved.¹³⁶ However, a number of witnesses commented that there was a need for better information, evidence and best practice sharing between partners in the catchments and improved engagement, especially with farmers, by the Environment Agency.¹³⁷ The Royal Society for the Protection of Birds was sceptical of catchment management schemes because of their voluntary nature, which it thought undermined the polluter pays principle. It was particularly concerned that such schemes

127 Paul Stanfield (Wessex Water) Q99 and Q112 and Mark Morton (Yorkshire Water Services Ltd) Q101. This approach is also being used to trap phosphorous and ammonia. For instance, Anglian water is investing £500,000 in a wetland in Norfolk remove these pollutants to work alongside its treatment plant and Severn Trent, Wessex Water and Scottish Water either had or were considering similar investments. See: Rachel Salvidge, Anglian Water plans £500,000 wetland facility, ENDS Report, (July 2017).

128 Lucinda Gilfoyle (Anglian Water) Q113

129 Paul Stanfield (Wessex Water) Q99; Mark Morton (Yorkshire Water Services Ltd) Q101; Dr Lucinda Gilfoyle (Anglian Water) Q104.

130 Dr Lucinda Gilfoyle (Anglian Water) Q104.

131 Paul Stanfield (Wessex Water) Q99

132 Dr Lucinda Gilfoyle (Anglian Water) Q114; Paul Stanfield (Wessex Water) Q115-Q116; Mark Morton (Yorkshire Water Services Ltd) Q121; Anglian Water NO30022.

133 Aileen Lawson (Ulster Farmers’ Union) Q179; Northern Ireland Freshwater Taskforce NO30039.

134 Yorkshire Water Services Ltd NO30021.

135 David Johnson (Wildlife and Countryside link) Q51 and Q53.

136 Will Andrews Tipper (Green Alliance) Q61–62.

137 Mark Morton (Yorkshire Water Services Ltd) Q119; David Johnson (Wildlife and Countryside link) Q63; Will Andrews Tipper (Green Alliance) Q63; Fraser McAuley (Country Land and Business Association) Q142-Q143.

were not protecting water-dependent environmentally sensitive sites.¹³⁸ Along with the Centre for Ecology and Hydrology, it thought that while schemes set a benchmark they had only delivered small improvements and not enough for specially protected areas.¹³⁹

54. Collaboration between stakeholders involved in river basin catchment management makes sense as it seeks to stop nitrate and other pollution at source and acknowledges that responsibility for better water quality lies with multiple actors. A key part of this is investment from water companies and they have made a persuasive case for a longer-term approach to funding. We would, however, note the Secretary of State's concern that water companies should invest more of their profits addressing environmental challenges, before passing their costs on to consumers.

55. We believe that the Government should consider whether a longer-term approach to river catchment planning and funding would deliver better environmental outcomes. Investment should be used to support farmers and other stakeholders who go beyond regulations and best practice, but it should not break the polluter pays principle. Such investment must ensure that environmentally sensitive sites are protected. We also recommend that the Environment Agency examines whether the sharing of evidence, data and best practice between stakeholders can be improved along with better engagement of farmers by the Agency.

Making More Progress on the Good Ecological Status of Water Bodies

56. Several academic witnesses said that if the ecological status of water bodies was to be improved then stricter nitrate standards would be required.¹⁴⁰ Currently 86% of rivers do not meet a good ecological standard. While the standard for nitrate in drinking water is set at 50 mg/l, we were told that to achieve good ecological status other EU countries had set the level between 1.5 mg/l and 4 mg/l (e.g. the Netherlands). The Soil Association told us that if a higher standard of 2 mg/l was adopted, only 6% of water bodies would comply.¹⁴¹ Professor Johnes also told us that the UK was the only EU Member State to not have a nitrate threshold for freshwaters because it focuses only on phosphorous control.¹⁴²

57. Witnesses also said that policies and regulations on pollutants and their sources needed to be joined up. This was because rivers and the organisms that live in them are exposed to multiple stressors, including nitrate but also phosphorous, other nutrients and air pollutants (e.g. ammonia and nitrogen oxides) which can be transported either in a wet (e.g. acid rain) or dry form and deposited in water bodies, raising acidity levels and affecting the delicate balance of ecosystems.¹⁴³ Professor Jarvie, from the Centre of Ecology and Hydrology, told us that nitrogen and phosphorous pollution needed to be tackled together as they were intertwined; and to concentrate on just one or to deal

138 RSPB NO30037. It stated that such sites included Natura 2000 sites, Special Areas for Conservation (SACs) and Special Protected Areas (SPAs). It said that 57 such sites were failing due to agricultural pollution and that it had not seen evidence that the Government had plans in place to address them.

139 Centre for Ecology and Hydrology NO30033. The Centre stated in its evidence that NVZs for instance had only delivered about a 5% reduction in nitrate concentrations.

140 Professor Jarvie Q12; Professor Johnes Q13; Will Andrews Tipper (Green Alliance) Q56; Centre for Ecology and Hydrology NO30033.

141 Helen Browning Q136.

142 Professor Johnes NO30024.

143 Professor Johnes Q19 and Q34. See also Centre for Ecology and Hydrology NO30033. For an overview of the atmospheric deposition of pollutants on water bodies see: US Environmental Protection Agency, [Air Pollution and Water Quality](#), (accessed 7 August 2018).

with them separately could have unintended consequences.¹⁴⁴ The Soil Association also recommended a holistic approach. It thought that the Government should take account of the climate change impact of the nitrogen cycle and pointed to the global warming potential of nitrous oxides, which is 298 times more powerful than CO₂ and remains in the atmosphere for 114 years. It also pointed to the climate change impact caused by the manufacture of nitrogen for artificial fertiliser.¹⁴⁵ This was important because climate change could exacerbate the impact of pollutants (e.g. extreme temperatures or rainfall). The Wildlife and Countryside link told us that the “levels of nitrate pollution that would be required to give us pristine ecology” would “not allow us to have a modern farming industry”, so there was a need to target ecosystems and priority sites and be “realistic”.¹⁴⁶ The challenge of ensuring a higher ecological standard of water was highlighted in September 2015, when the High Court granted WWF-UK, the Angling Trust and Fish Legal permission to bring a judicial review of the Environment Agency and Defra’s implementation of the Water Framework Directive. It focused on four protected Natura 2000 sites where it was claimed that agricultural pollution has been particularly harmful: Poole Harbour in Dorset, the river Eden in Cumbria, Marazion Marsh in Cornwall and the river Lugg in Herefordshire. Defra agreed that it would consider introducing mandatory water protection zones alongside voluntary measures aimed at reducing pollution.¹⁴⁷

58. The Government has acknowledged the issue of water and air pollution. The Environment Agency agreed that trying to tackle standards for air, water and soil through separate instruments would “not get us to where we want to go” and supported “having a coherent set [of instruments] that takes soil, air and water into account”.¹⁴⁸ The Minister also thought that there was an opportunity to look “holistically at how we manage all the pollutants in the water, and maybe consolidate some of these different instruments into one that is more effective and more consistent”.¹⁴⁹ The Minister did not accept that there was a trade-off between a modern farming industry and good water quality.

59. To make progress on improving the ecological status of water, the Government will have to use higher standards than those used for drinking water. This should include setting stricter standards for nitrates in freshwaters, as is the case in other EU Member States. It will also need to take a holistic approach to different pollutants, their collective impact and their sources. The Government have produced two plans—the Clear Air Strategy and the New Farming Rules for Water, which seek to tackle the sources and causes of pollution whether it is water, air-or soil based. The Environment Agency and Minister accepted that a more holistic approach makes sense.

60. *The Government should seek to ensure that various EU Directives and regulations are aligned and do not result in a siloed approach to individual pollutants but address them in their totality. The Government should also report on progress introducing mandatory water protection zones for vulnerable Natura 2000 sites, which it agreed to do in September 2015, and whether it is considering this approach more widely.*

144 Professor Jarvie Q19. See also: Centre for Ecology and Hydrology NO30033; RSPB NO30033.

145 Helen Browning suggested that if organic fertiliser was used from now until 2030, it could take between 23 and 65% of agricultural GHGs out of the system (Q139–140).

146 David Johnson (Wildlife and Countryside link) Q80–81.

147 House of Commons Library, [Water Quality](#), (July 2018), pp 27–28.

148 Helen Wakeham Q283.

149 George Eustice MP Q305.

3 Air Quality

Nitrogen as an Air Pollutant: Ammonia and Nitrogen Oxides

61. Nitrogen plays a role in air pollution primarily through two of its forms - ammonia and nitrogen oxides. Ammonia emissions from agriculture contribute to acidification of water sources with a devastating effect on biodiversity,¹⁵⁰ and have a deleterious impact on fauna and fungi.¹⁵¹ Ammonia can also combine with other forms of air pollution such as nitrogen oxides released by transport, industrial and household activities and sulphur dioxide from industry, and contribute to the formation of airborne fine particulate matter (also called PM_{2.5}), with strong negative impacts on human health.¹⁵² This Committee has looked at the health impact of nitrogen oxides as part of its work on air quality.¹⁵³ Nitrogen oxides,¹⁵⁴ particulate matter (PM), and ozone (O₃) cause a range of health problems, including: adverse impacts on lung function and lung growth, respiratory problems, asthma prevalence and incidence, cancer, heart disease, adverse birth outcomes and mortality.¹⁵⁵ Nitrogen dioxide, one of the nitrogen oxides, and particulate matter causes an estimated 40,000 early deaths every year,¹⁵⁶ and has been estimated to cost the UK up to £19 billion annually.¹⁵⁷ Another nitrogen oxide, nitrous oxide, is a potent greenhouse gas; it has a global warming potential 298 times greater than carbon dioxide,¹⁵⁸ and cause acidification and eutrophication of water ecosystems.¹⁵⁹

Sources of Ammonia, Nitrous Oxide and Nitrogen Oxides

62. The agricultural sector is responsible for about 88 percent of the UK's ammonia emissions,¹⁶⁰ and emissions from dairy farms have doubled over the past 10 years.¹⁶¹ We heard evidence that ammonia emissions may have increased due to the use of anaerobic digestate and spreading of urea fertilisers as opposed to ammonium nitrate-based fertilisers.¹⁶² In terms of nitrous oxide (N₂O), the agriculture sector dominates:

150 Q19 Professor Johnes; Wildlife and Countryside Link NO30032.

151 See Annex 2 for an overview of the pollutant impact of ammonia and nitrous oxides.

152 European Commission, [EU AGRICULTURAL OUTLOOK FOR THE AGRICULTURAL MARKETS AND INCOME 2017–2030](#), (2017), p 70.

153 See: Environment, Food and Rural Affairs, Environmental Audit, Health and Social Care, and Transport Committees, [Improving air quality](#), (HC 433; March 2018).

154 Nitrogen oxide compounds are formed when nitrogen and oxygen combine. NO_x, which includes nitric oxide (NO) and nitrogen dioxide (NO₂), is emitted from combustion processes. NO is subsequently oxidised to form NO₂, although some NO₂ is emitted directly. See: HM Government publication, Defra, [Air Pollution in the UK 2016, September 2017](#), Glossary.

155 As above p 6–9.

156 See Royal College of Physicians and Royal College of Paediatrics and Child Health, [Every breath we take: The lifelong impact of air pollution](#), (2016). A Report by the Government's Committee on the Medical Effects of Air Pollutants in August 2018 put the figure at 36,000. See: A report by the Committee on the Medical Effects of Air Pollutants, [Associations of long-term average concentrations of nitrogen dioxide with mortality](#), (August 2018).

157 See: Defra, [Air Quality: Public Health Impacts and Local Actions](#), (accessed July 2018). The World Health Organisation (WHO) has put the cost as high as \$83bn (£54bn) a year - see: WHO, '[Economic cost of deaths from air pollution \(outdoor and indoor\) per country, as a percentage of GDP](#)', (April 2015). Public Health England published research in May 2018 that estimated between 2017 and 2015, health and social care alone costs arising from air pollution could be as much £5.56bn - see: Public Health England, [Estimation of costs to the NHS and social care due to the health impacts of air pollution](#), (May 2018).

158 National Atmospheric Emissions Inventory, [About Nitrous Oxide](#), (accessed 21 July 2018).

159 National Atmospheric Emissions Inventory, [National Atmospheric Emissions Inventory](#), (accessed 21 July 2018).

160 George Eustice MP Q226.

161 Helen Wakeham (Environment Agency) Q230.

162 Jane Salter (Agricultural Industry Confederation) Q182–184

emissions from agricultural soils in 2016 account for 53% of total UK emissions, and other agricultural sources (i.e. management of waste and manure and field burning) add another 13%.¹⁶³ Other important sources in recent years include road transport, other fuel combustion sources and waste processes.¹⁶⁴

63. In 2016, almost all nitrogen oxides emissions (99%) came from the burning of fuels: 34% for road transport, 23% for other forms of transport (including off-road vehicles and mobile machinery), 22% from power stations and other energy producers, and 12% from other industrial sites.¹⁶⁵

Air Quality Regulation

64. Air quality is regulated by several EU Directives. The EU's 2016 National Emission Ceilings Directive sets national 'ceilings' for air pollutants, including nitrogen oxides and ammonia. The EU's 2008 Ambient Air Quality Directive sets limits for concentrations of pollutants in the air, including nitrogen dioxide, particulate matter, fine particulate matter, sulphur dioxide, lead, carbon monoxide and benzene.¹⁶⁶ As air quality is a devolved matter, separate legislation exists for Scotland, Wales and Northern Ireland.¹⁶⁷ Local authorities are required to regularly review and assess air quality in their areas and if national limits risk being breached the local authority concerned must declare an air quality management area (AQMA) and prepare an air action plan.¹⁶⁸ The UK is divided into 43 air quality zones for the purposes of monitoring and reviewing air quality.

65. Other relevant directives include the Industrial Emission Directive (IED) and the [Medium Combustion Plant Directive](#) which target emissions, including nitrogen oxides. See Annex 3 of this Report for further detail on these two Directives and transposing legislation.

66. The Committee on Climate Change monitors and reports on emissions of nitrous oxide as part of its work scrutinising the Government's progress towards meeting its carbon budgets and international commitments, such as the Paris Agreement.¹⁶⁹ There Government provides guidance regarding the control of emissions and a system of permits which businesses must obtain if their activities are likely to produce emissions.¹⁷⁰

163 National Atmospheric Emissions Inventory, [About Nitrous Oxide](#), (accessed 21 July 2018).

164 As above.

165 National Atmospheric Emissions Inventory, [Nitrogen Oxides](#), (accessed 21 July 2018).

166 See Annex 4 of this Report for further details on the National Emission Ceilings Directive and Ambient Air Quality Directive and relevant transposing legislation.

167 These measures are implemented across the UK by delegated legislation: Air Quality Standards (Wales) Regulations 2010 (as amended); Air Quality Standards (Scotland) Regulations 2010 (as amended); and Air Quality Standards Regulations (Northern Ireland) 2010 (as amended). See Defra, [UK and EU Air Quality Policy Context](#), (accessed 10 June 2018).

168 See: House of Commons Library, [Brexit and Air Quality](#), (June 2018), p 15. The overall system is referred to as the local air quality management (LAQM) system. Guidance is issued by the UK Government and the devolved administrations to local government. Separate guidance is produced for London under the devolved powers of the London Mayor.

169 Committee on Climate Change, [Reducing UK Emissions: 2018 Progress Report to Parliament](#), (June 2018), p 184-188.

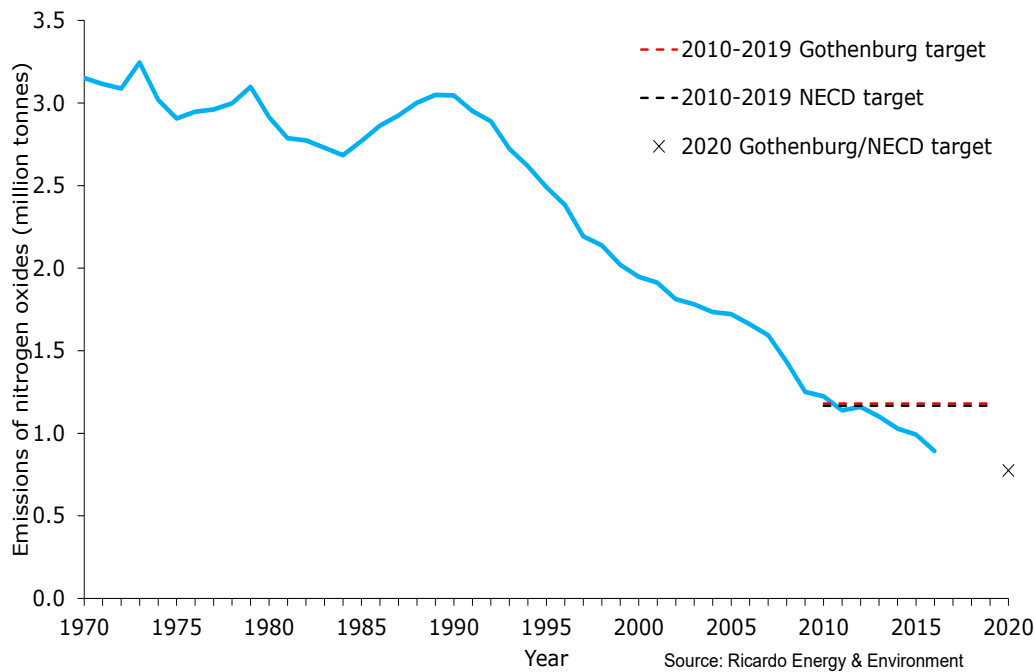
170 See for instance: Defra and the Environment Agency, [Control and monitor emissions for your environmental permit](#), (Updated August 2018).

Performance on Reducing Nitrogen Oxides and Ammonia Emissions

Nitrogen Oxides

67. Emissions of nitrogen oxides in 2016 had fallen by 72 per cent since 1970 to 0.89 million tonnes. Between 2015 and 2016, nitrogen oxides emissions decreased by 10% (see graph below):¹⁷¹

Figure 3: UK Nitrogen oxides emissions and targets: 1970 - 2016



The 2020 ceiling is applicable to total emissions excluding agricultural emissions (NFR sectors 3B & 3D). These sectors form a very small proportion of emissions of nitrogen oxides (0.007 million tonnes in 2016) and are not deducted from the time series in Figure 3.

68. These overall reductions in nitrogen oxide emissions have included reductions in nitrous oxide emissions. Emissions from this greenhouse gas reduced from just under 170 kilotonnes in 1990 to just over 72 kilotonnes in 2016.¹⁷² This has been achieved by closures of industrial units, industrial abatement installations and a decrease in the use of synthetic fertilisers.¹⁷³ However, the Committee on Climate Change (CCC) has warned that reductions since 2008 have flatlined. This includes agriculture, where emissions have remained almost constant since 2008, though in 2016 emissions were 2% higher than those in 2008.¹⁷⁴ The CCC stated that if the Government is to make further progress in hitting its Carbon Budgets, it will need to bring about further reductions in nitrous oxide emissions, including those from agriculture. It said that the latter can be achieved by better linking farming support to emissions reduction by addressing areas such as nutrient and waste and manure management.¹⁷⁵

171 Defra, [Emissions of Air Pollutants in the UK, 1970 to 2016](#), (February 2018).

172 National Atmospheric Emissions Inventory, [Nitrous Oxide](#), (accessed 21 July 2018).

173 As above.

174 Committee on Climate Change, [Reducing UK emissions 2018 Progress Report to Parliament](#), (June 2018), p 188.

175 As above, p 192.

69. Despite the overall reduction in nitrogen oxides, the UK is still breaching the EU-limit on nitrogen dioxide (NO₂) concentrations. The National Audit Office's report 'Air Quality', published in November 2017, found that over 86% of air quality zones in the UK (37 of 43 zones) did not meet nitrogen dioxide limits in 2016.¹⁷⁶ In May 2013 the UK Supreme Court had ruled that EU Air Quality Directive limits on nitrogen dioxide had been regularly exceeded in 16 zones across the UK and that air quality improvement plans had estimated that in London compliance with the Directive's standards would only be achieved by 2025 and by 2020 for the other 15 zones (the original deadline in the Directive was for compliance by 2010).¹⁷⁷ The European Environment Agency has also produced analysis which indicates that the UK has the second highest premature death rate from nitrogen dioxide in the EU, second only to Italy.¹⁷⁸

70. The UK Government has been referred to the European Court of Justice for failing to meet EU air quality standards, including action on nitrogen dioxide emissions.¹⁷⁹ It has also been challenged in UK courts through Judicial Review by private organisations, including ClientEarth, several times between 2015 and 2018. This included review of the Government's postponement of reaching compliance with air quality limits and subsequent air quality plans for tackling nitrogen dioxide pollution.¹⁸⁰ The last ruling, in February 2018, was that the latest government plan was "unlawful" and that more action was needed in 45 English local authority areas and in Wales.¹⁸¹ The Judge said that ministers had to ensure that in each of the areas, steps were taken to comply with the law as soon as possible.¹⁸² The EAC, along with the Health, Transport and Environment, Food and Rural Affairs Committees set out a number of recommendations for dealing with the nitrous dioxide problem, primarily in terms of road transport.¹⁸³

176 NAO, [Air Quality](#), (HC Paper 529; November 2017). For a list of the zones that did meet the limits - see House of Commons Library, [Brexit and Air Quality](#), (June 2018), pp 17–18.

177 See: House of Commons Library, [Brexit and Air Quality](#), (June 2018), pp 18–19.

178 European Environment Agency, [Air quality in Europe—2017 report](#), Table 10.1, p 57.

179 In May 2018, it was reported that the UK had been referred to the European Court of Justice along with France, Germany, Hungary, Italy and Romania because of illegal air pollution levels. See: Damian Carrington, [UK taken to Europe's highest court over air pollution](#), Guardian, (17 May 2018) and BBC News, [UK referred to Europe's top court over air pollution](#), (17 May 2018); House of Commons Library, [Brexit and Air Quality](#), (June 2018), pp 19–20.

180 See: House of Commons Library, [Brexit and Air Quality](#), (June 2018), pp 21–26, for a review of the Judicial Reviews. The air quality plans included: Defra, [Air quality in the UK: plan to reduce nitrogen dioxide emissions](#), (2015; withdrawn July 2017) and Defra, [Air quality plan for nitrogen dioxide \(NO₂\) in UK](#) (2017; updated March 2018).

181 See BBC News, [Government loses clean air court case](#), (21 February 2018); Sylvia Pfeifer, High Court rules UK air pollution plan is 'unlawful', Financial Times, (21 February 2018).

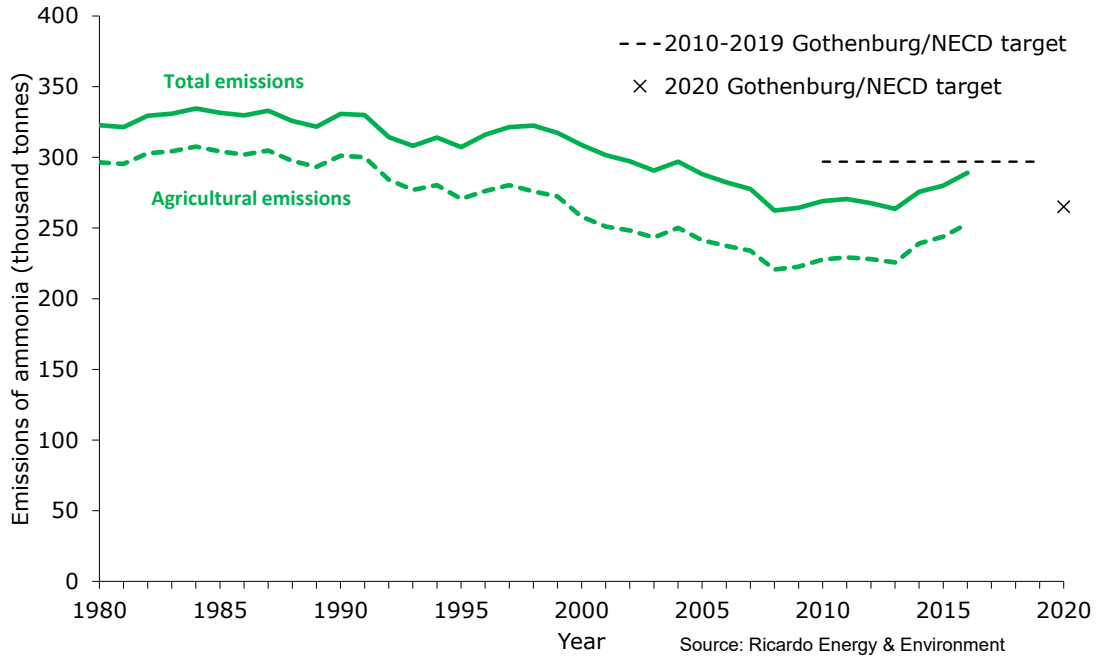
182 See above.

183 Commons Select Committees, [Committees call for a new Clean Air Act](#), (15 March 2018). This included: requiring the automobile industry to contribute to a new clean air fund, following the 'polluter pays' principle; speeding up the phasing out of petrol and diesel cars; introducing a Clean Air Act to enshrine the right to clean air in UK law and a national health campaign to highlight the dangers of air pollution; widening help and support for local authorities breaching NO₂ limit levels; aligning climate change schemes, urban planning, public transport and fiscal incentives with air quality goals; ensuring that costs of air pollution are part of plans for taxation and spending policies; ensuring that electric vehicle charging infrastructure prioritises air quality hotspots

Ammonia

71. Since 1980, ammonia emissions have fallen by 10%, although they have increased in recent years.¹⁸⁴

Figure 5: UK Ammonia emissions and targets: 1980-2016



72. The Government accepts this is an issue to be addressed, especially because of the impact such emissions are having on wildlife and habitats.¹⁸⁵ While ammonia emissions have grown, emissions of particulate matter have fallen: PM2.5 emissions fell 3.7% in 2016 to the lowest level on record, while emissions of larger particles known as PM10 were down by 1.9% over the year.¹⁸⁶ In 2016 ammonia emissions from agriculture, which accounts for 88% of total emissions was made up of:¹⁸⁷

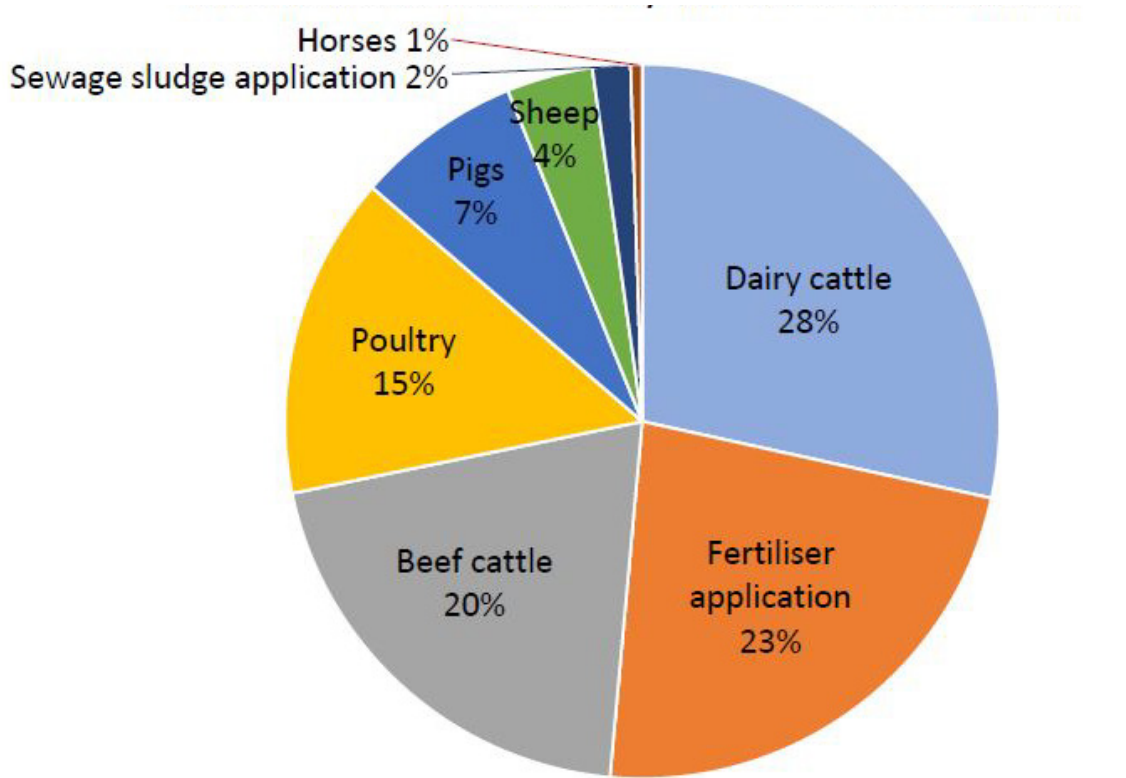
184 Defra, [Emissions of Air Pollutants in the UK, 1970 to 2016](#), (February 2018). See also: Defra, [State of the Environment: Air Quality](#), (February 2018).

185 Environment Agency, [Report on state of air quality in England highlights urgent action needed on ammonia emissions](#), (July 2018). Defra, [State of the Environment: Air Quality](#), (February 2018), notes that of England's nitrogen-sensitive habitats, 95% are adversely affected by nitrogen deposition (a 3% reduction since 1996) and that of England's acid-sensitive habitats, 59% are affected by acidification (a 17% reduction since 1996). See also: See also: Defra, [Biodiversity 2020: A strategy for England's wildlife and ecosystem services Indicators](#), (July 2018), pp 145–147.

186 Fiona Harvey, [Ammonia emissions rise in UK, as other air pollutant levels fall](#), Guardian, (February 2018). Environment Agency, [Report on state of air quality in England highlights urgent action needed on ammonia emissions](#), (July 2018), p 11.

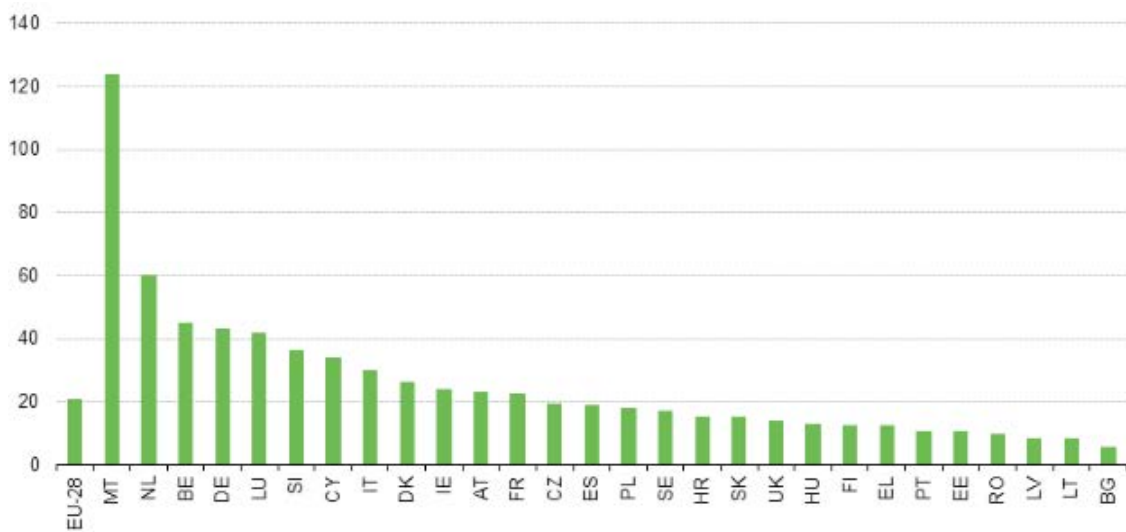
187 Defra, [Code of Good Agricultural Practice \(COGAP\) for Reducing Ammonia Emissions](#), (July 2018), p 3.

UK agriculture ammonia emissions (2016) by livestock and fertiliser category



73. In terms of comparing UK ammonia emissions with the rest of the EU, the graph below shows how the UK compares with other EU countries in terms of ammonia emissions from utilised agricultural land in 2015:

Aggregated emissions of agricultural NH₃ per utilised agricultural area (kilotonnes per million ha), 2015, EU-28



Source: European Environment Agency, [Agri-environmental indicator - ammonia emissions](#), (2017).

74. We have commented elsewhere on the Government's failure to meet air quality standards on nitrogen oxides, especially in relation to transport. We welcome progress on reducing particulate matter but we are disappointed that after many years of reductions in ammonia emissions they are beginning to rise. The Government has accepted that this is an issue that needs addressing. We would note that agriculture contributes 88% of ammonia emissions and nearly half of which are from cattle and about a quarter are from fertiliser applications. These are key areas where the Government needs to focus if recent rises in ammonia emissions are to be reversed and reductions made.

The Environment, Food and Rural Affairs Committee Air Quality Report (2016)

75. When the Environment, Food and Rural Affairs (EFRA) Committee looked at the issue of air quality in 2016,¹⁸⁸ it concluded that the Government needed to do more to help farmers to adopt modern practices that cut emissions of greenhouse gases and local air pollutants including ammonia and that better use should have been made of Common Agricultural Policy funding to achieve air quality improvements.¹⁸⁹ It also noted a divergence of opinion on whether regulation or voluntary action was the best way to tackle emissions. The EFRA Committee received evidence that suggested that regulatory approaches in the Netherlands and Denmark had, despite farmers' complaints,¹⁹⁰ changed the sector's thinking and driven best practice. The EFRA Committee heard that there were a wide range of technical options to reduce emissions such as improved systems for fertiliser application and manure handling and storage. For example, emissions could be reduced by avoiding the use of urea in fertiliser, by optimising the level of nitrogen in feed and by injecting slurries or ploughing manures into soils rapidly.¹⁹¹

The Government's Clean Air Strategy

76. The Government's 25 Year Environment Plan, published in January 2018, set clean air as a key goal and committed the Government to publishing an air strategy.¹⁹² The Government published its draft Clean Air Strategy in May 2018.¹⁹³ It stated that it would invest in improved modelling and analysis of air quality and bring together national and local data.¹⁹⁴ It would seek progressively to cut public exposure to particulate matter and halve the population living in areas with concentrations of fine particulate matter above WHO guideline levels (10 µg/m³) by 2025.¹⁹⁵ There would be better air quality information for the public and organisations; and coordination across Government to ensure a joined-

188 Environment, Food and Rural Affairs Committee, [Air Quality](#), (HC 479; April 2016).

189 As above, p 3.

190 In Denmark legislation was introduced regarding livestock installations, manure storage and spreading in 2001. In 2007, a new Danish Act on Environmental Permits for Livestock Installations was introduced, including buffer zones round specific habitat types with new and amended ammonia thresholds. The latter thresholds for permits were updated in 2012. In Netherlands, legislation includes the Ammonia and Livestock Act (2002) and the Decree on Low Emission Stables (2013/2015) alongside other emission reduction measures, which from 1 April 2018 imposes a reduction on the amount of cattle in the Netherlands. See: Helle Tegner Anker et al., [Comparison of ammonia regulation in Germany, the Netherlands and Denmark – legal framework](#), Department of Food and Resource Economics (University of Copenhagen), (November 2017), p 11.

191 As above, p 22.

192 Defra, [A Green Future: Our 25 Year Plan to Improve the Environment](#), (January 2018), p 13 and p 24.

193 Defra, [Clean Air Strategy 2018](#), (May 2018).

194 As above, p 4.

195 As above.

up approach to tackling air pollution. There would be more investment and support for clean technologies across the transport, energy, industry and agriculture sectors.¹⁹⁶ This included ending the sale of new conventional petrol and diesel cars and vans by 2040 and support for vehicles with zero exhaust emissions, which would help reduce the impact of nitrous oxides.¹⁹⁷

77. The strategy also sets out specific proposals for farming. It proposes a national code of good agricultural practice to control ammonia emissions,¹⁹⁸ to require and to support farmers to make investments in farm infrastructure and equipment that will reduce emissions through better management and storage of slurry and improved use of anaerobic digestate.¹⁹⁹ It proposes to improve the UK's ammonia inventory to ensure emissions are captured accurately and is considering extending IPCC (UN Intergovernmental Panel on Climate Change) emission permits to dairy farmers (currently applied to pigs and poultry farms) and is also looking at the mandatory use of urea inhibitors,²⁰⁰ alongside urea fertilisers.²⁰¹ In September 2018, the Government announced a £3m scheme to help farmers reduce ammonia emissions as part of its Clean Air Strategy.²⁰²

Reaction and Comment on the Clean Air Strategy

78. Several witnesses commented on the Strategy. The Country Land and Business Association told us they support the use of urea inhibitors.²⁰³ Others thought that the proposals should go further and supported a tax on nitrogen to reduce emissions and nutrient leaching.²⁰⁴ Several witnesses were concerned as to whether some of the proposals would be economically feasible for farmers and land managers, especially in the timeframe suggested by the Government, such as investment in farm infrastructure or reductions in fertiliser use.²⁰⁵ For instance, we were told that the typical cost of a steel slurry store for 100 cows was about £60,000 and that such stores often faced planning issues.²⁰⁶ There was therefore support for schemes and financial incentives for farmers to achieve policy goals in the areas of healthy soils and water and air quality.²⁰⁷ Others thought that the Government needed to consider the nitrogen cycle as a whole and the interaction between nitrogen applied to the land, or produced from animal waste and released into the air and

196 As above, p 5 and p 7.

197 As above, p 6.

198 Defra, [Code of Good Agricultural Practice \(COGAP\) for Reducing Ammonia Emissions](#), (July 2018).

199 Defra, [Clean Air Strategy 2018](#), (May 2018), p 62–65.

200 Urease inhibitors are potentially useful tools for controlling or reducing gaseous losses of ammonia following fertilization with urea. They can restrict urea hydrolysis for up to 7 to 14 days, after which rain, irrigation, or soil mixing would be required to further restrict ammonia losses. See M R Martins et al, 'Strategies for the use of urease and nitrification inhibitors with urea: Impact on N₂O and NH₃ emissions, fertiliser-15N recovery and maize yield in a tropical soil, *Agriculture, Ecosystems and Environment*', vol. 247, (September 2017), pp 54–62.

201 Defra, [Clean Air Strategy 2018](#), (May 2018), p 60.

202 The Scheme, is also part of the Catchment Sensitive Farming partnership between Defra, the Environment Agency and Natural England, and will help farmers deliver the new Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions (see Chapter 4). The Scheme will fund a team of specialists who will work with farmers and landowners to implement the measures and include training events, tailored advice, individual farm visits and support with grant applications, all funded by the programme. See: Defra, [£3m support scheme launched to reduce air pollution from farming](#), (September 2018).

203 Jane Salter (AIC) Q184; Country Land and Business Association NO3002.

204 Yorkshire Water Services Ltd NO30021; Wessex Water NO30007; UFU NO30009; AIC NO30040.

205 Jane Salter (Agricultural Industry Confederation) Q180 and Fraser McAuley (CLA) Q180.

206 NFU NO30012.

207 Green alliance NO30002; National Trust NO30046; Countryside Landowners Association NO30002; Wessex Water NO30007; NFU NO30012.

absorbed into water systems and back into soil.²⁰⁸ They suggested that this pointed to the need for a joined-up approach in terms of air, water and soil quality regulation, regulators and best practices.²⁰⁹ While a number of witnesses supported increased use of anaerobic digestion to dispose of farm and food waste,²¹⁰ others were concerned that poor handling, storage and disposal of anaerobic digestate was increasing ammonia emissions.²¹¹

79. We welcome the Government’s acknowledgement that both nitrogen oxides and ammonia are key air quality problems that need to be addressed. Plans to use urea inhibitors seem a sensible idea, as does extending IPCC emission permits to dairy farmers. Farmers should be paid for the delivery of public goods, and the new code on good practice for ammonia emissions, and better support for investment in farm infrastructure are both welcome. However, we note that other countries, such as Denmark and the Netherlands, have taken a more regulatory approach to controlling emissions which has led to significant reductions in their emissions.

80. We recommend that the Government considers whether it can better align policies on water, air and soil and the interaction between nitrogen in its various forms so that actions in one area do not have a negative impact in another. For instance, it needs to ensure that greater use of anaerobic digestion to reduce nutrients leaching into water sources does not lead to greater ammonia emissions, which have increased over the last two years. Better alignment needs to ensure that regulations and regulators are fully joined up across agriculture, water and air quality and that this is fully reflected in future agricultural payments based on the provision of ‘public goods’. For such a joined-up approach to work effectively after the UK leaves the EU, it is imperative that an independent overarching body can oversee these overlapping areas and enforce compliance. This further strengthens our case for an Environmental Enforcement and Audit Office (EEAO).

208 Helen Browning (Soil Association); Q181; Paul Cottingham (NFU) Q181; Fraser McAuley (CLA) Q180.

209 Paul Cottingham (NFU) Q181.

210 Yorkshire Water Services Ltd NO30021; Wessex Water NO30007; Northumbrian Water NO30044; Assured Biosolids Ltd NO30041.

211 Lagan Rivers Trust NO30017; Friends of the Earth Northern Ireland NO30033.

4 Agriculture and Nitrogen Pollution

81. As part of this inquiry, we considered some of the more detailed regulations and guidance that farmers work to. This included the Nitrates Directive, specific guidance on fertiliser use and animal waste, and new rules introduced in April 2018 and July 2018 on water quality and reducing ammonia emissions. We also looked at progress made in reducing the amount of nitrogen fertilisers used and the pressures that agriculture faces in balancing the demand for more efficient food production with water quality.

The Nitrates Directive

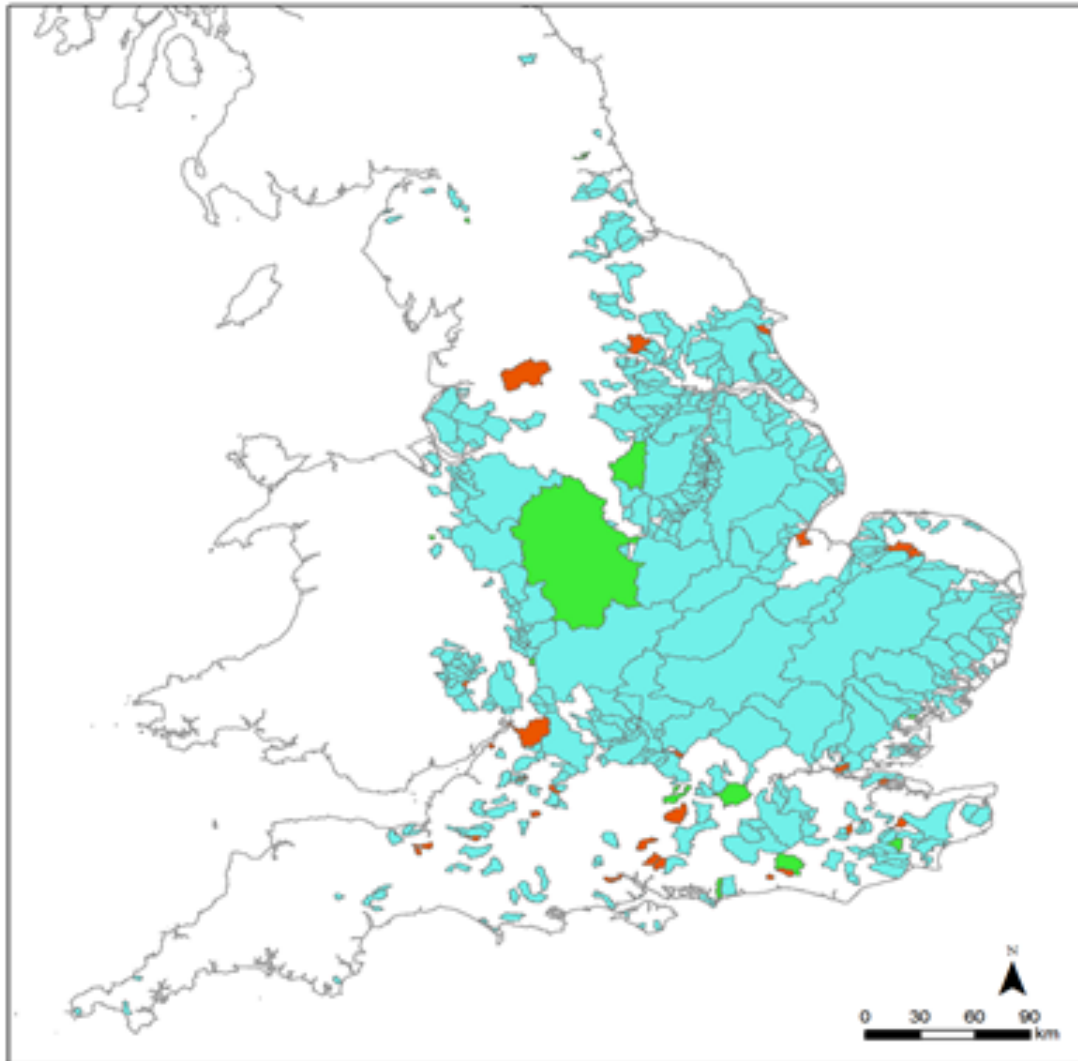
82. The [Nitrates Directive \(91 / 676 /EEC\)](#) aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. Further details regarding the Directive and transposing legislation are provided in Annex 2 of this Report.

83. In England, about 58% of land is designated as a Nitrate Vulnerable Zone (NVZ) due to nitrate pollution of the water environment, of which: 47% of land is NVZ because rivers breach the 50 mg/l nitrate limit; 25% of land is NVZ because groundwater breaches the 50 mg/l limit; 6% of land is NVZ because there is eutrophication in estuaries and lakes/reservoirs (13 estuaries and 68 lakes/reservoirs).²¹² Defra reviews NVZs every 4 years to account for changes in water pollution. NVZs for 2017 to 2020 started on 1 January 2017.²¹³ A map setting out existing NVZs, modified NVZs and new designations from 2017 is below.²¹⁴

212 Defra, [Explanatory Memorandum 8693/18 ADD: Report from the Commission on the Implementation of Council Directive 91/676/EEC Concerning the Protection of Waters against Pollution caused by Nitrates](#), (May 2018), p 5. These three designations overlap.

213 See: Defra, [Nutrient management: Nitrate Vulnerable Zones](#), (accessed 14 June 2018). NVZ in England can be found at: Environment Agency, [Check for Drinking Water Safeguard Zones and NVZs](#), (accessed 15 June). The area covered by NVZ between the 2009–2012 and 2013–2016 periods fell by 8% due to “new evidence, improved monitoring and methodology”. See: House of Lords European Energy and Environment Sub-Committee, [Letter from Minister of State for Agriculture, Fisheries and Food to the Chair of the Committee](#), (July 2018).

214 Defra NO30049.

Surface water Nitrate Vulnerable Zones 2017 - 2021 (England only)**Legend**

 Existing NVZ	 New designations
 Modified NVZ	



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84. Defra issues guidance on the maximum average amount of manufactured fertiliser and organic manure that can be applied to most crops each year in NVZs and the conditions in which this can be done.²¹⁵ It also sets how the application of fertiliser must be recorded, with records kept for five years, and how farmers must produce risk maps if they are spreading organic manure on their land indicating relevant topography and water systems.²¹⁶ Farmers can apply for grassland derogations to use higher levels of nitrogen if the nitrogen comes from grazing livestock manure and the agricultural area does not include surface water, buildings, woodland or greenhouses.²¹⁷ Defra also issues guidance on how silage and slurry should be stored, especially in relation to water

215 See: Defra, [Using nitrogen fertilisers in nitrate vulnerable zones](#), (accessed 15 June 2018). This includes different nitrogen load limits for different crops, specific distances from water sources and some limited exemptions.

216 As above.

217 Defra, [Grassland derogations for livestock manure in nitrate vulnerable zones](#), (updated September 2017).

sources.²¹⁸ Further protection can be introduced in the form of Water Protection Zones (WPZs), whereby additional measures to manage the area and/or stop activities that cause or could cause further damage or pollution to water.²¹⁹

Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions

85. In July 2018, Defra published the Code of Good Agricultural Practice (COGAP) for Reducing Ammonia Emissions in collaboration with the farming industry,²²⁰ and in September 2018 it announced a £3mn scheme to implement it.²²¹ It included guidance on how to cover and store organic manures, with reference to guidance on the storage of silage, slurry and agricultural fuel oil, as set out above. It noted that tight lid, roof or tent structures built on concrete or steel tanks or silos were highly effective, reducing ammonia emissions during storage by around 80%, and preventing rainfall entering the store. It also offered guidance on which spreading techniques could reduce emissions.²²² There was advice on the use of artificial fertiliser, such as: rapidly incorporating or injecting urea fertilisers into the soil when possible; using urease inhibitors; switching from ammonium nitrate to urea; and avoiding weather conditions that would increase emissions by reducing absorption. There was also specific advice for different types of livestock, in terms of their diets, the construction and maintenance of livestock housings, ventilation and the collection and storage of animal waste.

86. Farmers as well as receiving payments from the EU's Common Agricultural Policy (CAP), mainly through the Basic Payment Scheme (BPS),²²³ can apply for a range of funding schemes to help them address water and air quality issues.²²⁴

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- 218 See: Defra, [Storing silage, slurry and agricultural fuel oil, \(updated August 2018\)](#); Defra, [Storing organic manures in nitrate vulnerable zones, \(updated January 2017\)](#).
- 219 House of Commons Library, [Water Quality](#), (July 2018) p 28. Only one WPZ has been designated: in the river Dee catchment in England and Wales in 1999 following a series of accidental chemical pollution incidents.
- 220 Defra, [Code of Good Agricultural Practice \(COGAP\) for Reducing Ammonia Emissions](#), (July 2018).
- 221 The Scheme will fund a team of specialists who will work with farmers and landowners to implement the measures and include training events, tailored advice, individual farm visits and support with grant applications, all funded by the programme. See: Defra, [£3m support scheme launched to reduce air pollution from farming](#), (September 2018).
- 222 This included a comparison of different spreading techniques: surface broadcast; trailing hose (low emission) trailing shoe (low emission); shallow injector (low emission); deep injector (low emission).
- 223 The BPS includes a greening payment for farmers who use their land more sustainably and care for natural resources. It includes measures such as: diversifying crops; maintaining permanent grassland; dedicating 5% of arable land to 'ecologically beneficial elements'. It also includes making soil and ecosystems more resilient by growing a greater variety of crops, conserving soil carbon and grassland habitats associated with permanent grassland and protecting water and habitats by establishing ecological focus areas. See: [How BPS 2015 payments are calculated](#), (updated September 2016); European Commission, [Greening](#), (accessed 23 July 2018). Funding is linked to cross-compliance and farmers are inspected to ensure that they keep to rules and guidance.
- 224 This includes the Countryside Stewardship Scheme. The Higher Tier element of the Scheme allows funds various measures aimed at reducing nitrate pollution in farms based in NVZs. The Scheme also allows farmers to get free advice and training to reduce diffuse pollution from agriculture and apply for capital grants under the Countryside Stewardship Water Capital Grants Scheme. There is also a Facilitation Fund to help support collaborative projects that bring together farmers, foresters, and other land managers to improve local natural resources. Farms are inspected by the Rural Payments Agency (RPA) to ensure that they are keeping to the terms and conditions of the scheme. See: Natural England et al, [Countryside Stewardship: Higher Tier Manual](#), (Revised March 2018); Natural England et al, [Guide to Countryside Stewardship: Facilitation fund 2017](#), (Revised August 2017).

The New Farming Rules for Water

87. The new Rules for farmers and land managers to prevent water pollution were introduced in April 2018.²²⁵ The rules were designed to complement existing regulations and help implementation of the Water Framework Directive (WFD).²²⁶ Their main aim is to: keep soil on the land; match nutrients to crop and soil needs, and keep livestock fertilisers and manures out of the water. More specifically, the new Rules will: prohibit land managers from using artificial fertiliser within two metres of water sources and prohibit the use of organic manure within specified distances of different water sources depending on the type of source and equipment used. They will require land managers to risk assess the impact of applying nutrients in terms of diffuse agricultural pollution and test soils every five years for pH, phosphorous, nitrogen, magnesium and potassium levels to allow a more precise understanding of nutrient requirements. Land managers will have to ensure that steps are taken to protect water sources from diffuse agricultural pollution, such as fencing off water bodies. Farmers who are meeting their cross-compliance requirements will already be meeting their new legal obligations, but the legislative underpinning in the rules mean that civil penalties can be used as an added deterrent and criminal prosecution can be levied against the most serious offenders.²²⁷

88. The new rules were supported by a number of organisations.²²⁸ The Soil Association supported the testing of organic soil matter so that farmers could improve the holding capacity of their soils, though it suggested that the testing of soils should be carried out independently so that a database could track how much progress was being made on soil quality.²²⁹ The Country Land and Business Association was also pleased that soil health was being taken seriously by the Government in both the New Rules for Water and its 25 Year Environment Plan, which would help progress towards reducing erosion, flood damage etc. However, it suggested that farmers also needed access to good advice on soil health and to ensure compliance with both the new rules and existing Nitrate Vulnerable Zones.²³⁰ Other witnesses questioned whether the Environment Agency and the Rural Payments Agency had sufficient resources to ensure compliance and called for additional

225 Defra, [Rules for farmers and land managers to prevent water pollution](#), (April 2018). The rules were implemented by statutory instrument: Defra, [The Reduction and Prevention of Agricultural Diffuse Pollution \(England\) Regulations 2018](#), (April 2018). A consultation on the new rules was carried out between September and November 2015 and a summary of responses was published in November 2017 - Defra, [Consultation on new basic rules for farmers to tackle diffuse water pollution from agriculture in England: Summary of responses](#), (November 2017).

226 The regulations include the Nitrates Pollution Prevention Regulations 2015 (S.I. 2015/668) and the Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (S.I. 2010/639). See Defra, [EXPLANATORY MEMORANDUM TO THE REDUCTION AND PREVENTION OF AGRICULTURAL DIFFUSE POLLUTION \(ENGLAND\) REGULATIONS 2018 No. 151](#), (April 2018).

227 RSPB NO30037. See Defra, [The Reduction and Prevention of Agricultural Diffuse Pollution \(England\) Regulations 2018](#), (April 2018). They state that the Environment Agency may impose a restoration notice, compliance notice, stop notice, fixed monetary penalty, variable monetary penalty or accept an enforcement undertaking, as if it were an offence in relation to which the sanction in question was specified in Schedule 5 to the [Environmental Civil Sanctions \(England\) Order 2010](#). It is a valid defence if a person can show that they took all reasonable steps and exercised all due diligence to avoid committing the offence.

228 See: RSPB NO30037 and Hafren Waters NO30035.

229 Helen Browning Q157. See also:

230 Fraser McCauley Q158, Q169 and Q178. Paul Cottington (NFU) also thought that the requirement for manure management plan was key as farmers would need to show where they were using manures and at what time of year (Q196–197).

rigorous rules for storing, managing and applying slurry.²³¹ We were also told that farmers needed more support from Government if they were to invest in the continued improvements suggested by the New Farming Rules for Water but also for those aimed at reducing ammonia emissions, such as through increased funding from the Countryside Stewardship Scheme.²³²

89. We welcome the introduction of the New Farming Rules for Water, especially the focus on soil health, which we have previously championed, and the linkages with water quality. It is important that the rules are supported by good advice and information for farmers and other land managers so that the right behaviours and practices are encouraged and link to other policies and regulations, such as the wider rules for Nitrate Vulnerable Zones and those which seek to address ammonia emissions. Equally important is that data and evidence is collected and maintained to show that the rules are having an impact in improving water and soil quality and that sufficient resources are given to regulators to ensure compliance.

Progress on Reducing the use of Artificial Nitrogen Fertiliser

90. Overall fertiliser use in England and Wales has decreased by around 30% since 1982, though significantly more for phosphate and potash-based fertilisers.²³³ Reported average rates of nitrogen for cropped land use, have fallen slightly from 157 kg per hectare in 1984 to 146 kg/ha by 2015.²³⁴ On grassland, the average rate of usage has fallen more significantly from 131 kg/ha in 1984 to 56 kg/ha by 2015.²³⁵

Nitrogen and Phosphorous Surpluses in Soil

91. Another indicator of the success of reducing sources of nitrogen pollution, both in terms of water and air, is the “nitrogen balance” in UK soil. Though it does not estimate the actual losses of nitrogen nutrients to the environment, it does give an indication of the potential risk of losses if there are significant surpluses. The nitrogen balance takes account of both fertilisers and manure. Figures published by Defra in July 2017, show that while there has been an overall reduction in the nitrogen surplus since 2000, due to reductions in livestock and fertiliser use (as noted above), there was a slight increase (4%) between 2015 and 2016.²³⁶

231 Sue Everett NO30003. See also Rachel Salvidge, How new rules aim to tackle water pollution from farming, ENDS Report, (March 2018). The article noted the concerns of the Angling Trust and the Wildfowl and Wetlands Trust that the enforcement arrangements were not sufficient. The Angling Trust thought that slurry should also be subject to stricter regulation.

232 NFU NO30012.

233 Defra, [The British Survey of Fertiliser Practice 2016: Annual Report](#), (June 2017).

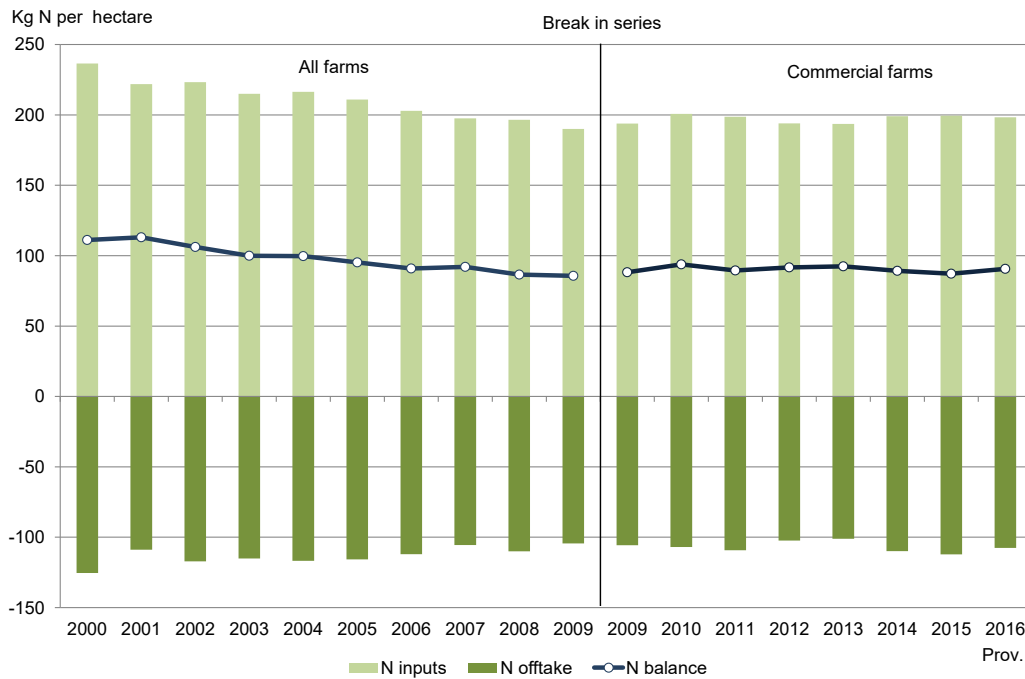
234 As above.

235 As above.

236 Defra, [Soil Nutrient Balances UK Provisional Estimates for 2016](#), (July 2017), p 2.

UK Nitrogen Balance

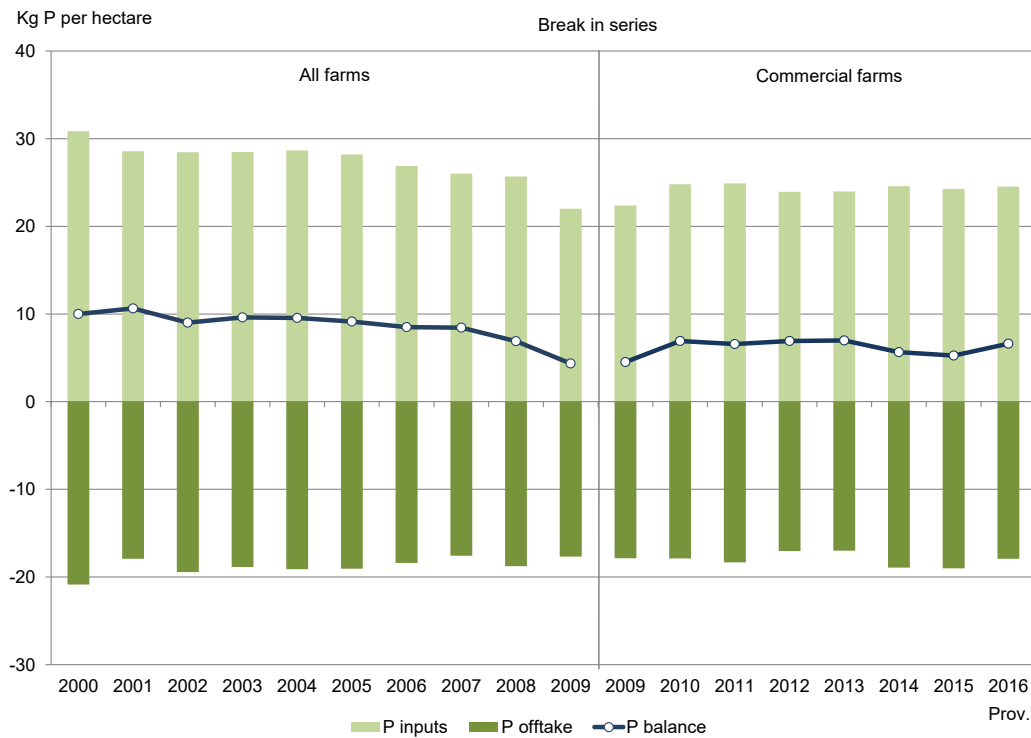
Chart 1: Summary of nitrogen balance for UK, 2000 to 2016 (kg N per hectare)



92. Corresponding data for phosphorous indicates that the overall surplus is lower than nitrogen and increased slightly between 2015 and 2016:²³⁷

UK Phosphorus Balance

Chart 2: Summary of Phosphorus balance for UK, 2000 to 2016 (kg P per hectare)



237 As above.

93. Several witnesses were critical that UK derogations from the Nitrates Directive meant that in many instances farmers were applying 250kg per hectare of nitrogen fertiliser rather than the 170kg set out in the Directive.²³⁸ We heard from witnesses who suggested how the UK could make more progress on reducing artificial fertiliser use. Several called for a tax on nitrogen fertiliser,²³⁹ while in our previous inquiry on Green Finance, Lord Turner of Ecchinswell, a former Chair of the Committee on Climate Change, suggested that thought could be given to a ‘nitrogen price’, similar to that applied to carbon in the EU’s Emissions Trading Scheme.²⁴⁰ Professor Jarvie pointed to Denmark, which has significantly reduced nitrate levels because it had been prepared to trade off some efficiency - e.g. sub optimum levels of fertiliser for arable crops, alongside better management of slurries and recycling and recovery of waste products.²⁴¹ Professor Johnes and the Soil Association, believed a major change would only come when animal manure and slurry was seen as a useful resource to be recycled, which would reduce the need for artificial fertiliser and reduce ammonia emissions because it would not be treated as a waste product to be stored and disposed of.²⁴² Farmers could run nitrogen, phosphorous and carbon budgets, balancing what they put into the soil with what they could utilise from animal waste, to increase nutrient efficiency.²⁴³ The NFU also supported efforts to encourage cooperation between livestock and arable farmers, especially when they were in the same location so that manures and slurry could be used as a resource.²⁴⁴

94. The Minister acknowledged that while there had been a significant reduction in nitrogen fertiliser applied to grasslands there had only been a slight reduction for crops.²⁴⁵ He did, however, note that Government was introducing new rules to require soil testing which would allow farmers to make more efficient use of fertilisers.²⁴⁶ The Government’s Clean Air Strategy (May 2018) also states that the Government will consider legislating to introduce nitrogen fertiliser limits and the use of urea inhibitors to reduce the impact of ammonia emissions,²⁴⁷ while Defra told us that it will ban the use of ammonium carbonate fertilisers.²⁴⁸ The Minister also stated that the Government was looking at countries such as Denmark and the Netherlands, where support had been given for farmyard manure banks so that manure could be used where it was needed, so reducing the need for artificial fertilisers while reducing emissions from it.²⁴⁹ However, he noted the geographical and logistical problems associated by many livestock farms not being located near arable farms.²⁵⁰ ***We recommend that the Government explores solutions to the logistical problems of moving organic animal waste from livestock farms to***

238 See Brighton ChaMP NO30027.

239 Sustainable Food Trust NO30047. The Trust pointed to research which indicated that the overuse of nitrogen in agriculture was costing the UK £11.88bn a year. See also Soil Association NO30038.

240 Environmental Audit Committee, [Oral Evidence: Green Finance](#), (HC Paper 617; February 2018), Q285.

241 Professor Helen Jarvie Q42-Q43. For example, Denmark has introduced mandatory levels of nitrogen management across the whole of the country and regulates the use of cover crops (10–14% of crops) and how much land can be left bare over winter.

242 Professor Johnes Q21 and Helen Browning (Soil Association) Q144.

243 Professor Johnes Q39 and 49 and Helen Browning (Soil Association) Q171.

244 Paul Cottingham (NFU) Q198.

245 George Eustice MP Q217-Q218. E.g. the New Farming Rules for Water.

246 George Eustice MP Q219.

247 Defra, [Clean Air Strategy 2018](#), (May 2018).

248 Defra NO30049. Ammonium Carbonate easily breaks down into ammonium-nitrogen and carbon dioxide on contact with soil. The nitrogen is in an immediately available form but subject to significant losses as ammonia gas. The ban respects UK commitments made under the Gothenburg Protocol and EU National Emissions Ceilings Directive.

249 George Eustice MP Q226. See also: Centre for Ecology and Hydrology NO30033.

250 George Eustice MP Q233.

arable farms. This could address the challenge of storing and managing animal waste and mitigating ammonia emissions whilst reducing the use of artificial fertiliser. The Government should also explore other incentives for reducing artificial fertiliser use, such as nitrogen and phosphorous budgets, and the concept of a nitrogen price.

The Role of Anaerobic Digestion

95. A number of witnesses suggested that anaerobic digestion might be a way of dealing with farm and food waste and reducing nitrate and other nutrient pollution. Anaerobic digestion (AD) is the process by which organic matter such as animal or food waste is broken down to produce biogas and bio-fertiliser. This process happens in the absence of oxygen in a sealed, oxygen-free tank called an anaerobic digester.²⁵¹ What's left from the process is a nutrient rich digestate or bio-fertiliser which can be pasteurised to kill any pathogens and then stored in large covered tanks ready to be applied twice a year on farmland in place of artificial fertilisers. Its proponents also note that it reduces landfill and reduces CO₂ entering the atmosphere.²⁵² The Biosolids Assurance Scheme estimates that around 3.6 million tonnes of biosolids are recycled to agricultural land in the UK every year, providing a service valued at least £25 million to the British farming industry.²⁵³ The resultant biogas can also be used as a form of renewable energy.

96. AD can take place in both water treatment plants and on farms and is subject to environment permits, especially in relation to management of biogas,²⁵⁴ and regulated by the EU [Sewage Sludge Directive 86/278/EEC](#)²⁵⁵ and the Biosolids Assurance Scheme.²⁵⁶ The water companies we heard from told us that they were using AD to generate power and were moving towards treating 100% of their remaining sewage sludges by AD.²⁵⁷ They also noted that the resultant digestate was easier to transport and for farmers to apply to their land which meant less use of artificial fertiliser, and more organic material, which led to less soil erosion.²⁵⁸ The Wildlife and Countryside Link thought that the use of AD was “overwhelmingly” positive because it turned “waste into a higher-value product and potentially recover[ed] energy as well in combined heat and power”.²⁵⁹ It was only negative

251 BIOGEN, [What is Anaerobic Digestion?](#), (accessed 30 July 2018). See also Parliamentary Office of Science and Technology (POST), [Anaerobic Digestion](#), (2011).

252 As above. See also Assured Biosolids Ltd NO30041.

253 Biosolids Assurance Scheme, [Welcome to the UK Biosolids Assurance Scheme website](#), (accessed 21 July 2018).

254 See: Environment Agency, [Standard rules SR2012 No12: The Environmental Permitting \(England & Wales\) Regulations 2010 - Standard Rules 2012 No 12 – Anaerobic digestion facility including use of the resultant biogas](#), (2012); Environment Agency, [SR2012 No 10: on-farm anaerobic digestion facility using farm wastes only, including use of the resultant biogas](#), (Updated August 2018).

255 . The Directive seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to prevent harmful effects on soil, vegetation, animals and humans. It prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into the soil. Treated sludge is defined as having undergone “biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use”. Sludge must not be applied to soil in which fruit and vegetable crops are growing or grown, or less than ten months before fruit and vegetable crops are to be harvested. Grazing animals must not be allowed access to grassland or forage land less than three weeks after the application of sludge. See: European Commission, [Sewage Sludge](#), (accessed 31 July 2018).

256 Biosolids Assurance Scheme, [The Scheme Standard](#), (January 2018). It covers the treatment, management, transportation and application of biosolids.

257 Mark Morton (Yorkshire Water Services Ltd) Q124; Dr Lucinda Gilfoyle (Anglian Water) Q 125; Paul Stanfield (Wessex Water) Q127; Yorkshire Water Services Ltd NO30021; Northumbrian Water NO30044.

258 Dr Lucinda Gilfoyle (Anglian Water) Q 125 and Paul Stanfield (Wessex Water) Q 127.

259 David Johnson (Wildlife and Countryside Link) Q75

if crops were grown for AD purposes.²⁶⁰ The Environment Agency noted that AD was a way of managing animal waste and slurry by producing a more “consistent product that can then be exported or used more consistently on-farm”.²⁶¹

97. However, Lagan Rivers Trust and Friends of the Earth Northern Ireland were concerned that the intensive use of AD facilities in Northern Ireland had not been regulated properly and had led to increased nitrate pollution from its over application to farms and associated elevated ammonia emissions.²⁶² The Agricultural Industries Confederation also thought that AD had led to increased ammonia emissions.²⁶³

98. Anaerobic digestion offers an effective solution to managing sewage sludge and repurposing waste as a resource. This can be used as a renewable energy source and as a bio-fertiliser which can reduce the need for artificial fertiliser. Both uses have the added advantage of reducing carbon emissions, including reductions in the emissions required to manufacture artificial nitrogen fertilisers. This area is regulated by the EU, UK and an assurance scheme. Compliance is essential to realising the advantages of anaerobic digestion. *The Government should set out how it is monitoring anaerobic digestion and ensuring compliance and how this is supporting reductions in air, water and soil nitrate pollution.*

Future Pressures on UK Agriculture and its implications for Water Pollution

99. Professor Jarvie, from the Centre of Ecology and Hydrology, told us that future progress on reducing nitrate pollution would be contingent on a number of pressures.²⁶⁴ She pointed to population growth which could place pressures on water bodies because of increased effluents, including nitrates and phosphates.²⁶⁵ She also suggested that population growth and the UK leaving the EU might increase the need for more food production, which might lead to increased demands placed on the land, which could have consequences in terms of water and air pollution.²⁶⁶ She also suggested that climate change might change the frequency and intensity of rainfall and droughts which could change the stability of nitrate in soils.²⁶⁷ The Ulster Farmers Union also suggested that there could be particular tensions when Governments set ambitious growth targets for the sector alongside water quality targets.²⁶⁸ ***The Government should conduct an assessment to understand how future pressures, such as population growth and climate change, might impact upon air, water and soil quality. This could include working with the Committee on Climate Change to develop models and scenarios to help guide the Government’s nitrogen reduction strategy, as it has for reducing greenhouse gas emissions. The Committee could also help the Government ensure that such a strategy was aligned with other objectives such as delivering the Government’s Carbon Budgets***

260 David Johnson (Wildlife and Countryside Link) Q77.

261 Helen Wakeham (Environment Agency) Q231.

262 Lagan Rivers Trust NO30017; Friends of the Earth Northern Ireland NO30033.

263 Jane Salter (Agricultural Industries Confederation) Q182–183.

264 Professor Jarvie Q14.

265 See also Environment Agency, [The State of the Environment: Water Quality](#), (February 2018).

266 See also Professor Johnes Q49; NFU NO30012; Mr Harriet Moore-Boyd NO30028.

267 Professor Jarvie Q14. See also Environment Agency, [The State of the Environment: Water Quality](#), (February 2018); Wildlife and Countryside Link NO30029.

268 Ulster Farmers’ Union NO30009; Mr Harriet Moore-Boyd NO30028.

5 Monitoring, Enforcement and Resourcing Issues

100. We took evidence and heard from a range of witnesses on how the regime on nitrates, pollutants and water quality is monitored and enforced and the impact of this framework on efforts to reduce nitrate pollution.

Monitoring Nitrate Pollution and Water Quality

101. The Environment Agency told us that in England there are 6,000 surface water monitoring points and 2,400 groundwater monitoring points which carry out 2 million tests a year.²⁶⁹ Samples are taken at sampling points around England and can be from coastal or estuarine waters, rivers, lakes, ponds, canals or groundwaters. They are taken for several purposes including compliance assessment against discharge permits, investigation of pollution incidents or environmental monitoring.²⁷⁰ The Agency supplied figures showing the number of samples and tests taken and costs involved, which suggest that the number of samples and tests carried out and funding have decreased.²⁷¹

Year	Number of water samples	Number of tests for individual measures of water quality	Laboratory costs (total £K)	...of which Nitrate (nutrient) costs (£K)	Monitoring Staffing cost (£K)*3	Modelled Monitoring staff number
2010	131,838	2,510,250	13,826	1,038	13,142	336
2011	137,340	2,579,323	14,212	865	13,690	350
2012	155,394	2,670,028	14,780	659	15,490	396
2013	159,964	2,755,700	13,186	*2	15,946	407
2014	135,392	2,262,788	11,978	688	13,496	345
2015	122,576	2,156,176	12,875	606	12,219	324
2016	112,224	2,020,475	12,797	578	13,053	333
2017	95,202	1,745,242	12,760	410	11,298	280
2018*1	n/a	n/a	11,650	402	11,712	302

*1 - opening budgets for laboratory costs, predictions of samples to be analysed and staffing levels to deliver the monitoring.

*2 - nutrient only costs for 2013 are unavailable

269 Helen Wakeham (Environment Agency) Q254.

270 Environment Agency, [Water Quality Archive](#), (accessed 21 July 2018).

271 Defra and Environment Agency NO30053.

102. We were told that the number of tests varied year from year. For example, monitoring activity peaked in 2012–13 due to extensive water quality investigations required for the first cycle of the Water Framework Directive, which informed River Basin Management Plans published in 2015. It also stated that since then it has “refined its monitoring programmes to make them more targeted, risk based and efficient” and aims to “only monitor where additional information is needed to justify improvements and effectively manage pressures on the water environment”.²⁷² The Agency confirmed that the system rested on a mixture of monitoring and modelling.²⁷³ The Agency also said that it was midway through a strategic review of its monitoring, as it was assessing what sort of monitoring it would need to help deliver the Government’s 25 Year Environment Plan,²⁷⁴ though the Agency has previously noted that resources have become “stretched” requiring better use of information, including third party information.²⁷⁵

103. We received evidence that questioned the efficacy of the current monitoring system. Friends of the Earth Northern Ireland reported that the number of surface water monitoring sites in Northern Ireland had decreased from 622 in 2008–2011 to 156 stations in 2015, while groundwater monitoring sites in Northern Ireland had reduced from 71 to 53.²⁷⁶ We also heard evidence from several witnesses who questioned the comprehensiveness of the monitoring regime. Professor Johnes questioned whether there were enough tests, at the right times (i.e. taking account of seasonal differences), in enough locations, that also took account of the three-dimensional nature of water bodies themselves (i.e. depth and distance from other land and water bodies).²⁷⁷ She thought that a lack of monitoring would lead to a poor evidence base and in turn poor policy and investment decisions.²⁷⁸ Professor Jarvie among others told us that she feared that there was too much focus on individual pollutants and that monitoring did not take a holistic view of pollutants and how they interacted, such as nitrates, phosphates and organic matter.²⁷⁹ She thought that the monitoring system was “not fit for purpose”.²⁸⁰ Several witnesses also contended that in some cases there was too much reliance on modelling and not enough on actual data, a point made by Dr Ward in relation to measurements of nitrate in groundwater, which he thought was “only just meeting the requirements”.²⁸¹ Finally, the Agricultural Industries Association questioned what it saw as a lack of investment in national agricultural statistics because of funding cuts which meant that there was a paucity of evidence and data on farming practices which was undermining a good understanding of their impact on water quality and the success of pollution mitigation strategies.²⁸²

272 Defra and Environment Agency NO30053 and Helen Wakeham (Environment Agency) Q261.

273 Helen Wakeham (Environment Agency) Q256.

274 Helen Wakeham (Environment Agency) Q259.

275 Environment Agency, [Strategic Monitoring Review Programme: A new approach to gathering and using environmental information](#), (February 2018). See also Dr. Hannah Green Senior Advisor (Integrated Water Planning) Environment Agency, [Environment Agency – Strategic Monitoring Review for water: Opportunity to consider new approaches](#), (March 2018). Dr Green noted that key drivers for the strategic review of the Agency’s water monitoring were value for money and financial pressures.

276 Friends of the Earth Northern Ireland (NO30034)

277 Professor Johnes Q28–31.

278 Professor Johnes Q29.

279 Professor Jarvie Q10–11 and Q12. See also Jane Salter (Agricultural Industries Association) and Aileen Lawson (Ulster Farmers Union) Q135; Professor Johnes Q22.

280 Professor Jarvie Q25.

281 Dr Ward Q23 and Q32,

282 Jane Salter (Agricultural Industries Association) Q186–187.

104. The Environment Agency rejected the suggestion that the system was not fit for purpose and told us it offered a “world-class understanding of our water systems”.²⁸³

105. We are concerned that a number of witnesses told us that the monitoring system for water quality was not fit for purpose and that figures supplied by the Environment Agency show that the numbers of samples taken, tests carried out and funding have decreased in recent years. Despite the Agency telling us that this is due to increased efficiency, we are troubled that this is occurring ahead of the UK leaving the EU and implementation of the Government’s 25 Year Environment Plan, and before the 2018 New Farming Rules for Water have fully bedded in. We think that it is imperative that good monitoring is in place to provide a baseline against which these new policies can be measured.

106. The Environment Agency should publish the results of its Strategic Monitoring Review as soon as possible and provide evidence that its monitoring is comprehensive in terms of: the range and number of sites; the frequency of testing; the amount of third party information it is using; the full range of pollutants and their combined impact upon water quality; the impact of farming practices and pollution mitigation strategies; the correct balance between modelling and data. This is important as it provides the evidence base for policies and future investment decisions and ensures that Government policies can be scrutinised and progress can be monitored.

Enforcement, Compliance and Resourcing Issues

107. Farms in England are inspected by several agencies which ensure compliance with water quality and pollution regulations. The Environment Agency told that it was part of a number of activities led by Natural England, involving Catchment Sensitive Farming Officers that are “attempting to help farmers comply with legislation and reduce pollution”.²⁸⁴

108. The Agency said that it had 80 to 100 officers involved in farm inspections that amounted to about 30 fulltime equivalents.²⁸⁵ The Minister told us that the Rural Payments Agency (RPA) had about 400–500 staff, who inspected about 4,000 farms to ensure compliance with water quality and pollution reduction activities.²⁸⁶ It supplied figures on the total number and types of inspections carried out:²⁸⁷

283 Helen Wakeham (Environment Agency) Q254.

284 Helen Wakeham Q265.

285 Helen Wakeham Q267.

286 George Eustice MP Q273. E.g. cross-compliance rules.

287 Defra and Environment Agency NO30053.

Table 3 Rural Payment Agency number of inspections, by type of inspection, 2010 to 2017

Inspection Grouping	2010	2011	2012	2013	2014	2015	2016	2017
On Farm	11,407	10,392	10,646	12,887	10,946	13,111	12,464	10,713
Remote Sensing	3,702	4,001	3,996	4,489	3,907	4,426	4,668	4,481
Meat	2,816	2,922	2,937	2,774	2,790	2,172	1,907	1,848
Trader	1,969	1,772	1,812	985	693	1,038	889	374
Total	19,894	19,087	19,391	21,135	18,336	20,747	19,928	17,416

109. The Minister stated that the RPA used a risk-based model which included random visits to about 5% of farms alongside inspections of farms with a history of non-compliance.²⁸⁸ The Environment Agency told us that inspections were also carried out by voluntary assurance schemes such as the Red Tractor Scheme, which carried out about 45,000 inspections a year,²⁸⁹ and which included certification in areas such as managing animal waste and slurry, protecting water courses and responsible use of artificial fertilisers and manures.²⁹⁰

110. The Environment Agency has a Sanctions and Enforcement Policy which aims to stop illegal activity; put right environmental harm; ensure compliance with the law; and punish offenders.²⁹¹ The Policy states that the Agency “will normally consider all other options before considering criminal proceedings” and that “generally, prosecution is our last resort”.²⁹²

111. We heard from several witnesses who told us that that the regulatory system was failing to ensure compliance, primarily because of a lack of resources. The Wildlife and Countryside link told us that while the Environment Agency had “the teeth” it did not have the resources to enforce compliance.²⁹³ Wessex Water said that though there were some “very, very good people” working for the Environment Agency, “resources wise it is struggling”, which meant that there was “no effective regulatory backstop to catchment management”.²⁹⁴ Wessex Water, along with several other submissions also said that there were particular problems around the Rural Payments Agency and its enforcement of cross-

288 George Eustice MP Q271.

289 Helen Wakeham Q277.

290 The Red Tractor Scheme includes as part of its certification environmental protection and contamination controls including: measures to contain contamination from potential pollutants such as human sewage, sludge, anaerobic digestates, slurry and effluent; efficient and sensitive use of artificial fertilisers and manures. See: Red Tractor Scheme, Red Tractor Fresh Produce Standards, (accessed 20 July 2018).

291 Environment Agency, [Environment Agency enforcement and sanctions policy](#), (Updated May 2018).

292 As above.

293 David Johnson (Wildlife and Countryside link) Q57-Q60. Dr Lucinda Gilfoyle (Anglian Water) agreed the EA did not need any more power and that it was about making sure that baseline regulations were enforced. See also Will Andrews Tipper (Green Alliance) Q62.

294 Paul Stanfield (Wessex Water) Q118. See also Ms Sue Everett NO30003, Wildlife and Countryside Link NO30032 and Wessex Water (NO30007)

compliance and Nitrate Vulnerable Zone inspections.²⁹⁵ Along with other witnesses, it thought that part of the problem stemmed from a plethora of regulations and regulators which needed more regulatory alignment.²⁹⁶ We also heard concerns about enforcement in Northern Ireland in relation to both the funding and independence of the Northern Ireland Environment Agency and cross compliance inspections.²⁹⁷

112. Witnesses told us that one of the consequences of poor enforcement was that farmers would be more reluctant to use good practices if they suspected that neighbouring farmers were not doing the same.²⁹⁸ We also heard that poor compliance and enforcement was also problematic if the regulatory regime was changing, because it would be harder to pick up problems as a new system, such as the New Farming Rules for Water or the Government's 25 Year Environment Plan, was introduced.²⁹⁹

113. The Environment Agency told us that it was "very efficient" with the resources that it had. It accepted that it did "less farm inspections than [it] did in the past" though it maintained that current inspections were "very highly targeted".³⁰⁰ The Agency said that there had been 20 prosecutions from 2012 to 2016 in terms of non-compliance with water quality regulations.³⁰¹ However, it stated that prosecutions were not the best indication of the effectiveness of compliance and enforcement because they were at the end of a very long regulatory process and were rarely the best way to achieve a positive outcome and diverted Agency resources to pursue a case.³⁰²

114. We are concerned that a number of witnesses suggested that the EA lacks the resources it needs to ensure compliance with the existing regime and rules. We do not believe that 30 FTE Inspectors to cover the whole of England is enough. The regime is also fragmented with various bodies involved, both regulators and market-led assurance bodies. Though prosecutions may not necessarily be the best guide to the effectiveness of the regime, only 20 prosecutions between 2012 and 2016 seems too low. There is a danger that a poorly regulated and resourced regime will discourage farmers and others to comply if they see neighbours flout the rules without a penalty. A poorly resourced and fragmented compliance regime also risks public money, especially in the form of cross compliance payments, being misused. A lack of resources will also

295 Paul Stanfield (Wessex Water) Q120. See also Ms Sue Everett NO30003, Wildlife and Countryside Link NO30032 and Wessex Water (NO30007). Wildlife and Country Link suggested in their submission that research for the World Wildlife Fund found that 20–30% of farmers were failing to comply with cross compliance standards.

296 Paul Stanfield (Wessex Water) Q121 and Dr Lucinda Gilfoyle (Anglian Water) Q121; Wildlife and Countryside Link NO30032.

297 Lagan Rivers Trust (NO30017) claimed that statutory bodies in the Northern Ireland were failing to acknowledge, implement or enforce current EU environmental directives. They claimed that only 6% of farms in the province had a cross-compliance inspection in 2016. See also Friends of Earth Northern Ireland (NO30034) and Northern Ireland Environment Link Freshwater Task Force (NO30039); Mrs Harriet Moore Boyd (NO30028).

298 David Johnson (Wildlife and Countryside link) Q57.

299 Will Andrews Tipper (Green Alliance) Q60.

300 Helen Wakeham Q265.

301 Helen Wakeham Q269. In a letter to the Chairman of the Lords European Energy and Environment Select Committee in July 2018, the Minister of State at Defra, George Eustice MP, responded to figures which showed that compliance rates for the Nitrates Directive had fallen from 95 to 77% in England and Wales. He reiterated that the main reason for non-compliance in England and Wales was record keeping and that better targeting of non-compliance undertaken by the Rural Payments Agency had improved detection of those not abiding by cross-compliance rules. He said that compliance rates in Scotland were very high. However, he stated that the main causes for breaches in Northern Ireland were due to poor management of slurry, effluent storage and application of slurry to fields. See: House of Lords European Energy and Environment Sub-Committee, [Letter from Minister of State for Agriculture, Fisheries and Food to the Chair of the Committee](#), (July 2018).

302 Helen Wakeham Q269–270.

undermine the credibility of the Government's 25 Year Plan for the Environment, and of any new system and the compliance body that will oversee it if the UK leaves the EU. *The Government needs to bring forward plans and costings to indicate that it has sufficient resources to enable effective enforcement and oversight.*

6 Monitoring, Compliance and Enforcement after the UK Leaves the EU

115. We considered what impact leaving the EU will have on existing legislation in terms of transposition and continuity and how, with the absence of EU institutions, compliance will be ensured. In addition, we considered how the Government's 25 Year Environment Plan and its Agriculture Bill 2017–19, matched the targets and objectives of existing EU regulation. Finally, we looked at the implications that leaving the EU will have for Northern Ireland and the Republic of Ireland, who share several river basins.

EU Regulatory Transposition Issues

116. The EU (Withdrawal) Act 2018 will incorporate the existing body of EU Environmental law into UK Law.³⁰³ The Minister told us that the Government was “committed to the water quality objectives that we have, and those will become retained EU law once the EU Withdrawal Bill has completed its passage”.³⁰⁴ The Environment Agency also said that there was nothing in the Government's plans that “suggests that we will row back on our water quality objectives”.³⁰⁵ However, we warned in our previous report - *The Future of the Natural Environment after the EU Referendum*, about the dangers of ‘zombie legislation’, that is the prospect of EU Law not being updated, monitored or enforced by an appropriate governance body.³⁰⁶ We are therefore concerned as to how the Government will replicate the oversight provided by the European Environment Agency, the European Commission and the European Court of Justice in relation to nitrates, water and air quality and how legislation will be updated.³⁰⁷ We have also previously noted that the European Commission provides a mechanism by which individuals and organisations can raise complaints, free of charge, for breaches of relevant legislation.³⁰⁸ The latter has been the case with a number of breaches of water quality legislation, notably the Urban Waste Water Directive.³⁰⁹

303 Department for Exiting the European Union, [EU \(Withdrawal\) Bill Fact Sheet 8: Environmental Principles](#), (May 2018).

304 George Eustice MP Q235

305 Helen Wakeham (Environment Agency) Q234

306 EAC, *The Future of the Natural Environment after the EU Referendum*, (HC 599; January 2017), pp 15–20. See also: Politico, [Brexit threatens environmental law enforcement](#), (January 2018);

307 See EAC, [The Government's 25 Year Plan for the Environment](#), (HC 803; July 2018), pp 19–33. This issue was also raised in relation to UK regulation of F-gases after the UK leaves the EU - see: EAC, *UK Progress on Reducing F-gas Emissions*, (HC 469; April 2018), p 26.

308 EAC, [The Government's 25 Year Plan for the Environment](#), (HC 803; July 2018), pp 25–26. See also: European Commission, [How to submit a complaint to the European Commission](#), (accessed July 2018). Defra and the Environment Agency told us that complaints can be made to the relevant regulator, such as the Environment Agency in England, or Devolved Administration in the usual manner, following published guidelines (NO30053). However, the point is that complaints can be made to the Commission when UK regulators have not acted on breaches and complaints.

309 For instance, in May 2017 the ECJ ruled against the UK Government on a number of breaches of the Urban Waste Water Directive dating back to 2009 (see Environmental Analyst, [‘At-source’ water treatment dealt blow by EU court ruling](#), July 2018) and the [judgement](#) noted that the original case hinged on “various citizens’ complaints”. This has also been the case for UK breaches of air quality - see: Client Earth, [UK Government loses third air pollution case as judge rules air pollution plans ‘unlawful’](#), (February 2018).

Holding the Government to Account for Environmental Outcomes

117. Section 16 of the EU (Withdrawal) Act 2018 commits the Government to produce a draft environment bill within 6 months of the EU (Withdrawal) Act 2018 being passed (the deadline is therefore 26 December 2018³¹⁰). This must include a set of environmental principles, and proposals for a public authority to take on environmental oversight functions, including proportionate enforcement action for environmental breaches.³¹¹ The Secretary of State told us in April 2018 that the enforcement powers of such a body “should, wherever possible, either emulate or build on the enforcement powers that the Commission itself currently has, so the capacity to take the Government or any other relevant body to court”.³¹² Previously, in November 2017 he had told the Committee: “Outside the European Union the question is what replaces the Commission, how do we have the ECJ as a role replicated ... The most important thing though is, having recognised there is a gap”.³¹³ In May 2018, the Government published a consultation for a new Environmental Principles and Governance Bill, to be published in Autumn 2018, which included proposals for a “world-leading body to hold government to account for environmental outcomes”.³¹⁴ The body would seek to: provide independent scrutiny and advice on existing and future government environmental law and policy; respond to complaints about government’s delivery of environmental law; and hold government to account publicly over its delivery of environmental law and exercising enforcement powers where necessary.³¹⁵

118. However, the proposals were criticised as being too weak because the new body would ensure that the Government had regard to environmental principles rather than statutory targets, while critics fear that there was conflict within the Cabinet on what powers the new body should have.³¹⁶

119. We therefore proposed in our Report - The Government’s 25 Year Plan for the Environment, published in July 2018, creating in UK law an independent oversight body—The Environmental Enforcement and Audit Office (EEAO), that reports to Parliament. We stated that it should have strong powers replicating those of the European Commission and European Environment Agency to ensure that the Government delivered on its stated objective of restoring as well as maintaining the UK’s nature and biodiversity. We also proposed that a statutory body of parliamentarians, modelled on the Public Accounts Commission, should set the EEAO’s budget, scrutinise its performance and oversee its governance. Crucially, we stated that the EEAO, whilst monitoring public bodies and reporting on their performance against key environmental targets, including those for

310 The Bill received [Royal Assent](#) on the 26 June 2018.

311 [European Union \(Withdrawal\) Act 2018, Section 16](#). Section 16(2) of the EU (Withdrawal) Act 2018 states that the principles, however worded, must include: the precautionary principle so far as relating to the environment; the principle of preventative action to avert environmental damage; the principle that environmental damage should as a priority be rectified at source; the polluter pays principle; the principle of sustainable development; the principle that environmental protection requirements must be integrated into the definition and implementation of policies and activities; public access to environmental information; public participation in environmental decision-making, and access to justice in relation to environmental matters.

312 Environmental Audit Committee, [25-Year Environment Plan](#), (HC Paper 803; April 2018), Q118.

313 Environmental Audit Committee, [The Government’s Environmental Policy](#), (HC Paper 544; November 2017) Q1–2.

314 Defra, [Defra, Environmental Principles and Governance after the United Kingdom leaves the European Union: Consultation on environmental principles and accountability for the environment](#), (May 2018).

315 See Above, pp 20–34.

316 See: Guardian, [Campaigners attack plan for new watchdog to protect environment after Brexit](#), (May 2018); Financial Times, [Anger that new environment watchdog lacks power to prosecute government](#), (May 2018). This is discussed in EAC, [The Government’s 25 Year Plan for the Environment](#), (HC 803; July 2018), pp 23–24.

water and air quality, should have effective and proactive enforcement powers, with the power to fine government departments and agencies that fail to comply, collecting fines and overseeing remedial compliance actions. The EEAO should also allow complaints to be brought by members of the public.³¹⁷

120. We are concerned that, despite the assurances of the Minister, the compliance regime for EU water quality and nitrate directives can not be fully transposed into UK law and run the risk, as we have warned before, of ending up as ‘zombie’ legislation. These laws will no longer be updated to take account of changes across the EU and will be divorced from the EU institutions which ensure administrative support, compliance and enforcement. While we welcome the Secretary of State’s acknowledgement of the need for an environmental watchdog to fill the Commission-shaped hole and to replace the European Court of Justice, we are worried that his proposals do not provide an independent body with sufficient powers to ensure that statutory water quality and pollution reduction targets are met. We are also concerned that it will be more difficult to bring cases against the Government for breaches of nitrate pollution and water quality legislation. In addition, we are concerned that if the current system of monitoring, compliance and enforcement is currently under-resourced, as several witnesses told us, regulators such as the Environment Agency will struggle to take on responsibilities previously undertaken by EU institutions.

121. The Government should ensure that its draft environmental bill includes a watchdog as we have recommended, with sufficient powers to enforce compliance with statutory water quality targets, fine Government departments and public authorities for non-compliance, and allow complaints for breaches to be raised and dealt with by the courts. The Government also needs to provide assurance that the post-EU regulatory system will be sufficiently resourced.

The 25 Year Environment Plan versus the Water Framework Directive

122. In January 2018, the Government published its long delayed 25 Year Environment Plan.³¹⁸ We have dealt with the plan in detail in our report ‘The Government’s 25 Year Plan for the Environment’.³¹⁹ The Plan included proposals on air pollution and water quality.³²⁰ On water quality, the Plan stated that the Government would: ensure that by 2021 the proportion of water bodies with enough water to support environmental standards increased from 82% to 90% for surface water bodies and from 72% to 77% for groundwater bodies; reaching or exceed objectives for rivers, lakes, coastal and ground waters that are specially protected, whether for biodiversity or drinking water; minimise by 2030 the harmful bacteria in designated bathing waters and continue to improve the cleanliness of water bodies.³²¹ The Plan also stated that the Government would “improv[e] at least three quarters of our waters to be close to their natural state

317 EAC, [The Government’s 25 Year Plan for the Environment](#), (HC 803; July 2018), p 50.

318 Defra, [A Green Future: Our 25 Year Plan to Improve the Environment](#), (January 2018).

319 EAC, [The Government’s 25 Year Plan for the Environment](#), (HC 803; July 2018). See also: House of Commons Library Standard Note, [The 25 Year Environment Plan](#), (January 2018).

320 On air quality, the plan said it would be achieved by: meeting legally binding targets to reduce emissions of five damaging air pollutants, including ammonia and nitrogen oxides, to halve the health effects of air pollution by 2030; ending the sale of new conventional petrol and diesel cars and vans by 2040; maintaining continuous improvement in industrial emissions by building on existing good practice and regulatory frameworks. See: Defra, [A Green Future: Our 25 Year Plan to Improve the Environment](#), (January 2018), pp 97–99.

321 As above, p 25.

as soon as is practicable”.³²² The target reflected the targets set in the current River Basin Management Plans analysis of where environmental benefits would outweigh costs and is based on existing plans to reform the abstraction system and the Government meeting or exceeding existing EU legal requirements for water quality targets, especially those for bathing waters.³²³ However, the Water Framework Directive (WFD) aims for ‘good status’ for all ground and surface waters in the EU by 2027. “As soon as is practicable” can be seen as a weakening of this target.

123. We questioned the Minister on the gap between what the Plan stated and the target set out in the WFD. He told us that the Government had no intention of watering down the WFD outcomes and that the Plan was “a much more general broader framework” that did not go “into listing each and every commitment” and which was “more about the approach and principles”.³²⁴ When asked about targets he said that the Government had “deliberately not tried to have targets for everything”,³²⁵ and that it was important to “have the trend moving in the right direction”.³²⁶ The Secretary of State also told us in evidence to our Inquiry on the 25 Year Plan that he did “not want to have any dilution” of the Water Framework Directive,³²⁷ and in subsequent correspondence that targets for the Plan were intended as a “direct translation of commitments of the WFD”.³²⁸ The Environment Agency told us that the UK along with other EU Member states were finding the 2027 target in the Water Framework Directive a “challenge” because it would mean ensuring all water bodies were returned to a near-natural state.³²⁹ However, the Agency maintained that there was nothing to suggest that it was rowing back on water quality objectives. It told us that it is currently looking at robust metrics to support delivery of the 25 Year Plan, which will be ready by the end of 2018, drawing on wide stakeholder engagement. In terms of nitrates and water pollution it said that they will “be based on metrics already in use, for example WFD monitoring, as well as those developed for the 25 Year Environment Plan”.³³⁰

124. In June 2018, the Secretary of State wrote to the Chair of the Environmental Audit Committee stating that it had become clear that it would “be very challenging for most member states to achieve good status for all waters”, a key target in the WFD, due to the “sheer pressure from human populations, industry and agriculture”. As a result, he said it was “likely that member states and the EU Commission will need to consider extending the WFD deadline in some way or revising water quality objectives looking beyond 2027”.

322 As above.

323 See House of Commons Library Standard Note, [The 25 Year Environment Plan](#), (January 2018), pp 16–17.

324 George Eustice MP Q234.

325 George Eustice MP Q 245.

326 George Eustice MP Q250.

327 Environmental Audit Committee, [The Government’s 25 Year Plan for the Environment](#), (HC 803; 24 July 2018), Q86.

328 Environmental Audit Committee, [Correspondence from the Secretary of State to the Chair on 25 year environment plan](#), 17 May 2018.

329 Helen Wakeham (EA) Q 247–248.

330 Defra and Environment Agency NO30053

Health and Harmony and the Agriculture Bill

125. In February 2018, the Government published a consultation - Health and Harmony: The Future for Food, Farming and the Environment in a Green Brexit.³³¹ It set out a new agricultural policy to replace current Direct Payments under the EU's Common Agricultural Policy that would be based on new principles:

Our aim is for public money to buy public goods. In 25 years' time, we want cleaner air and water, richer habitats for more wildlife and an approach to agriculture and land use which puts the environment first. From 2022 onwards, a new environmental land management system will be the cornerstone of our agricultural policy, achieving improved biodiversity, water, air quality, climate change mitigation, and the safeguarding of our historic landscapes. This will allow us to fulfil our manifesto commitment to become the first generation to leave the environment in a better state than we found it.³³²

126. It stated that there was an opportunity to enhance measures to deal with the interconnected issues of soil health, water pollution and ammonia emissions³³³ but also wider goals of air quality and climate change.³³⁴ As direct payments from the CAP are reduced and phased out they would be replaced by new Environmental Land Management Schemes, collaborative projects in areas such as diffuse pollution, and capital grants.³³⁵

127. On the 12th September 2018, the Government published the Agriculture Bill.³³⁶ Clause 1 of the Bill set out powers to move towards a new system based on paying public money for public goods, including environmental protection, tackling climate change, improving the productivity of agricultural, horticultural or forestry activity and reducing flooding. The Explanatory Notes to the Bill state that environmental outcomes will include clean air, clean and plentiful water and thriving plants and wildlife through the carrying out of environmentally beneficial land and water management activities. The Explanatory Notes gave the example of incentivising the planting of trees around farms to capture ammonia emissions and protect nearby sensitive habitats from damaging nitrogen deposition.³³⁷

128. Clause 5 of the Agricultural Bill states that there will be a seven-year transition period from the old CAP system to the new system starting in 2021 and ending in 2027.³³⁸ The Minister told us that direct payments to farms would continue until 2021 and would match overall CAP payments to the end of the current Parliament.³³⁹ During the transition period to the new system, payments would be slowly reduced to free up funds,

331 Defra, [Health and Harmony: The Future for Food, Farming and the Environment in a Green Brexit](#), (Cm 9577; February 2018). The consultation closed on the 8 May 2018.

332 As above, p 15. Such environmental public goods would also include soil health (p 32) and working towards achieving world-class animal welfare, high animal health standards and the protection of crops, tree, plant and bee health (pp 33–34).

333 As above, p 36

334 As above, pp 32–33. This includes a focus on nitrous oxides as both pollutant and Green House gas.

335 As above, p 37.

336 Defra, [Agriculture Bill 2017–19](#), (Bill 266 of 2017–2019; September 2018).

337 Defra, [Agriculture Bill: Explanatory Notes](#), (Bill 266-EN; September 2018).

338 As above p 15. Clause 5(2) gives powers to the Secretary of State to extend the agricultural transition period.

339 George Eustice MP Q221-Q223.

with reductions dependent on the size of the farms receiving them.³⁴⁰ For instance, the consultation on the Agriculture Bill stated that during the transition to the new system the Countryside Stewardship scheme would be opened up in 2019 to make it easier for farmers to apply for funding.³⁴¹ The Minister said that the transition would allow farmers to adjust and ease the roll out of a new IT system to manage the new regime.³⁴² The EA said that it was currently looking at how it will support the new regime.

129. A number of witnesses agreed that when the UK leaves the EU, the Government should incentivise farmers and other land managers to go beyond regulations and best practice.³⁴³ This included supporting farmers to use natural infrastructure, such as wetlands and forests,³⁴⁴ but also cover crops and grasslands,³⁴⁵ to ensure that nitrates were fixed in the land by compensating them accordingly for such changes in land use and reduced profitability.³⁴⁶ It was suggested that the Government should give more support to farmers for using less artificial fertiliser,³⁴⁷ use stricter limits on the use of fertiliser in NVZs,³⁴⁸ and consider extending NVZ areas.³⁴⁹ There was also support for more investment in farm infrastructure, such as improved slurry stores and covers,³⁵⁰ increased investment in research to improve nutrient efficiency and advice for farmers,³⁵¹ and water troughs to keep animals away from water courses.³⁵² Other evidence called for better detection technology to identify pollution at source.³⁵³ However, the Royal Society for the Protection of Birds has expressed concerns that a system that moves towards payments for ecosystem services runs the danger of undermining the polluter pays principle because it moved the emphasis away from polluters and victims to providers and beneficiaries.³⁵⁴

130. The Minister said that the Government had tried to flex existing funding streams such as the Rural Development Programme to make capital grants available to farmers to invest in covers for slurry stores and was looking to roll out similar projects.³⁵⁵ However, he said that he envisaged a “future scheme having capital elements to make sure we are

340 Defra noted that these payments, that are currently “not linked to any specific public benefits”, are skewed towards the largest landowners with the top 10% of recipients currently receive almost 50% of total payments, while the bottom 20% receive just 2%. See: Defra, [Landmark Agriculture Bill to deliver a Green Brexit](#), (September 2018).

341 Defra, [Health and Harmony: The Future for Food, Farming and the Environment in a Green Brexit](#), (Cm 9577; February 2018), p18.

342 George Eustice MP Q224.

343 David Johnson (Wildlife and Countryside link) Q55, Q68-Q69, Q71-Q72 and Q84; Will Andrews Tipper (Green Alliance) Q56; Fraser McCauley (Country Land and Business Association) Q159-Q160; Green Alliance NO30042; Yorkshire Water Services NO30021; Country Land and Business Association NO30002; NFU NO30012.

344 See Wildlife and Countryside Link NO30032. This has been an approach used in Denmark. For instance, by 2021, Denmark is aiming to have introduced 1,000 mini wetlands with an assumed average effect of fixing 900kg of nitrogen per wetland. See also National Trust NO30046; Brighton ChaMP NO30027.

345 Soil Association NO30038; Anglian Water NO30022.

346 Paul Cottingham (NFU) Q199-Q201 and Helen Browning (Soil Association) Q146. Germany, for example, provides compensation to farmers who implement groundwater protection measures.

347 David Johnson (Wildlife and Countryside link) Q69. Germany for instance has plans to ban the use of urea fertiliser by 2020 and it is thought France will follow. See also National Trust NO30046.

348 Professor Dave Reay NO30001; Anglian Water NO30022; Brighton ChaMP NO30027.

349 Professor Dave Reay NO30001.

350 Helen Browning (Soil Association) Q198 and Q202; Jane Salter (AIC) Q198; David Johnson (Wildlife and Countryside link) Q69

351 Both France and several US States, such as California, have provided substantial funds for research into methods and technologies that can reduce nitrate leaching. See Anglian Water NO30022; John Innes Centre NO30023.

352 Paul Cottingham (NFU) Q201.

353 Professor Dave Reay NO30001.

354 Rachel Salvidge, ‘Polluter pays principle ‘at risk of being undermined’, ENDS Report, (December 2016).

355 George Eustice MP Q280.

really supporting that kind of investment in infrastructure”.³⁵⁶ He also said that the Government should be prepared to incentivise different approaches to the management of soils, reduced application of fertilisers and increased use of cover crops during the winter.³⁵⁷ He said it was about “proactively supporting and incentivising the right sorts of behaviours”.³⁵⁸ He maintained that while the “polluter pays” principle was important and was included in the Environment Plan, and that negligence and recklessness should be addressed, it should not be an obstacle to encouraging farmers to join schemes that tackle pollution or an excuse for inaction.³⁵⁹

131. Despite the Minister telling us that the Government had no intention of watering down commitments on reducing water pollution and improving water quality we are very disappointed that the Water Framework Directive (WFD) target of ‘good status’ for all ground and surface waters in the EU by 2027 has not been retained within the 25 Year Environment Plan. The Plan’s aim to ensure that at least three quarters of our water will be close to their natural state as soon as is practicable is a significant watering-down of the aim in the Directive. This retreat seemed to be confirmed by the Secretary of State’s subsequent letter to the Chair concerning the challenging nature of the 2027 WFD target. We also question the absence of targets and key milestones within the Plan. The Minister contended that overall trends are more important, but interim targets and milestones are vital stepping stones to guide policy and measure progress. While we support the use of public funds to support the provision of public goods this must not undermine the polluter pays principle and public money should fund public goods which go above and beyond compliance with regulatory requirements.

132. The Government should, as part of its upcoming environmental legislation, and as we argued in our report on its 25 Year Environment Plan, produce robust targets and milestones to underpin legally binding targets on water quality. If there is any weakening of long-term and interim national, EU or international water quality targets, the Government needs to provide an explanation of where they are weaker and why. We look forward to seeing the metrics for nitrate and water pollution by the end of the year, which we hope will underpin clear targets in line with or exceeding those set out in the Water Framework Directive.

Northern Ireland and The Republic of Ireland: Regulatory Alignment

133. We considered the implications of the Prime Minister’s promise of “full regulatory alignment” whereby Northern Ireland would have ongoing alignment with the Republic of Ireland, and by implication the EU, to avoid a hard border while at the same time maintaining alignment with the rest of the UK. There has been much debate as to how and whether these two things can be reconciled if the UK has a different regulatory regime from the EU.³⁶⁰ Currently there is still disagreement between the UK and EU on how a hard

356 George Eustice MP Q281.

357 George Eustice MP Q289.

358 George Eustice MP Q296.

359 George Eustice MP Q277 and Q294-Q295.

360 See House of Commons Library, Brexit: ‘sufficient progress to move to phase 2’, (December 2017), pp 31–41; House of Lords Library, Leaving the EU: Role of the Devolved Administrations and Implications for the Union, (January 2018), pp 16–18; Anthony Costello, The UK needs to clarify what ‘full regulatory alignment’ means before the next phase of the Brexit talks, LSE European Institute, (January 2018); Business Green, Could the Irish border hold the key to a green Brexit?, (December 2017).

border can be avoided,³⁶¹ and doubts have been expressed as to whether the issue can be resolved.³⁶² The answers to these questions are beyond the scope of this inquiry. However, the Government has indicated that the environment is an area where full regulatory alignment would apply,³⁶³ and Defra have confirmed that water quality management in a cross-border context has been identified as an area of North-South cooperation within the scope of EU negotiations on UK withdrawal from the EU.³⁶⁴ In terms of nitrate pollution and water quality the issue of “full regulatory alignment” is given more prominence because Northern Ireland and the Republic share three international river basin districts.³⁶⁵ Presently there is cooperation between bodies on either of the border. The Environmental Protection Agency in Ireland is represented on the UK wide Water Framework Directive Technical Advisory Group (UKTAG) which advises on the technical implementation of the WFD for water quality management. The North South Working Group on Water Quality (containing representatives from Ireland and NI Government Departments as well as the relevant environment agencies in Northern Ireland and Ireland) also meets to discuss areas of co-operation and progress on the implementation of European water Directives.³⁶⁶

134. The Wildlife and Countryside link told us that coordination groups on either side of the border were very concerned as to how the current catchment-based approach for shared water bodies would work and whether there would be consistency if the UK deviates from EU standards.³⁶⁷ The Ulster Farmers’ Union said that there had to be a cross-border mechanism that allowed flexibility. It said that though there were currently different rules on both sides of the border, the issue for farmers was how different they would be and how far the UK deviated from EU standards such as the Nitrates and Water Framework Directives. It said that the “sooner we know that information we can get on with dealing with businesses and getting businesses to adapt”.³⁶⁸ The Environment Agency told us that England currently shared water bodies with Scotland and Wales and that common sense generally prevailed in terms of cooperation and that Northern Ireland and the Republic had the technical advisory bodies to coordinate actions and policies after the UK leaves the EU.³⁶⁹ However, such coordination between different countries and nations within the UK is within the overall context of EU legislation which will no longer be the case when the UK leaves the EU. If there is divergence between the UK and the EU this will present a challenge for full regulatory alignment between Northern Ireland and the Republic. This will apply to shared water bodies but also other areas, such as ammonia emissions. The

361 The EU has proposed a backstop that would mean Northern Ireland staying in the EU customs union, large parts of the single market and the EU VAT system. The UK Government opposes this idea. The Prime Minister has said that the EU’s proposal would threaten the constitutional integrity of the UK. She has instead suggested a backstop that would see the UK remaining aligned with the EU customs union for a limited time after 2020. See BBC News Online, [Q&A: The Irish border Brexit backstop](#), (17 July 2018).

362 See: Danial Boffey and Lisa O’Carroll, [Barnier stands firm on post-Brexit border in Irish Sea](#), Guardian, (31 August 2018); James Blitz and Alex Barker, [UK and EU set to miss target of Brexit deal by October](#), Financial Times, (29 August 2018); Peter Foster, [Why the Irish backstop issue is the Brexit poison pill that cannot be swallowed by any side](#), Telegraph, (19 July 2018);

363 The Prime Minister noted on 11 December 2017 that the environment would be one of six sectors, alongside waste and water management, the electricity market, agriculture, and questions relating to road and rail transport, where there would be ‘full regulatory alignment’. HC Hansard, 11 December 2017, col 38.

364 Defra and Environment Agency NO30053.

365 Defra and Environment Agency NO30053.

366 Defra and Environment Agency NO30053.

367 David Johnson (Wildlife and Countryside link) Q87.

368 Aileen Lawson (Ulster Farmers Union) Q166–168.

369 Helen Wakeham (Environment Agency) Q300–301.

Minister told us that there had been no progress on the issue of regulatory alignment and that it needed to be “added to the list of Northern Ireland Border issues in the context of Brexit”.³⁷⁰

135. We are concerned that if UK and EU policies on nitrate pollution and water quality diverge in the future it will present challenges for Northern Ireland, particularly its farmers, where there are shared water bodies. Regulatory alignment could also have an impact on the Government’s proposals to tackle ammonia emissions through its Clean Air Strategy if there is a divergence in this area as well. *The Government should produce a strategy for dealing with future divergence for both water and air quality. This should include proposals for sharing river basins that span the Irish border according to catchment management principles.*

Conclusions and recommendations

Water Quality

1. It is a cause for concern that 86% of English rivers did not reach good ecological status in 2016, which is lower than the EU average, and that the UK is also performing badly compared to many of its European neighbours in terms of the chemical status of its ground waters. It is particularly worrying that the UK may not hit the 2027 target set in the Water Framework Directive for all water bodies to have a good ecological status. (Paragraph 24)
2. This is having a negative impact on our ecosystems and the organisms that live in them. We note that there were 314 serious pollution incidents in 2016 and that this level of incidents has persisted for nearly a decade, which suggests that more needs to be done to reduce pollution in both surface waters and groundwaters. The figures also show that the Government is rightly concentrating on agriculture and the water industry as the major polluters. (Paragraph 25)
3. We are reassured that regulators are reporting high levels of drinking water quality. But as we note elsewhere in this report, the costs of delivering this in terms of mitigating nitrate pollution, especially in groundwater sources, are high. Such costs are ultimately passed on to the consumer. (Paragraph 28)
4. We are disappointed that the Government was slow in addressing UK breaches of the Urban Water Directive in 2009 which led the ECJ ruling against the UK 2017. We have seen similar problems elsewhere in relation to air quality and nitrogen dioxide emissions. The fact that the UK was slow to respond to these breaches even after the intervention of the European Commission and European Court of Justice does not inspire us with confidence about maintenance of water standards once the UK leaves their jurisdiction. This underlines why a powerful environmental watchdog will be needed after the UK leaves the EU and particularly in the event of leaving without a deal. This body will need to set, monitor and evaluate targets to reduce pollution incidents and improve water quality. (Paragraph 30)
5. Though there has been an improvement in the quality of UK bathing waters over the past 25–30 years, the UK is still 7th from the bottom of the scale. The European Environment Agency notes that nitrate pollution from diffuse pollution is a major cause of bathing water not reaching excellent status and that steps taken to address this will have the added benefit of also addressing phosphate pollution. It is crucial that the Government continues to enforce the various initiatives to control nitrate pollution and improve water quality if our beaches are to move into the upper tier of EU bathing quality. The new system of farm payments, linking payments to provision of public goods should look at reducing nitrate pollution from agriculture as a key public good. (Paragraph 34)
6. Though progress has been made in reducing nitrates in surface waters, levels are high in some areas, especially in parts of England, and we still lag behind a number of our European neighbours. We are particularly disturbed to hear of the high levels of nitrate pollution in some of our groundwater sources, which supply nearly

a third of our drinking water, which might not peak for another 60 years. Water companies are having to invest substantial sums of money in nitrate removal and water blending plants, the costs of which are being passed on to customers through water bills. (Paragraph 44)

7. Though significant progress has been made in reducing levels of phosphorous in rivers over the last 20 years, which we welcome, it remains the main cause of eutrophication and an obstacle to our surface waters achieving good ecological status. *The Government should continue to invest in new technologies and natural infrastructure approaches that can reduce phosphorous levels further. This should include encouraging water companies and landowners to trial such measures and rolling them out if they are cost-effective.* (Paragraph 47)
8. Collaboration between stakeholders involved in river basin catchment management makes sense as it seeks to stop nitrate and other pollution at source and acknowledges that responsibility for better water quality lies with multiple actors. A key part of this is investment from water companies and they have made a persuasive case for a longer-term approach to funding. We would, however, note the Secretary of State's concern that water companies should invest more of their profits addressing environmental challenges, before passing their costs on to consumers. (Paragraph 54)
9. *We believe that the Government should consider whether a longer-term approach to river catchment planning and funding would deliver better environmental outcomes. Investment should be used to support farmers and other stakeholders who go beyond regulations and best practice, but it should not break the polluter pays principle. Such investment must ensure that environmentally sensitive sites are protected. We also recommend that the Environment Agency examines whether the sharing of evidence, data and best practice between stakeholders can be improved along with better engagement of farmers by the Agency.* (Paragraph 55)
10. To make progress on improving the ecological status of water, the Government will have to use higher standards than those used for drinking water. This should include setting stricter standards for nitrates in freshwaters, as is the case in other EU Member States. It will also need to take a holistic approach to different pollutants, their collective impact and their sources. The Government have produced two plans—the Clear Air Strategy and the New Farming Rules for Water, which seek to tackle the sources and causes of pollution whether it is water, air-or soil based. The Environment Agency and Minister accepted that a more holistic approach makes sense. (Paragraph 59)
11. *The Government should seek to ensure that various EU Directives and regulations are aligned and do not result in a siloed approach to individual pollutants but address them in their totality. The Government should also report on progress introducing mandatory water protection zones for vulnerable Natura 2000 sites, which it agreed to do in September 2015, and whether it is considering this approach more widely.* (Paragraph 60)

Air Quality

12. We have commented elsewhere on the Government's failure to meet air quality standards on nitrogen oxides, especially in relation to transport. We welcome progress on reducing particulate matter but we are disappointed that after many years of reductions in ammonia emissions they are beginning to rise. The Government has accepted that this is an issue that needs addressing. We would note that agriculture contributes 88% of ammonia emissions and nearly half of which are from cattle and about a quarter are from fertiliser applications. These are key areas where the Government needs to focus if recent rises in ammonia emissions are to be reversed and reductions made. (Paragraph 74)
13. We welcome the Government's acknowledgement that both nitrogen oxides and ammonia are key air quality problems that need to be addressed. Plans to use urea inhibitors seem a sensible idea, as does extending IPCC emission permits to dairy farmers. Farmers should be paid for the delivery of public goods, and the new code on good practice for ammonia emissions, and better support for investment in farm infrastructure are both welcome. However, we note that other countries, such as Denmark and the Netherlands, have taken a more regulatory approach to controlling emissions which has led to significant reductions in their emissions. (Paragraph 79)
14. *We recommend that the Government considers whether it can better align policies on water, air and soil and the interaction between nitrogen in its various forms so that actions in one area do not have a negative impact in another. For instance, it needs to ensure that greater use of anaerobic digestion to reduce nutrients leaching into water sources does not lead to greater ammonia emissions, which have increased over the last two years. Better alignment needs to ensure that regulations and regulators are fully joined up across agriculture, water and air quality and that this is fully reflected in future agricultural payments based on the provision of 'public goods'. For such a joined-up approach to work effectively after the UK leaves the EU, it is imperative that an independent overarching body can oversee these overlapping areas and enforce compliance. This further strengthens our case for an Environmental Enforcement and Audit Office (EEAO).* (Paragraph 80)

Agriculture and Nitrogen Pollution

15. We welcome the introduction of the New Farming Rules for Water, especially the focus on soil health, which we have previously championed, and the linkages with water quality. It is important that the rules are supported by good advice and information for farmers and other land managers so that the right behaviours and practices are encouraged and link to other policies and regulations, such as the wider rules for Nitrate Vulnerable Zones and those which seek to address ammonia emissions. Equally important is that data and evidence is collected and maintained to show that the rules are having an impact in improving water and soil quality and that sufficient resources are given to regulators to ensure compliance. (Paragraph 89)
16. *We recommend that the Government explores solutions to the logistical problems of moving organic animal waste from livestock farms to arable farms. This could address the challenge of storing and managing animal waste and mitigating ammonia*

emissions whilst reducing the use of artificial fertiliser. The Government should also explore other incentives for reducing artificial fertiliser use, such as nitrogen and phosphorous budgets, and the concept of a nitrogen price. (Paragraph 94)

17. Anaerobic digestion offers an effective solution to managing sewage sludge and repurposing waste as a resource. This can be used as a renewable energy source and as a bio-fertiliser which can reduce the need for artificial fertiliser. Both uses have the added advantage of reducing carbon emissions, including reductions in the emissions required to manufacture artificial nitrogen fertilisers. This area is regulated by the EU, UK and an assurance scheme. Compliance is essential to realising the advantages of anaerobic digestion. *The Government should set out how it is monitoring anaerobic digestion and ensuring compliance and how this is supporting reductions in air, water and soil nitrate pollution. (Paragraph 98)*
18. *The Government should conduct an assessment to understand how future pressures, such as population growth and climate change, might impact upon air, water and soil quality. This could include working with the Committee on Climate Change to develop models and scenarios to help guide the Government's nitrogen reduction strategy, as it has for reducing greenhouse gas emissions. The Committee could also help the Government ensure that such a strategy was aligned with other objectives such as delivering the Government's Carbon Budgets. (Paragraph 99)*

Monitoring, Enforcement and Resourcing Issues

19. We are concerned that a number of witnesses told us that the monitoring system for water quality was not fit for purpose and that figures supplied by the Environment Agency show that the numbers of samples taken, tests carried out and funding have decreased in recent years. Despite the Agency telling us that this is due to increased efficiency, we are troubled that this is occurring ahead of the UK leaving the EU and implementation of the Government's 25 Year Environment Plan, and before the 2018 New Farming Rules for Water have fully bedded in. We think that it is imperative that good monitoring is in place to provide a baseline against which these new policies can be measured. (Paragraph 105)
20. *The Environment Agency should publish the results of its Strategic Monitoring Review as soon as possible and provide evidence that its monitoring is comprehensive in terms of: the range and number of sites; the frequency of testing; the amount of third party information it is using; the full range of pollutants and their combined impact upon water quality; the impact of farming practices and pollution mitigation strategies; the correct balance between modelling and data. This is important as it provides the evidence base for policies and future investment decisions and ensures that Government policies can be scrutinised and progress can be monitored. (Paragraph 106)*
21. We are concerned that a number of witnesses suggested that the EA lacks the resources it needs to ensure compliance with the existing regime and rules. We do not believe that 30 FTE Inspectors to cover the whole of England is enough. The regime is also fragmented with various bodies involved, both regulators and market-led assurance bodies. Though prosecutions may not necessarily be the best guide to the effectiveness of the regime, only 20 prosecutions between 2012 and 2016 seems too low. There is a danger that a poorly regulated and resourced regime

will discourage farmers and others to comply if they see neighbours flout the rules without a penalty. A poorly resourced and fragmented compliance regime also risks public money, especially in the form of cross compliance payments, being misused. A lack of resources will also undermine the credibility of the Government's 25 Year Plan for the Environment, and of any new system and the compliance body that will oversee it if the UK leaves the EU. *The Government needs to bring forward plans and costings to indicate that it has sufficient resources to enable effective enforcement and oversight.* (Paragraph 114)

Monitoring, Compliance and Enforcement after the UK Leaves the EU

22. We are concerned that, despite the assurances of the Minister, the compliance regime for EU water quality and nitrate directives can not be fully transposed into UK law and run the risk, as we have warned before, of ending up as 'zombie' legislation. These laws will no longer be updated to take account of changes across the EU and will be divorced from the EU institutions which ensure administrative support, compliance and enforcement. While we welcome the Secretary of State's acknowledgement of the need for an environmental watchdog to fill the Commission-shaped hole and to replace the European Court of Justice, we are worried that his proposals do not provide an independent body with sufficient powers to ensure that statutory water quality and pollution reduction targets are met. We are also concerned that it will be more difficult to bring cases against the Government for breaches of nitrate pollution and water quality legislation. In addition, we are concerned that if the current system of monitoring, compliance and enforcement is currently under-resourced, as several witnesses told us, regulators such as the Environment Agency will struggle to take on responsibilities previously undertaken by EU institutions. (Paragraph 120)
23. *The Government should ensure that its draft environmental bill includes a watchdog as we have recommended, with sufficient powers to enforce compliance with statutory water quality targets, fine Government departments and public authorities for non-compliance, and allow complaints for breaches to be raised and dealt with by the courts. The Government also needs to provide assurance that the post-EU regulatory system will be sufficiently resourced.* (Paragraph 121)
24. Despite the Minister telling us that the Government had no intention of watering down commitments on reducing water pollution and improving water quality we are very disappointed that the Water Framework Directive (WFD) target of 'good status' for all ground and surface waters in the EU by 2027 has not been retained within the 25 Year Environment Plan. The Plan's aim to ensure that at least three quarters of our water will be close to their natural state as soon as is practicable is a significant watering-down of the aim in the Directive. This retreat seemed to be confirmed by the Secretary of State's subsequent letter to the Chair concerning the challenging nature of the 2027 WFD target. We also question the absence of targets and key milestones within the Plan. The Minister contended that overall trends are more important, but interim targets and milestones are vital stepping stones to guide policy and measure progress. While we support the use of public funds to

support the provision of public goods this must not undermine the polluter pays principle and public money should fund public goods which go above and beyond compliance with regulatory requirements. (Paragraph 131)

25. *The Government should, as part of its upcoming environmental legislation, and as we argued in our report on its 25 Year Environment Plan, produce robust targets and milestones to underpin legally binding targets on water quality. If there is any weakening of long-term and interim national, EU or international water quality targets, the Government needs to provide an explanation of where they are weaker and why. We look forward to seeing the metrics for nitrate and water pollution by the end of the year, which we hope will underpin clear targets in line with or exceeding those set out in the Water Framework Directive.* (Paragraph 132)
26. We are concerned that if UK and EU policies on nitrate pollution and water quality diverge in the future it will present challenges for Northern Ireland, particularly its farmers, where there are shared water bodies. Regulatory alignment could also have an impact on the Government's proposals to tackle ammonia emissions through its Clean Air Strategy if there is a divergence in this area as well. *The Government should produce a strategy for dealing with future divergence for both water and air quality. This should include proposals for sharing river basins that span the Irish border according to catchment management principles.* (Paragraph 135)

Annex 1: Nitrogen Pollution: Sources and Impact

Box 2: Human Activities and Nitrogen Pollution	
Agriculture– Fertiliser	<p>Manufactured fertiliser containing urea, ammonium and nitrate, used to replace naturally occurring nitrogen in soil, increases agricultural production,¹ but over-use can run off and leach from crops and grasslands into water systems causing pollution.²</p> <p>Impact: The build-up of nutrients can lead to growth in some plants and algae leading to habitat changes and potential reduction in oxygen levels (i.e. eutrophication).³ In estuaries this can affect invertebrates, smother saltmarsh vegetation and interfere with waders and waterfowls' ability to feed. Excess nitrate in groundwater can also impact upon ecosystems which depend on such sources but also upon freshwaters, such as lakes, wetlands and headwater streams.⁴ It can also affect drinking water quality and lead to methaemoglobinaemia ('blue baby syndrome'), which was a particular risk to babies before the 1950s.⁵ To avoid this a nitrate standard was set - 50 milligrams of nitrates per litre,⁶ and a nitrite standard of 0.5 milligrams per litre.⁷</p>
Agriculture– Animal Waste	<p>Animal waste, particularly manure and slurry but also organic fertiliser, can lead to ammonia and nitrous oxide emissions and nitrate and phosphorous leaching into water systems,⁸ if it is not managed correctly.⁹</p> <p>Impact: As with fertiliser, manure leaching can cause eutrophication and affect ecosystems and drinking water.¹⁰ If it leads to ammonia emissions this can contribute to acidification and atmospheric particulate pollution, while nitrous oxide is a potent greenhouse gas,¹¹ and pollutant. Ammonia emissions can also have a deleterious impact on fauna and fungi.¹²</p>
Soil Quality Impact	<p>Depending on its use, the quality and composition of soil can affect both water and air quality by allowing various nutrients including nitrogen, to run off into water and wider ecosystems.¹³</p> <p>Impact: can lead to eutrophication and impact on various ecosystems.¹⁴</p>
Sewage (Urban Waste Water)	<p>Sewage is a mixture of domestic waste water from kitchens, bathrooms and toilets, the waste water from industries discharging to sewers and rainwater run-off from roads and other impermeable surfaces such as roofs, pavements and roads draining to sewers.¹⁵ This can cause a problem if it finds its way into water systems, for example, through discharges or flooding.</p> <p>Impact: Untreated waste water can lead to chronic ecosystem damage due to oxygen depletion of receiving waters from the biodegradation of organic matter.¹⁶ They also pose potential health risks from water-borne pathogens from discharges to waters used for recreational activities, such as swimming and canoeing.¹⁷</p>

Box 2: Human Activities and Nitrogen Pollution

Air Pollution	<p>Air pollution is caused by the emission of pollutants, either directly or through chemical reactions in the atmosphere. Sources include power stations, transport, household heating, agriculture and industrial processes. Key pollutants include nitrogen oxides (NO_x), ammonia (NH₃); and particulate matter (PM10 and PM2.5) and they can mix with other pollutants, such as ozone and sulphur dioxide. Nitrogen oxides are the generic name for a range of gases, including nitrous oxide, nitrogen dioxide, nitric oxide and nitrous oxide.</p> <p>Road transport is the main source of nitrogen oxides (particularly nitrogen dioxide and nitric oxide), followed by the electricity supply industry and other industrial and commercial sectors. The main sources of agricultural nitrogen oxide emissions are soils and animal waste. The over use of nitrate fertiliser is mainly responsible for nitrous oxide, a greenhouse gas. The main source of ammonia pollution is agriculture (82% in 2016), mainly through fertiliser use and livestock farming.</p> <p>Impact: Air pollution is “caused by the emission of pollutants, which either directly or through chemical reactions in the atmosphere lead to negative impacts on human health and ecosystems”.¹⁸ Nitrogen oxides (NO_x), especially nitrogen dioxide and nitric oxide, along with particulate matter (PM), and ozone (O₃) cause tens of thousands of early deaths, costing billions of pounds in health impacts each year.¹⁹ They can also have a negative impact on wildlife, such as a significant reduction in biodiversity.²⁰ This is because when any of the nitrogen oxides dissolve in water and decompose, they form nitric or nitrous acids which can lead to acidity and eutrophication.²¹</p> <p>One of the nitrogen oxides - nitrous oxide, is also powerful greenhouse gas and is measured by the Committee on Climate Change.²² The two main sources of agricultural nitrous oxide emissions are agricultural soils (77% in 2016) and waste and manure (20% in 2016) particularly through the use of inorganic fertiliser and urine and dung deposited on grassland.²³</p>
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- 1 The ability to use large amounts of manufactured nitrogen-containing fertiliser was enabled by the Haber-Bosch process, which allowed the creation of anhydrous ammonia and offered an alternative to techniques such as crop rotation (see BASF, [A new century in agriculture – the Haber-Bosch process](#)), while other processes have allowed the mass production of urea and nitrate (see European Fertiliser Manufacturers’ Association, [Production of urea and urea ammonium nitrate](#), (2000)).
- 2 See Parliamentary Office for Science and Technology, [Diffuse Pollution of Water by Agriculture](#), POST Note 478, (2014), pp 1–2; Food and Agricultural Organisation (FAO), [Control of water pollution from agriculture - FAO irrigation and drainage paper](#), (1996), Chapter 3; Wessex Water (NO30007); Professor Penny Johnes (NO30024); Brighton ChaMP for Water (NO30027); Wildlife and Countryside Link (NO30032); Friends of the Earth Northern Ireland (NO30034); RSPB (NO30037).
- 3 For eutrophication, its causes and consequences for ecosystems see: Chislock, M. F et al, [Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems](#). *Nature Education Knowledge*, (2013), vol. 4, no. 4, p 10; European Environment Agency, [Eutrophication](#), (accessed 21 May 2018); National Ocean Service, [What is eutrophication?](#), (accessed 21 May 2018).
- 4 Defra Written Evidence (NO30049); Plymouth Marine Laboratory NO30004.
- 5 For the symptoms of methemoglobinemia see: Lorna Fewtrell, [Drinking-Water Nitrate, Methemoglobinemia, and Global Burden of Disease: A Discussion](#), *Environmental Health Perspectives*, vol. 112, no 4, (2014), pp 1371–1374; Sally Bradberry, [Complications of poisoning: Methemoglobinemia](#), *Medicine*, vol. 40, Issue 2, (February 2012), pp 59–60. See also Dr Paul Kay, University of Leeds NO30006.
- 6 See WHO, [Nitrate and nitrite in drinking-water Background document for development of WHO Guidelines for Drinking-water Quality](#), (2011), p 16.
- 7 These levels are set in [the EU Drinking Water Directive \(98/83/EC\)](#), p 330/50.

- 8 See: National Farmers Union, [Diffuse Water Pollution Guidance](#), (accessed 5 June 2018); Parliamentary Office for Science and Technology, [Diffuse Pollution of Water by Agriculture](#), POST Note 478, (2014), p 2; Sue Everett (NO30003). Wessex Water (NO30007); Professor Penny Johnes (NO30024); Brighton ChaMP for Water (NO30027); ADAS (NO30029); Centre for Ecology and Hydrology (NO30033); Friends of the Earth Northern Ireland (NO30034).
- 9 See: National Association of Agricultural Contractors, [Best Practice in Slurry and Manure Application](#), (2008).
- 10 See: National Association of Agricultural Contractors, [Best Practice in Slurry and Manure Application](#), (2008).
- 11 Eurostat, [Agriculture and Environment: Pollution Risks](#), (December 2017), p 7. Natural England estimated in 2009 that agriculture contributed to 90% of ammonia emissions in the UK, of which the majority is from livestock farming (Natural England, [Environmental impacts of land management](#), NERR 30, (2009), p 52), whilst in 2017 the National Audit Office estimated that this figure was 81% (NAO, [Air Quality](#), (December 2017), p 6).
- 12 See: Plantlife, [We need to talk about Nitrogen: The impact of atmospheric nitrogen deposition on the UK's wild flora and fungi](#), (June 2018).
- 13 Environmental Audit Committee, [Soil Health](#), (HC 180; June 2016), p. 5, p 17, p 22, and p 30,
- 14 We recommended that the Government should “produce and consult on proposals to increase the ambition, scope and effectiveness of cross compliance to mitigate the impact of agriculture on soil health and incentivise provision of wider ecosystems services such as water quality and flood protection”.
- 15 See: European Commission Environment Directorate, [Glossary of terms related to Urban Waste Water](#), (accessed 10 June 2018); Defra, [Waste water treatment in the United Kingdom – 2012: Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EEC](#), (2012), p 3.
- 16 For eutrophication, its causes and consequences for ecosystems see: Chislock, M. F et al, [Eutrophication: Causes, Consequences, and Controls in Aquatic Ecosystems](#). *Nature Education Knowledge*, (2013), vol. 4, no. 4, p 10; European Environment Agency, [Eutrophication](#), (accessed 21 May 2018): National Ocean Service, [What is eutrophication?](#), (accessed 21 May 2018).
- 17 See: Defra, [Waste water treatment in the United Kingdom – 2012: Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EEC](#), (2012), p 3.
- 18 Defra, [Emissions of Air Pollutants in the U1K 1970 to 2016](#), (February 2018), p 3.
- 19 See also NAO, [Air Quality](#), (December 2017); Lancet, [Commission on Pollution and Health](#), (October 2017); Royal College of Physicians and Royal College of Paediatrics and Child Health, [Every Breath We take: The Lifelong Impact of Air Pollution](#), (2016); p 6 and Defra, [Effects of air pollution](#), (accessed 10 June 2018). See also European Environment Agency, [Air Quality in Europe - 2017](#), (October 2017), Chapter 10, pp 55–60.. More recent research has suggested that air pollution can also cause brain damage and impact on intelligence - see: Xiaobo Zhang, [Time to act: air pollution is damaging our brains as well as our lungs](#), *Daily Telegraph*, (October 2018) and Xin Zhang, Xi Chen, and Xiaobo Zhang, [The impact of exposure to air pollution on cognitive performance](#), *Proceedings of the National Academies of Sciences of the United States of America*, (August 2018), vol 115, no 37, pp 9193–9197.
- 20 See also: Defra, [Emissions of Air Pollutants in the UK: 1970–2016](#), (February 2018), p 4 and Plantlife, [We need to talk about Nitrogen: The impact of atmospheric nitrogen deposition on the UK's wild flora and fungi](#), (June 2018). See also European Environment Agency, [Air Quality in Europe - 2017](#), (October 2017), Chapter 11, pp 61–65.
- 21 See: European Commission, [In-Depth Report: Nitrogen Pollution and the European Environment Implications for Air Quality Policy](#), (2013), pp 5–9.
- 22 See: The Conversation, [Nitrogen pollution: the forgotten element of climate change](#), (December 2016).
- 23 Committee on Climate Change, [Reducing UK Emissions: 2018 Progress Report to Parliament](#), (June 2018), p 184 -188.

Annex 2: Water Quality Directives

Directive	Key Elements
Water Framework Directive (WFD)	<p>This Directive is the EU's key water quality directive and was established for the assessment, management, protection and improvement of water quality.²⁴ It stipulates that EU member states should aim to achieve good status of water in all bodies of surface and ground water by 2015, or 2027 by the latest. It sets out certain standards for this to be achieved and includes measures for drinking water status and targets associated with the Habitats and Birds Directives.²⁵ Good status involves meeting certain standards for water ecology,²⁶ chemistry,²⁷ and quantity of waters and at a general level that water shows only a slight change from what would normally be expected under undisturbed conditions.²⁸ The European Commission is carrying out an Evaluation and Fitness Check Roadmap on the WFD and related Directives, which is due to finish in 2019.²⁹</p> <p>The Directive is transposed in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended). Regulation is provided by the Environment Agency in England and by Natural Resources Wales.³⁰ Separate legislation applies in Scotland and Northern Ireland, regulated respectively by the Scottish Environment Protection Agency (SEPA),³¹ and the Department of Environment Northern Ireland (DAERA).³²</p>
Drinking Water Directive	<p>This seeks to ensure that drinking water is fit for human consumption.³³ It requires Member States to regularly monitor and test drinking water with 48 microbiological, chemical and indicator parameters.³⁴ The Directive also requires that Member States produce water quality reports every three years for the European Commission and relevant information for the public. The Directive is currently under review.³⁵</p> <p>EU measures are transposed in England through The Water Supply (Water Quality) Regulations 2016.³⁶</p>

<p>Bathing Water Directive</p>	<p>This requires Member States to protect bathing water areas, monitor and assess bathing areas for two parameters of faecal bacteria and ensure that bathing waters are integrated with other EU measures protecting the quality of water bodies through the Water Framework Directive.³⁷ Member States must monitor bathing waters every year, with some exemptions. Bathing waters are classified as: poor, sufficient, good or excellent, which are based on bacteriological quality. The category “sufficient” is the minimum quality threshold that all Member States should have attained by the end of 2015 at the latest. Tackling nitrates is a key element in achieving excellent bathing water quality and the measures supported by the Nitrates Directive, whilst tackling nitrate pollution, will also have a positive impact on reducing phosphate pollution.³⁸</p> <p>The Bathing Directive is implemented in England by The Bathing Water (Amendment) (England) Regulations 2018.</p>
<p>Ground Water Directive</p>	<p>This helps underpin the WFD by setting baseline groundwater quality standards and established pollution trend studies.³⁹ It also calls for measures to prevent or limit inputs of pollutants into groundwater to be operational so that WFD environmental objectives can be achieved by 2015 and for reviews of technical provisions of the directive to be carried out every six years thereafter to ensure compliance with good chemical and quantitative status criteria,⁴⁰ based on EU standards of nitrates and pesticides and on threshold values established by Member States.⁴¹</p> <p>The Directive, as amended, is transposed in England by The Groundwater (Water Framework Directive) (England) Direction 2016, and guidance is provided on how to protect groundwater and prevent groundwater pollution.⁴² The Government can introduce a number of measures to further protect water bodies. When an area is designated as a Water Protection Zone (WPZ), the regulator can apply additional measures to manage the area and/or stop activities that cause or could cause further damage or pollution to water. Only one WPZ has been designated: in the river Dee catchment in England and Wales in 1999 following a series of accidental chemical pollution incidents. Groundwater source protection zones are defined by the Environment Agency for groundwater sources to apply a general level of protection for all drinking water sources. Pollution prevention measures can be set up in area which are at higher risk and to monitor the activities of potential polluters nearby.</p>

<p>Urban Waste Water Directive</p>	<p>This seeks to protect the water environment from the adverse effects of discharges of urban waste water and from certain industrial discharges, including sensitive areas and their catchments which might be vulnerable to eutrophication.⁴³ The latter includes the impact of nitrates and phosphates. It requires pre-authorisation of all discharges of urban wastewater, of discharges from the food-processing industry and of industrial discharges into urban wastewater collection systems and monitoring of treatment plants and receiving waters. It also stipulates controls of sewage sludge disposal and re-use, and treated waste water re-use whenever it is appropriate.⁴⁴</p> <p>The Directive is implemented in England and Wales by The Urban Waste Water Treatment (England and Wales) Regulations 1994. The European Environment Agency noted in its evidence to us that pressures to water quality stemming from urban waste water and urban run-off to groundwaters are more significant than many of other EU countries.⁴⁵</p>
<p>Nitrates Directive</p>	<p>This aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices.⁴⁶ Member States are required to identify areas of polluted water or at risk of pollution. They can designate areas of land as Nitrate Vulnerable Zones (NVZs) which drain into polluted waters or waters at risk of pollution and which contribute to nitrate pollution or apply measures to the whole territory instead of designating NVZs. The Directive also calls for the establishment of Codes of Good Agricultural Practice to be implemented by farmers on a voluntary basis. Codes should include: limiting the use of nitrogen fertilisers to when crops need them and to the right conditions (e.g. weather and topography) to minimise nutrient leaching into water systems; good storage of livestock manure; crop rotations, soil winter cover, and catch crops to prevent nitrate leaching and run-off during wet seasons.</p> <p>The Nitrate Directive is implemented in England by the Nitrate Pollution Prevention (Amendment) Regulations 2016.</p>

24 See: European Commission, [The EU Water Framework Directive - integrated river basin management for Europe](#), (accessed 16 July 2018).

25 For instance, this includes Natura 2000 sites, which are sites that have been designated either as a Special Protection Area (SPA) due to the rare, vulnerable or migratory birds present or as a Special Area of Conservation (SAC) to protect scarce or threatened wild animals, plants or habitats.

26 Ecological status includes: biological quality (i.e. composition and abundance of specified elements such as fish, benthic invertebrates, aquatic flora); hydro morphological quality (e.g. river continuity, channel patterns, dynamics of flow or substrate of the river bed); physio-chemical quality (e.g. elements such as temperature, oxygenation, pH, nutrient conditions and the concentrations of specific pollutants (synthetic and non-synthetic)). See: House of Commons Library. [Water Quality](#), (July 2018), p 10.

27 Chemical status is measured by reference to environmental quality standards for chemical substances at European level (otherwise known as priority substances, such as benzene and lead), which specify maximum annual average concentrations for specific water pollutants. See: House of Commons Library. [Water Quality](#), (July 2018), p 10.

28 See European Environment Agency, [Freshwater Quality](#), (accessed 11 June 2018).

- 29 European Commission, [Fitness check of the Water Framework Directive and the Floods Directive](#), (accessed 25 July 2018).
- 30 In Scotland the Directive is implemented by the [Water Environment and Water Services \(Scotland\) Act 2003](#) and in Northern Ireland by the [Water Environment \(Water Framework Directive\) Regulations \(Northern Ireland\) 2017](#).
- 31 See: SEPA, [Water](#), (accessed 28 July 2018).
- 32 See: DAERA, [Water Pollution](#), (accessed 28 July 2018).
- 33 See: European Commission, [The Directive overview](#), (accessed 17 July 2018). The Directive was [reviewed](#) and a proposal to update it was submitted by the Commission in February 2018.
- 34 See European Commission Environment Directorate, [Drinking Water: The Directive Overview](#), (accessed 11 June 2018).
- 35 The European Commission has proposed a revision of the Directive, to bring into line with more up-to-date scientific evidence, to provide more information for the public, to better equip Members states to address risks and to tie in water supplies with the circular economy (e.g. better supply to reduce need for plastic bottle). See European Commission Environment Directorate, [Review of the Drinking Water Directive](#), (accessed 12 June 2018) and House of Commons Library, [Water Quality](#), (July 2018), pp 19–20.
- 36 There are separate regulations for [Wales](#), [Scotland](#) and [Northern Ireland](#).
- 37 See European Commission Environment Directorate, [Bathing water quality](#), (accessed June 2018).
- 38 European Environment Agency, [UK bathing water quality in 2017](#), (May 2018), p 9. E.g. Nitrate Sensitive Zones but also basin catchment to deal with diffuse agricultural nitrate pollution.
- 39 See: European Commission, [Groundwater as a resource](#), (accessed 21 July 2018).
- 40 See: House of Commons Library. [Water Quality](#), (July 2018), p 11–12, for an overview of quantitative and chemical status in groundwater bodies.
- 41 See European Commission, [Groundwater in the Water Framework Directive](#), (accessed 15 July 2018), which offers an overview of how the Groundwater Directive integrates with the WFD and other water quality Directives and measures.
- 42 See: Environment Agency, [Protect groundwater and prevent groundwater pollution](#), (March 2017).
- 43 For more detailed information on sensitive areas see: Defra, [Waste water treatment in the United Kingdom – 2012: Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EECA, \(2012\)](#), pp 11–15. For an up-to-date list of UK sensitive areas see: Defra, [Sensitive areas currently identified in the UK under the Urban Waste Water Treatment Directive since 1994](#), (accessed 12 June 2018).
- 44 See: European Commission Environment Directorate, [Urban Waste Water Directive Overview](#), (accessed 13 June 2018).
- 45 European Environment Agency NO30050. This included 24 EU countries, excluding Greece, Ireland, Lithuania and Slovenia.
- 46 European Commission Environment Directorate, [The EU Nitrates Directive](#), (2010), p 1.

Annex 3: Air Quality Directives

Directive	Key Elements
National Emissions Ceilings Directive	<p>The Directive sets levels for five pollutants (nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), sulphur dioxide (SO₂), ammonia (NH₃) and fine particulate matter (PM_{2.5})). It requires Member States to make national emissions reduction commitments, using 2005 as a base year. These national emission reduction commitments need to be met in two phases, from 2020 to 2029, with more stringent reductions from 2030 onwards.⁴⁷ The Directive was one of the EU's measures to implement the Gothenburg Protocol to the United Nations Economic Commission for Europe's (UNECE) Convention on Long Range Transboundary Air Pollution and its amendments.⁴⁸</p> <p>The Directive is transposed into UK legislation by the National Emission Ceilings Regulations 2018.</p>
Ambient Air Quality Directive	<p>This sets limits for ambient concentrations of seven pollutants (nitrogen dioxide, particulate matter, fine particulate matter, sulphur dioxide, lead, carbon monoxide and benzene).⁴⁹ Where pollution breaks the thresholds, air quality plans must be introduced to correct the situation. These may include specific measures to protect sensitive groups, such as children. If there is a risk that pollution levels may exceed the thresholds, short-term action plans to reduce road traffic, construction works or certain industrial activities, for instance, must be implemented.⁵⁰ The Directive requires the UK to report air quality data to the European Commission.</p> <p>The Directive is transposed into UK legislation through the Air Quality Standards Regulations 2010.</p>
Industrial Emissions Directive (IED)	<p>The IED aims to protect human health and the environment through the use of "Best Available Techniques" (BAT). BAT means the available techniques which are the best for preventing or minimising emissions and impacts on the environment. The European Commission produces BAT reference documents setting out the technology which must be used and the way the installation is designed, built, maintained, operated and decommissioned. Permits are required to operate in accordance with the Directive.⁵¹</p> <p>It is implemented through the Environmental Permitting (EP) regime in England and Wales, the Pollution Prevention and Control (PPC) regime in Scotland and in Northern Ireland through the Pollution Prevention and Control Regulations (Northern Ireland) 2013.⁵² The IED includes a requirement for businesses within Member States to take measures to reduce ammonia emissions. It applies to pig and poultry holdings if they have more than 2,000 production pig places (for pigs over 30 kg), 750 sow places or 40,000 poultry places.⁵³</p>

Medium Combustion Plant Directive	<p>This regulates pollutant emissions (including sulphur dioxide (SO₂), nitrogen oxides (NO_x)) from the combustion of fuels in plants used to heat large buildings (offices, hotels, hospitals, prisons) and industrial processes, as well as for power generation.</p> <p>It is transposed by The Environmental Permitting (England and Wales) (Amendment) Regulations 2018.</p>
<p>Other Related Directives and measures</p>	<p>In addition, the Common Agricultural Policy, the Nitrates Directive and the Industrial Emission Directive have targeted ammonia emissions from farming by changing farming practices, such as introducing pollution control measures in livestock farms and linking such practices to CAP payments through cross-compliance.⁵⁴</p>

- 47 See: Defra, [Explanatory Memorandum to the National Emission Ceilings Regulations 2018](#), (2018). For an overview of the limits and how they are recorded see: Defra, [UK and EU Air Quality Limits](#), (accessed 9 June 2018). This includes the production of an initial National Air Pollution Control Programme (NAPCP) by 1 April 2019 - see: EU Commission, [Draft Guidance on National Air Pollution Control Programmes](#), (March 2017).
- 48 The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone was amended in 2012 to inter-alia include particulate matter as a pollutant. See UNECE, [Parties to UNECE Air Pollution Convention approve new emission reduction commitments for main air pollutants by 2020](#), (2012). See House of Commons Library, [Brexit and Air Quality](#), (June 2018), pp 9–10.
- 49 It set the following emissions limits and deadlines for human health: by January 2005 for PM10: a maximum annual mean concentration of no more than 40µg/m³ and a 24 hour mean concentration of 50µg/m³ not to be exceeded more than 35 times a year; by January 2010 for NO : a maximum annual mean concentration of no more than 40µg/m³ and an hourly mean concentration of 200µg/m³ not to be exceeded more than 18 times in a year; by January 2015 for PM2.5: a maximum annual mean concentration of 25µg/m³; by January 2020 for PM2.5: a maximum annual mean concentration of 20µg/m³; by January 2010 for ozone: a target of a daily 8 hour ozone mean of 120 µg/m³ not to be exceeded more than 25 days year (averaged over 3 years). A long-term objective of a daily 8-hour ozone mean of 120 µg/m³, with no exceedances from January 2020. See: House of Commons Library, [Brexit and Air Quality](#), (June 2018) p 11.
- 50 See: House of Commons Library, [Brexit and Air Quality](#), (June 2018), p 8.
- 51 See: House of Commons Library, [Brexit and Air Quality](#), (June 2018), p 14.
- 52 See Defra, [Environmental Permitting Guidance Core Guidance For the Environmental Permitting \(England and Wales\) Regulations 2010](#), (updated 2013).
- 53 See: European Commission, [New EU environmental standards for large poultry and pig farms](#), (November 2017).
- 54 See: Eurostat, [Agri-environmental indicator - ammonia emissions](#), (accessed 21 July 2018).

Formal minutes

Tuesday 6 November 2018

Members present:

Mary Creagh, in the Chair

Philip Dunne Kerry McCarthy
Robert Goodwill

Draft Report (*UK Progress on Reducing Nitrate Pollution*), proposed by the Chair, brought up and read.

Paragraphs 1 to 135 read and agreed to.

Summary agreed to.

Resolved, That the Report be the Eleventh 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.

[The Committee adjourned]

Witnesses

The following witnesses gave evidence. Transcripts can be viewed on the [inquiry publications page](#) of the Committee's website.

Wednesday 28 February 2018

Professor Robert Ward, Director of Science, British Geological Survey;
Professor Helen Jarvie, Principal Scientist Hydrochemistry, Centre for Ecology and Hydrology; **Professor Penny Johnes**, Professor of Biogeochemistry, University of Bristol. [Q1–49](#)

David Johnson, Director of the Rivers Trust, representing Wildlife and Countryside Link; **Will Andrews Tipper**, Head of Natural Environment, Green Alliance. [Q50–88](#)

Tuesday 6 March 2018

Dr Lucinda Gilfoyle, Head of Catchment and Coastal Strategy, Anglian Water, **Paul Stanfield**, Catchment Delivery Manager, Wessex Water, and **Mark Morton**, Senior Hydrogeologist, Yorkshire Water Services Ltd. [Q89–133](#)

Paul Cottingham, Environment and Land Use Adviser, SW National Farmers Union, **Aileen Lawson**, Senior Policy Officer Ulster Farmers Union, **Fraser McAuley**, Land Use Policy Adviser, CLA, **Jane Salter**, Head of Environmental Policy, Agricultural Industries Confederation, and **Helen Browning**, Chief Executive, Soil Association. [Q134–202](#)

Wednesday 21 March 2018

George Eustice MP, Minister of State for Agriculture, Fisheries and Food, Defra and **Helen Wakeham**, Deputy Director of water quality, groundwater and land contamination, Environment Agency. [Q203–307](#)

Published written evidence

The following written evidence was received and can be viewed on the [inquiry publications page](#) of the Committee's website.

NO3 numbers are generated by the evidence processing system and so may not be complete.

- 1 ADAS ([NO30029](#))
- 2 Agricultural Industries Confederation ([NO30040](#))
- 3 Anglian Water Services Ltd ([NO30022](#))
- 4 Assured Biosolids Ltd ([NO30041](#))
- 5 Brighton ChaMP for Water ([NO30027](#))
- 6 British Geological Survey ([NO30019](#))
- 7 Centre for Ecology & Hydrology ([NO30033](#))
- 8 CLA (Country Land & Business Association) ([NO30002](#))
- 9 Defra and the Environment Agency ([NO30053](#))
- 10 Department for Environment, Food and Rural Affairs ([NO30049](#))
- 11 European Environment Agency ([NO30050](#))
- 12 Friends of the Earth Northern Ireland ([NO30034](#))
- 13 Game & Wildlife Conservation Trust ([NO30043](#))
- 14 Green Alliance ([NO30042](#))
- 15 Hafren Water Ltd ([NO30035](#))
- 16 HM Government of Gibraltar ([NO30052](#))
- 17 John Innes Centre ([NO30023](#))
- 18 Lagan Rivers Trust ([NO30017](#))
- 19 Mrs Harriett Moore-Boyd ([NO30028](#))
- 20 Ms Sue Everett ([NO30003](#))
- 21 National Farmers Union ([NO30012](#))
- 22 National Trust ([NO30046](#))
- 23 Newry & District Anglers Association ([NO30024](#))
- 24 Northern Ireland Environment Link Freshwater Task Force ([NO30039](#))
- 25 Northumbrian Water Group ([NO30044](#))
- 26 Plymouth Marine Laboratory ([NO30004](#))
- 27 Professor David Reay ([NO30001](#))
- 28 RSPB ([NO30037](#))
- 29 Six Mile Water Trust ([NO30016](#))
- 30 Soil Association ([NO30038](#))
- 31 Sustainable Food Trust ([NO30047](#))
- 32 Ulster Farmers' Union ([NO30009](#))
- 33 University of Bristol ([NO30026](#))

- 34 University of Leeds ([NO30006](#))
- 35 Wessex Water ([NO30007](#))
- 36 West Country Rivers Trust ([NO30048](#))
- 37 Wildlife and Countryside Link ([NO30032](#))
- 38 Yorkshire Integrated Catchment Solutions Programme (iCASP) ([NO30051](#))
- 39 Yorkshire Water Services Ltd ([NO30021](#))

List of Reports from the Committee during the current Parliament

All publications from the Committee are available on the [publications page](#) of the Committee's website. The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2017–19

First Report	Plastic bottles: Turning Back the Plastic Tide	HC 339
Second Report	Disposable Packaging: Coffee Cups	HC 657
Third Report	The Ministry of Justice: Environmental Sustainability	HC 545
Fourth Report	Improving air quality	HC 433
Fifth Report	UK Progress on Reducing F-gas Emissions	HC 469
Sixth Report	Green finance: mobilising investment in clean energy and sustainable development	HC 671
Seventh Report	Greening Finance: embedding sustainability in financial decision making	HC 1063
Eighth Report	The Government's 25 Year Plan for the Environment	HC 803
Ninth Report	Heatwaves: adapting to climate change	HC 826
First Special Report	The Future of Chemicals Regulation after the EU Referendum: Government Response to the Committee's Eleventh Report of Session 2016–17	HC 313
Second Special Report	Marine Protected Areas Revisited: Government Response to the Committee's Tenth Report of Session 2016–17	HC 314
Third Special Report	Sustainable Development Goals in the UK: Government Response to the Committee's Ninth Report of Session 2016–17	HC 616
Fourth Special Report	Plastic bottles: Turning Back the Plastic Tide: Government Response to the Committee's First Report	HC 841
Fifth Special Report	Disposable Packaging: Coffee Cups: Government's Response to the Committee's Second Report	HC 867
Sixth Special Report	The Ministry of Justice: Environmental Sustainability: Government's Response to the Committee's Third Report	HC 982
Seventh Special Report	Improving air quality: Government Response to the Committee's Fourth Report	HC 1149
Eighth Special Report	UK Progress on reducing F-gas Emissions: Government's Response to the Committee's Fifth Report Eighth	HC 1406
Ninth Special Report	Green finance: mobilising investment in clean energy and sustainable development: Government Response to the Committee's Sixth Report	HC 1450

Tenth Special Report	Heatwaves: adapting to climate change: Government Response to the Committee's Ninth Report	HC 1671
Eleventh Special Report	Greening Finance: embedding sustainability in financial decision making: Government Response to the Committee's Seventh Report	HC 1673
Twelfth Special Report	The Government's 25 Year Plan for the Environment: Government Response to the Committee's Eighth Report	HC 1672