House of Commons

Environmental Audit Committee

Soil Health

First Report of Session 2016–17

HC 180

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Report, together with formal minutes relating to the report

Ordered by the House of Commons to be printed 25 May 2016

HC 180
Published on 2 June 2016
by authority of the House of Commons

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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Summary

Soil, water and air are all essential to human life and society—but of these three, soil is often the forgotten component. Yet soil is crucial to agricultural production, climate change mitigation and adaptation, urban development, and flood risk management. Neglecting the health of our soil could lead to reduced food security, increased greenhouse gas emissions, greater flood risk, and damage to public health. We heard that some of the most productive agricultural land in the country is at risk of becoming unprofitable within a generation due to soil erosion and loss of organic carbon, and the natural environmental will be seriously harmed. The Government says it will ensure that all soils are managed sustainably by 2030. Our inquiry suggests that the Government's actions do not match its ambition, and casts doubt on whether we are on track to achieve the 2030 goal.

Around 300,000 hectares of soil are thought to be affected by legacy contamination from the UK's industrial past. Local authority duties to clean up contaminated land are set out in the Environmental Protection Act 1990. Defra has recently withdrawn capital grant funding for local authorities to clean up contamination. Defra refused to assess the impact of withdrawing the grants, saying that other local authority funding would suffice. This is surprising given that the bulk of contamination clean-up under the relevant part of the Act was funded by Defra's capital grants. We are concerned that Defra appears complacent about this policy, and that in withdrawing the funding it has undermined local authorities' ability to meet their statutory duties. We have heard evidence that Defra is wrong to dismiss the impact of its policy: some local authorities now have no budget to investigate contamination, and we heard that it would be 'reckless' for a local authority to investigate a site if there is no funding in place for remediation. This presents the real danger that contaminated sites are being left unidentified, with consequential public health impacts. A small amount of temporary funding was recently announced, but we call on Defra to continue this funding and set it at the level of the previous scheme.

Soil is a massive carbon sink, storing three times as much carbon as the atmosphere. Soil carbon is particularly concentrated in peatlands. Degradation of soil leads to increased carbon emissions and contributes to climate change—so each tonne of carbon retained in soil provides flexibility elsewhere in the economy for meeting our carbon budgets. The carbon content of soil is also important to wider soil health. The UK's arable soils have seen a worrying decline in carbon levels since 1978, with widespread and ongoing decline in peat soil carbon. At COP21 the Government signed up to a scheme to increase soil carbon levels by 0.4% per year. Our witnesses told us that methods to increase soil carbon are well-understood but not implemented to their full potential. The Government must set out specific, measureable and time-limited plans to meet the goal to increase soil carbon. The Government should take tougher action to tackle land use practices which degrade peat, such as burning of blanket bogs. It should also explain how the results of its research into lowland peat management will inform its 25-year environment plan.

The Government relies on 'cross-compliance' rules associated with farm payments to regulate agricultural soil health. Landowners are required to keep their land in good agricultural and environmental condition, and can be fined if they breach rules requiring minimum soil cover, management of erosion, and maintenance of soil organic matter. However, we heard evidence suggesting that the rules and their implementation are not sufficient to support the Government's 2030 ambition to manage soil sustainably. Crucial elements of soil health, such as structure and biology, are not assessed at all. The rules are accompanied by a minimalistic inspection regime which Defra aims to reduce further, and only two breaches were detected in 2015. The rules allow for excessive loopholes and often focus on preventing practices which are already widely abandoned. Moreover, the rules focus primarily on preventing further damage to soil, when an effective system would also focus on restoration and improvement of soil health. We call on the Government to review and consult on its implementation of cross-compliance to increase the scope, force and ambition of the scheme.

Knowing how our actions are affecting soil health is crucial to developing effective policy. However, the UK lacks an ongoing national-scale monitoring scheme for soil health. Many indicators of soil health change slowly, so it is appropriate to measure only every few years—but successive Governments have neglected to establish a rolling scheme to monitor soil health. We heard that such a scheme could be affordable and would not be overly difficult to establish. We call on the Government to set up such a scheme and to explore whether innovations from Wales, involving alignment and co-funding with EU payments, could be rolled out to the rest of the country.

The Government has an ambitious goal to ensure that all soils are managed sustainably by 2030. Current policy does not put us on a trajectory to meet this goal. Further action is required to back up the Government's laudable words on soil health. The Government should use its upcoming 25-year environment plan to propose policies to strengthen soil protection, so that policies are not focused merely on damage limitation but encourage restoration and improvement of soil quality & organic matter.

1 Introduction: the importance of soil to society

1. Soil, water and air are all essential to human life and society—but of these three, soil is often the forgotten component. Soil plays a crucial role in many aspects of a functioning modern society, including agriculture, food security, climate change mitigation, and flood risk management.[1] Soil makes it possible for plants to grow: 95 percent of the world's food production is reliant on soil. Agricultural production from UK soil is worth £5.3bn per year.[2] Soil supports urban development, providing a mechanical foundation for infrastructure and housing. Soil stores and regulates water and so assists in flood risk management. Healthy soil stores a large amount of carbon and so helps protect against climate change. By contrast, degraded soil emits carbon into the atmosphere, potentially speeding up climate change. Soil is home to a quarter of the earth's biodiversity including earthworms, fungi and bacteria which maintain its fertility and provide raw materials for the medical industry.[3]

2. The UK's soils are relatively young, having been formed around 10,000 years ago after the last ice age. By comparison, some soils in Africa and Australia are thought to have formed 65-144 million years ago.[4] Soil grows slowly—it takes an average of 100 years to generate 1cm of topsoil.[5] Since any soil loss is not recoverable within a human lifespan, soil should be regarded as a non-renewable resource.[6] Nevertheless, we heard that soils are sometimes managed as if they were abundant resources.[7]

3. Soil is a 'Cinderella' environmental issue. Despite soil health underpinning many functions of society, we were told repeatedly that it does not receive due attention relative to other issues such as air quality, water quality and biodiversity—either in terms of statutory protection, Government policy attention, or public interest.[8] We also heard evidence that the UK's soils are in increasingly poor condition. Research has suggested that the UK's agricultural capacity is in danger,[9] that the current rate of soil erosion is 10-100 times higher than it has been in the past, and that 2.2 million tonnes of soil is eroded each year in the UK.[10] It was estimated in 2011 that the cost of soil degradation in England and Wales is between £0.9 billion and £1.4 billion per year.[11] The main costs relate

1 Centre for Ecology and Hydrology (SHI72); Wardell Armstrong LLP (SHI69); Dr Arwyn Jones (SHI76); ADAS UK (SHI23); Willie Towers (Q1); CIWEM (SHI15)
2 Soil Security Programme (SHI48)
3 James Hutton Institute (SHI52); STARS (SHI55); British Geological Society (SHI36); CIWEM (SHI15); British Ecological Society (SHI58); Dr Tim Harrod (SHI09); Prof Mark Hodson (SHI03); Institute for Global Food Security (SHI64); Lancaster Environment Centre (SHI14); Microbiology Society (SHI74); Soil Security Programme (SHI48); Robert Palmer (SHI10); Soil First Farming (SHI65); STARS (SHI55)
4 Macaulay Institute, The Soil Beneath Your Feet
5 Prof Richard Bardgett (SHI49); British Ecological Society (SHI58); Dr Jacqueline Hannam (SHI41)
6 UN FAO, Soil Infographic; Reading Agricultural Consultants (SHI73); Scotland's Rural College (SHI22)
7 Dr Arwyn Jones (SHI76); Sue Cornwell (Q2)
8 Prof Richard Bardgett (SHI49); Soil Security Programme (SHI48); Soil Association (SHI62); The Geological Society (SHI51); Wardell Armstrong LLP (SHI69); S Atkinson (SHI8); ADAS UK (SHI23); Willie Towers (Q1); CIWEM (SHI15); Compassion in World Farming (SHI42); Soil Security Programme (SHI48); Newcastle University (SHI63); Newcastle University Student and Staff Soil Science Society (SHI31); RCUK (SHI53); David Powlson (Q81)
9 Edmonson et al 2014, Urban cultivation in allotments maintains soil qualities adversely affected by conventional agriculture, Journal of Applied Ecology; See also Sustainable Food Trust (SHI78)
10 Rothamsted Research (SHI18); Centre for Ecology and Hydrology (SHI72); James Hutton Institute (SHI52); The Woodland Trust (SHI38)
11 Graves et al, The total cost of soil degradation in England and Wales

to greenhouse gas emissions, agricultural costs, loss of productivity, and flooding as a result of soil degradation. Degradation is likely to be further increased by climate change: warmer and drier weather may increase the decomposition of organic matter within soils, leading to carbon losses and increased greenhouse gas emissions, whilst more extreme rainfall events will increase erosion risk.[12]

4. The increase in urban development and our industrial heritage are also contributors to soil degradation. An estimated 300,000 hectares of land in the UK are affected to some degree by contamination. [13] Past industrial sites have left a legacy of soil contaminated by the disposal of waste materials on site and the demolition of building containing toxic elements, such as cadmium, arsenic and lead, at levels which are detrimental to human health. This contaminated land restricts the use of brownfield land for urban development.[14]

5. Soil can be defined as "a dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms".[15] Soil health is multi-faceted, depending on a range of biological, chemical and physical factors. Key components include: nutrients and acidity; organic carbon content; structure and water capacity; biological activities; and chemical pollution (particularly in urban soils).[16] Since soils are highly variable, any assessment of soil health has to be context dependent. For instance a healthy peat has very different properties to a healthy arable soil.[17]

Our inquiry

6. The Government has ambitious policy goals for soil management. In its 2011 Natural Environment White Paper, it announced an aspiration that soil should be managed sustainably by 2030.[18] Some of our witnesses expressed doubt that this aim could be met on the current trajectory.[19] The aim of our inquiry is to investigate whether the Government's action matches its ambition on soil health.

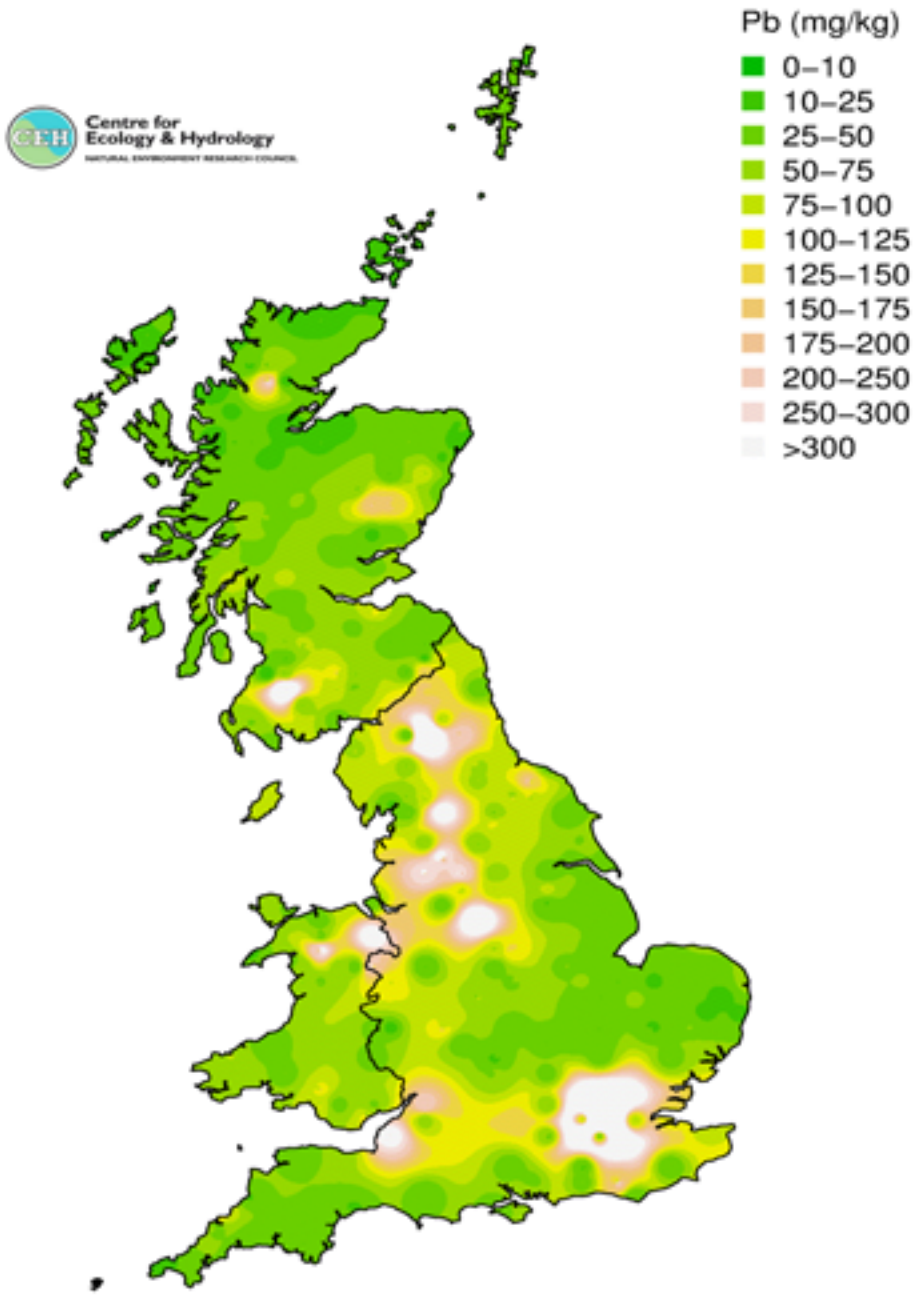
7. We held four evidence sessions and questioned a range of experts including academics, farming representatives, practitioners, and professional bodies. We received over 70 pieces of written evidence. A full list of witnesses can be found at the end of this report. We are grateful to everyone who gave evidence to this inquiry. We would also like to thank our specialist adviser Professor Bridget Emmett of the Centre for Ecology and Hydrology.

12 See Prof Richard Bardgett (SHI49); Dr Franciska de Vries (SHI32)
13 Defra, Dealing with contaminated land in England and Wales
14 Centre for Ecology and Hydrology (SHI72); Smart Growth UK (SHI29). Note that contamination is not limited to brownfield land and can also affect greenfield sites (Howard Price, Q134).
15 Brady, N.C. (1974). The Nature and Properties of Soils. New York: MacMillan
16 White Rose Sustainable Agriculture Consortium (SHI71); Microbiology Society (SHI74)
17 Rothamsted Research (SHI18). See also APPG on Agroecology (SHI40); Dr Tim Harrod (SHI09); National Farmers' Union (SHI44); National Trust (SHI68); RCUK (SHI53); Martin Rogers (Q6).
18 The Natural Choice: securing the value of nature, Defra, 2011
19 Lord Krebs (Q40); David Powlson (Q81)

2 Contaminated land

8. In 2005 it was estimated that 325,000 sites in the UK are affected by some degree of contamination, covering an area of 300,000 hectares.[20] Former factories, mines, steelworks, refineries and landfills have led to contamination by chemicals, heavy metals, tar, gases, asbestos and radioactive substances.[21] For example, Figure 1 shows the concentration of lead in Britain's topsoil.

Figure 1: Lead concentration in topsoil (Countryside Survey)



20 Defra, Dealing with contaminated land

21 Defra Contaminated Land Overview; See also The Geological Society (SHI51)

Contamination can also occur in greenfield land, for example as a result of agricultural pollution.[22] From a statutory perspective, land is contaminated if it contains substances which could cause significant harm or pollute controlled waters.[23] Untreated contamination may have a negative effect on public health. Research has found a statistically significant relationship between soil metal content and respiratory illnesses in Glasgow.[24] Further research found a statistically significant relationship between self-reported poor health and wards with a high proportion of brownfield sites, even when controlling for socio-economic factors.[25] Research is ongoing into the suspected link between persistent low-level soil contaminants and Primary Biliary Cirrhosis.[26] Further research suggests that historic coastal landfills could be significant sources of contamination if they were to be flooded or eroded.[27]

9. Part 2A of the Environmental Protection Act 1990, enacted in 2000, provides a mechanism for cleaning up contaminated land which cannot or will not be dealt with through the planning system or other voluntary measures. Part 2A sets out how local authorities should identify and remediate contaminated land, and the legislation requires local authorities to produce written strategies setting out how they will carry out their duties.[28]

10. Under Part 2A, the key principle is that the polluter responsible for causing or knowingly permitting the contamination should pay for remediation. If the polluter cannot be found, then the current owner or occupier will be liable.[29] In practice, however, Part 2A remediation is only funded by the original polluter in 9% of cases, and by the current owner or occupier in a further 8% of cases.[30] So the cost of remediation under Part 2A falls on the public purse far more often than not. Howard Price said:

> The Environmental Protection Act [was] supposed to make the polluter pay, which is fine. The trouble is that many of these polluters can no longer be found. Some of this contamination goes back hundreds of years, most of it for the last couple of centuries. The polluters are long gone. The next people on the list to be liable are the current occupiers who are often entirely innocent families without the means to do anything about this. In that case, the costs fall by default on the local authority. It is probably fair to say that the size of the scale of these costs was unexpected but it has run to tens of millions of pounds so far.[31]

11. Of all sites remediated between 2000 and 2013, it is estimated that 83% (72,000 sites) were dealt with through planning applications rather than through the Part 2A process described above. A further 7% (5,500 sites) were dealt with through Part 2A duties.[32]

22 Howard Price, Q135
23 Defra Statutory Guidance on Contaminated Land, 2012
24 Morrison S et al: An initial assessment of spatial relationships between respiratory cases, soil metal content, air quality and deprivation indicators in Glasgow, Scotland, UK: relevance to the environmental justice agenda (Environ Geochem & Health. 2014; 36(2): 319–332)
25 Bambra et al. (2014) Healthy Land? An examination of the area-level association between brownfield land and morbidity and mortality in England. Environment and Planning A 46:433-454; See also Dr Karen Johnson (SHI82)
26 Newcastle University (SHI63)
27 Floods and coastal erosion may expose contents of UK landfills, QMUL
28 Defra Statutory Guidance on Contaminated Land, 2012
29 Defra Statutory Guidance on Contaminated Land, 2012
30 Environment Agency, Dealing with contaminated land in England 2000–2013, April 2016
31 Howard Price, Q149
32 Cranfield CL:AIRE, An examination of contaminated land sector activity in England and Wales

However, we heard evidence suggesting that it is unwise to rely on the planning system to remediate all contamination. In noting that local authority action on contaminated land had declined, Dr Karen Johnson warned that a planning-only approach to clean-up may exacerbate inequality:

> Local authorities taking positive action and going out and remediating […] has dried up. It is only the planning system that can address those contaminated issues and, as I say, when we are in an economic downturn then they are not getting addressed. Even when they are getting addressed—[it is] in the high value sites, not the low value sites in lower socioeconomic status areas.[33]

Dr Johnson added that relying on the planning system leads to "low value, economically unviable sites for regeneration" not being remediated, so "we have a lot of pieces of wasteland in communities of lower socioeconomic status."[34]

12. Howard Price (Chartered Institute of Environmental Health) noted that there is ambiguity in the National Planning Policy Framework about whose responsibility it is to set environmental standards in planning. Mr Price also expressed concerns that the planning guidance on this matter has reduced dramatically in the National Planning Policy Framework, and that this is being "exploited to some extent by developers and in the case of appeal-averse planning authorities". He expressed concern that as a result, remediation through planning may not always leave sites entirely safe.[35]

Funding for remediation

13. In the past, Defra funding for clean-up of contamination has been available to local authorities in the form of contaminated land capital grants. This funding peaked at £17.5m in 2009/10 and fell to £2m in 2013/14. In December 2013 it was announced that the funding would be reduced to £0.5m in 2014 and then phased out from April 2017.[36] In 2013/14, the most recent year for which data is available, 41 of 79 grants were approved, awarding £1.5m of the £5.8m requested. The average grant value was £38,000, and the largest grant was £383,000 for a project in Wakefield.[37]

14. Rory Stewart, Parliamentary Under Secretary of State at Defra, told us that the funding stream had never been intended to be permanent, and described it as an attempt to "pump-prime" councils bringing forward projects.[38] He said:

> The central government funding, the Defra funding, was designed as a top-up to the money that local government itself spends on doing this. This was designed as surge funding in order to help us clear some of the backlog, which allowed us to tackle over 100 key sites, but it was not designed as a replacement for the money that the local government itself spends on research into contaminated land and amelioration of contaminated land.[39]

33 Dr Karen Johnson (Q140)
34 Dr Karen Johnson (Q134); See also Smart Growth UK (SHI29)
35 Howard Price (Q148)
36 Smart Growth UK (SHI29); For 2016/17, a "final" £0.4m contingency fund has been made available, targeted at sites where there is "imminent danger of serious harm".
37 Defra, Funding for contaminated land Grant scheme spreadsheet
38 Rory Stewart, Q224
39 Rory Stewart, Q210

However, this was not reflected in Defra's correspondence at the time of the withdrawal. We were provided with correspondence from 2014 from the then Parliamentary Under Secretary Lord de Mauley, suggesting that the funding had not been regarded as temporary. In a letter to the Chartered Institute of Environmental Health, Lord de Mauley described the withdrawal as "regrettable, but necessary given current circumstances and departmental budget cuts".[40] In addition, the funding stream has been available in various forms since before the Environmental Protection Act was enacted in 2000,[41] so a description of it as "temporary" does not seem apt.

15. After the announcement of funding withdrawal, Defra was asked in a written question whether it had assessed the potential impact on local authorities' ability to meet their statutory duty under Part 2A. George Eustice, answering for Defra, said that no such assessment had been carried out:

> Funding to support local authorities in fulfilling their statutory obligations under part 2A of the Environmental Protection Act 1990 remains in the form of the Revenue Support Grant. An assessment of the impact on local authorities of the withdrawal of the Contaminated Land Capital Grants Scheme has therefore not been undertaken.[42]

This reasoning matches Defra's 2013 letter to local authorities announcing this change, which noted that "funding for local authorities to fulfil their statutory obligations under Part 2A […] will continue to be provided through the Revenue Support Grant".[43]

16. However, data suggests that the capital grant funding was crucial to Part 2A remediation, with 81% of Part 2A remediation being funded by Defra capital grants between 2000 and 2013. Polluters or current owners/occupiers funded 17% of Part 2A remediation, and less than 2% of cases are recorded as being remediated through "other public funding (e.g. local authority funding)".[44] This suggests that Revenue Support Grant funds have rarely been made available for Part 2A remediation. Howard Price also expressed doubt that Revenue Support Grant funding is used adequately for contaminated land remediation:

> The trouble with that is that the amount that individual local authorities are allocated for this work is not disclosed to them and it is not ring-fenced, so they don't know if they are getting what they should and many of my colleagues in local authorities say they never see a penny of it because it is siphoned off to somewhere else.[45]

17. Our witnesses expressed concern at the consequences of withdrawing the Contaminated Land Capital Grants Scheme. Prof Chris Collins (Soil Security Programme, University of Reading) said that it might affect the identification of contaminated sites:

> [The] decision meant that a lot of the site identification that was occurring up to that point stopped [… .] [Previously,] if you had a large site that was beyond

40 Correspondence between Defra and CIEH, 2013–14 (SHI87)
41 See discussion of the Supplementary Credit Approvals scheme in House of Commons Library, Local Government Finance (Supplementary Credit Approvals) Bill 1997/98; Smart Growth UK (SHI29)
42 PQ Joan Walley to George Eustice, 182027, 6 Jan 2014
43 Correspondence between Defra and CIEH, 2013–14 (SHI87)
44 Environment Agency, Dealing with contaminated land in England 2000–2013, April 2016
45 Howard Price (Q149)

> the capability of a particular council they could bid for money to address that particular site. That has gone, so for potentially large sites where is the money coming from to remediate these? There has been a loss of expertise as well with councils under financial pressure. I know of at least one instance where one environmental control pollution officer is now serving four councils where he used to serve one.[46]

Prof Collins added that this decision puts people at risk because "sites are not being identified whereas they would have been in the past".

18. Howard Price also said that the funding reductions have resulted in local authorities being unwilling to identify contaminated land:

> Without the prospect of remediation being funded, it would frankly be a reckless local authority that determined a site was contaminated without having identified someone in one of the very small proportion of cases—the 17% of cases—who could actually pay for it. You don't go along to someone's home and say, "There is an unacceptable risk from the land in your garden but, sorry, we know you cannot pay but we cannot pay either". It is a major block and it is making Part 2A virtually unworkable now. […] I have certainly heard of local authorities where staff have been told not to find contaminated land because of the cost consequences.[47]

Rory Stewart told the Committee that he did not recognise this risk.[48] However, Howard Price's view is echoed in York Council's 2016 contaminated land strategy. It states that one of its priorities is to "carry out detailed inspections of potentially contaminated sites as resources and service priorities allow"—but goes on to note that "no budget is available at present for this". York adds that "we have had insufficient funds to undertake any investigations since [Defra's capital grant funding was withdrawn]".[49]

19. A recent survey of local authorities assessing the impact of revised statutory guidance for Part 2A yielded further concern about the withdrawal of the grant scheme. Two (anonymous) comments from this survey are below:

> 1. The recent cut of the capital grants scheme has effectively closed any work that will be undertaken on Part 2A since local authorities cannot be expected to investigate land and then be burdened with remediation costs and/or blight to land/property.[50]

> 2. I think the withdrawal of funding has taken the teeth out of the Part 2A regime. I have experience already of several authorities "parking" their strategic inspections due to lack of funding and in house expertise, and that is the easy/cheap bit! Without government funding I can't see many detailed inspections being carried out as even if funding could be secured for a site investigation, the question of blame and liability is not something an already over stretched staff will want to deal with.[51]

46 Prof Chris Collins, Q148
47 Howard Price, Q149-150
48 Rory Stewart, Q226
49 Contaminated Land Strategy 2016, York Council
50 Cranfield University/CL:AIRE, Impact of the revised Part 2A Statutory Guidance survey, 2014
51 Cranfield University/CL:AIRE, Impact of the revised Part 2A Statutory Guidance survey, 2014

Another respondent to the survey suggested that Part 2A "needs a dedicated funding stream to operate effectively". A contaminated land officer working in the north of England raised the concern that the withdrawal of remediation funding, in diminishing Councils' ability to "proactively identify and address legacy contamination", might also have removed the deterrent to create new contaminated land in the future.[52]

20. A contaminated land officer also told us that the stringent process for identifying statutory contaminated land might also explain why it has been difficult for local authorities to identify sites:

> In lay-terms, for land to be determined as statutory contaminated land (Part 2A) the Council has to prove, by investigation and risk assessment that there are actual significant adverse health or environmental effects, or a significant likelihood of significant adverse health or environmental effects, AND that there are no other means to address those risk AND that those measures do not give rise to any direct or indirect health or socio-economic impacts.—*Phew! So much for the 'precautionary principle'*.[53]

21. We asked Rory Stewart, Parliamentary Under Secretary of State at Defra about the effects of withdrawing the capital grants. He emphasised that dealing with contaminated land is the responsibility of local authorities and not central Government:

> The key thing to understand is that responsibility for contaminated land rests and has always rested with local authorities. It is true that the central government provided support over time to local authorities to encourage more action on contaminated land. That has been a programme where over 100 different key sites have been restored, but the decision of the Department is that that responsibility now needs to rest with the local authorities to prioritise them on the basis of their own cost benefit analysis.[54]

22. Defra's Single Departmental Plan 2015–2020 contains the commitment to "invest £100m into environmental schemes to remediate contaminated land, restore important peatland habitats and increase woodland planting".[55] It has since emerged that less than 2% of this money will be made available for contaminated land—£1.9m over five years. Only £0.4m of this money will be made available to local authorities, and only in 2016/17.[56]

23. **Defra's decision to withdraw Capital Grant funding for contaminated land remediation has undermined councils' ability to meet their statutory duty under the Environmental Protection Act. Despite this, Defra appears complacent about the issue. Although local authorities hold the statutory duty to remediate contaminated land under Part 2A, 83% of Part 2A projects between 2000 and 2013 relied on Defra's Capital Grant Scheme for funding. With this scheme to be fully withdrawn from 2017, and in the context of wider financial pressure, we have heard evidence that local authorities are having difficulty meeting this duty, making Part 2A "virtually unworkable". It is therefore not credible for Defra to suggest that withdrawing the Capital Grant Scheme has not had a detrimental effect on councils' ability to meet**

52 SHI86. This individual has asked for their identity to be withheld.
53 Anonymous Contaminated Land Officer (SHI86); emphasis in original
54 Rory Stewart, Q209
55 Defra, Single departmental plan:2015 to 2020
56 Defra follow-up evidence (SHI90)

their statutory duty. The rationale Defra gave in 2014 for not producing an impact assessment for withdrawing the funding was entirely spurious: the fact that most Part 2A remediation depended on the funding is sufficient for its withdrawal to require an assessment. The decline of Part 2A has implications for both health inequality and regional inequality. Contamination in high-value areas such as London will continue to be remediated through planning, while sites in other cities such as Middlesbrough, Liverpool and York will not be identified or remediated at all.

24. ***We are disappointed that Defra's recently-announced temporary funding for contamination clean-up does not match the scale of the problem and the possible implications for regional inequality and public health. Funding should match the previous scheme—the £17.5m made available in 2009–10 amounts to around £19.6m in 2016–17 prices—and Defra should consider an ongoing dedicated funding stream for Part 2A. Defra should undertake a detailed assessment of the effects of its earlier decision to withdraw capital grant funding for contaminated land remediation, including (a) the ability of local authorities to meet their statutory duties in the absence of this funding, and (b) the consequences for health and inequality. DCLG should make clear what proportion of funds allocated to local authorities through the Revenue Support Grant are in service of statutory contaminated land duties.***

Data gathering on contaminated land

25. An Environment Agency update on the state of contaminated land in England has recently been published, covering the period 2000–2013.[57] The previous such update covered 2000–2007, giving a six-year gap between data releases. The data is based on a survey of local authorities which had a 60% response rate—a stark fall from 91% in the previous survey.[58] When we asked Rory Stewart, Parliamentary Under Secretary of State at Defra, whether this meant that our knowledge of the state of contamination was unacceptably poor, he told the Committee that he was content with this response rate:

> This is not a compulsory survey. We go out on a voluntary basis and a 60% response rate, as somebody who looks at surveys conducted, I am afraid is not that unusual. When conducting a voluntary survey, a 60% response rate is fine. That is perfectly within the realm of what we would anticipate.

26. However, section 78u of the Environmental Protection Act 1990 appears to require local authorities to respond to such a survey:

57 Environment Agency, Dealing with contaminated land in England 2000–2013, April 2016
58 Defra, Dealing with contaminated land in England and Wales

> **Reports by the appropriate Agency on the state of contaminated land.**
>
> (1) The appropriate Agency shall—(a) from time to time, or (b) if the Secretary of State at any time so requests, prepare and publish a report on the state of contaminated land in England and Wales or in Scotland, as the case may be.
>
> (2) A local authority shall, at the written request of the appropriate Agency, furnish the appropriate Agency with such information to which this subsection applies as the appropriate Agency may require for the purpose of enabling it to perform its functions under subsection (1) above.
>
> (3) The information to which subsection (2) above applies is such information as the local authority may have, or may reasonably be expected to obtain, with respect to the condition of contaminated land in its area, being information which the authority has acquired or may acquire in the exercise of its functions under this Part.[59]

Furthermore, the Environment Agency survey is described as being "commissioned under the statutory obligation of the Local Authority to provide this information". It is therefore surprising that the Minister described it as voluntary and that a 60% response rate is regarded as acceptable.[60] It also jars with Defra's Single Departmental Plan 2015–2020, which contains commitments to improve Defra's data and release more data.[61]

27. **The Minister was mistaken to describe data-gathering on contaminated land as voluntary, when it is in fact required by statute. The fall in response rate from 90% to 60%, coupled with the seven-year interval between publications, is not commensurate with the importance of the issue. Defra's approach to this dataset is completely out of step with its wider drive for better environmental data. The Government publishes hundreds of data indicators at local authority level on an annual compulsory basis, and there is no obvious reason why data on contaminated land should not be subject to the same arrangements. The fact that contaminated land is the responsibility of local authorities gives no reason for Defra to refrain from collecting data. We urge the Government to redouble its efforts to collect adequate data on contamination, which will allow us to better understand the link to health and inequality.**

28. ***Defra should begin annual reporting of the state of contaminated land in England and Wales from 2017/18, in line with many other local authority-level data collections. All local authorities should be expected to respond, as the law requires. This data need not be as detailed as the current, occasional, Environment Agency surveys—but should cover at minimum (a) number of sites identified, (b) number of sites remediated including funding category, and (c) level of resource available at a local level to carry out Part 2A duties. Meanwhile, Defra should continue to seek data from councils who did not respond to the recent survey, and should provide reassurance on whether any authorities failed to respond to both of the two most recent surveys.***

59 Environmental Protection Act 1990, section 78u
60 Defra, An examination of contaminated land sector activity in England and Wales
61 Defra, Single departmental plan:2015 to 2020

3 Soil carbon and climate change

Carbon emissions from soil degradation

29. Soil is a vital store of carbon. If it is badly managed, it can be a major source of greenhouse gas emissions.[62] An estimated 9.8 billion tonnes of carbon are stored in Britain's soils.[63] Indeed, soils store three times as much carbon as is contained in the atmosphere, and degradation of carbon-rich soils releases significant quantities of CO2.[64] The British Society of Soil Science told us that if soils are not managed for carbon storage then climate change could be "heightened".[65] Heath Malcolm said that greenhouse gas emissions from soil were 22.29 million metric tonnes of CO2 equivalent (MtCO2e) in 2013. The Committee on Climate Change notes that emissions from soil are "higher than for many industrial and energy sources, for example petroleum refining (14.7 MtCO2e), concrete production (6 MtCO2e) and the chemical industry (5.2 MtCO2e)". However, as Heath Malcolm told us, "under some circumstances soils can increase their carbon stocks and act as a sink for CO2"—so gross emissions from soil do not tell the whole story. Greenhouse gas removals by soil from the atmosphere amounted to 15.5 MtCO2e in 2013, meaning that the net emissions from soil were 6.75 MtCO2e—1.45% of the UK's total emissions.[66] Greenhouse gas emissions are estimated to account for around half of the economic cost of soil degradation.[67]

30. Professor David Powlson noted that the large stock of carbon already in soils is significant and should be managed carefully:

> Because you have this big stock in the world soils already, it is both an opportunity and a threat. It is a threat because you might lose some of that stock, and so deforestation, draining of peat soils have been talked about. These are all things that lead to release of carbon from this big stock. I now put more priority in a sense of looking after those places where we have big stocks. Don't drain peat, absolutely minimise deforestation. […] You have to be very careful to preserve and keep those places where you already have big stocks.[68]

31. Defra also commented on the importance of soil in relation to climate:

> Soil plays a critical role in regulating our climate, as the biggest terrestrial carbon store. Increasing the resilience of soils to the impacts of climate change allows them to continue to deliver the societal, economic and ecosystem benefits they provide.[69]

62 Soil Association (SHI62); see also RCUK (SHI53); Dr Franciska de Vries (SHI32)
63 Soil Association (SHI62); Committee on Climate Change (SHI46)
64 Defra (SHI56)
65 British Society of Soil Science (SHI30)
66 Heath Malcolm (SHI80)
67 Graves et al, The total cost of soil degradation in England and Wales
68 Prof David Powlson (Q88)
69 Defra (SHI56)

Declining soil carbon in arable and peat soils

32. Organic carbon levels are crucial to soil health and the ability of soil to deliver ecosystem services.[70] The Soil Association told us, for instance, that "everything from long-term yields and the quality of food grown, to resilience to extreme weather and soil erosion" depends on carbon levels.[71] ADAS UK expanded on the importance of soil organic matter, which is the dominant component of soil carbon:

> Organic matter provides a food source and habitat for the soil biological community, drives the cycling of nutrients within soils and is a central component of soil aggregation and the maintenance of structure and water relations. It is therefore widely recognised that soil organic matter is fundamental to the maintenance of soil fertility and function, and a key indicator of soil quality.[72]

33. Because of this, as the 2007 Countryside Survey notes, "all soils need to retain carbon". However data shows that while overall organic carbon levels have generally remained static, there has been a significant decline in carbon levels in in arable and peat soils.[73] The National Soil Inventory found a decrease of 5 grams per kilogram in arable soil carbon between 1978 and 2003.[74] The Countryside Survey records that, between 1978 and 2007, the topsoil carbon concentration in arable soils fell by 11%. The bulk of this reduction was observed between 1998 and 2007.[75]

34. Loss of carbon from soil has negative consequences, as Mistra EviEM outline:

> On farmland that is harvested regularly, decline in carbon content can result from organic compounds being broken down, being removed in crops, or eroded. If the stock of soil carbon is degraded, then the atmospheric concentration of carbon dioxide can change.[76]

35. The Committee on Climate Change warns that organic carbon loss may contribute to decline in agricultural yields, and that some loss is caused by land management practices. In their Statutory Progress Report to Parliament on preparing for climate change (2015), the fertility of agricultural soils was given a 'red' rating to signify that progress is not being made to manage the vulnerability. They said that Defra should take action to deliver its policy aspiration for all soils to be sustainably managed by 2030.[77]

Peatland degradation

36. Because the UK's peatlands store around 40% of our soil carbon[78], they are especially important. Natural England research published in 2010 shows that 57% of England's soil

70 Ecosystem services are "the benefits provided by ecosystems that contribute to making human life both possible and worth living", as defined by the UK National Ecosystem Assessment.

71 Soil Association (SHI62). See also APPG on Agroecology (SHI40); British Ecological Society (SHI58); Karen Johnson & Jennifer Jeffes (SHI28); Lancaster Environment Centre (SHI14); Martin Rogers (Q3)

72 ADAS UK (SHI23)

73 Countryside Survey 2007; Prof Chris Evans (SHI79); Committee on Climate Change (SHI46); AHDB (SHI75)

74 National Soil Inventory

75 Heath Malcolm (SHI80)

76 Mistra Council for Evidence-Based Environmental Management, Sweden

77 Committee on Climate Change, Progress in preparing for climate change: 2015 report to Parliament

78 UK National Ecosystem Assessment (2011) The UK National Ecosystem Assessment: Synthesis of the Key Findings.

carbon is stored in lowland Fens.[79] The research also found that the majority of England's peatlands are currently net sources of greenhouse gases, with lowland peats being particular hotspots for emissions. Some upland peats are still capturing carbon (i.e. taking in more than they emit), but even among upland peats most are net sources of carbon emissions rather than net sinks for carbon. ADAS UK told us that deep peats in upland areas support semi-natural habitats and are most important for carbon storage and climate regulation. STARS doctoral students told us that healthy peatlands also "provide cleaner and cheaper water by filtering rainfall before entering waterways".[80] Wildlife and Countryside Link added that "runoff from degraded peat soils also negatively affects water quality".[81]

37. The National Trust told us that the health of peat determines whether it is a carbon store or sink. They said that "practices (e.g. drainage or burning) designed to increase its productivity for particular enterprises, have unintended consequences". They added that "eroding peat soils will lead to sediment in watercourses and discolouration, the latter requiring costly treatment before being used as drinking water".[82] Newcastle University said that "The decomposition of peat removes one of the most efficient carbon sinks on the planet and has massive implications for feedbacks to the global climate system."[83]

38. The British Ecological Society notes that there is "widespread degradation to UK peatland soils by drying through loss of sphagnum [peat moss], gripping, erosion, gullying and burning (both managed and wildfire)." Other witnesses also raised the issue of burning on upland peats as a damaging practice.[84] The Committee on Climate Change commented on upland peats, pointing out that 14% are eroding, 18% have been drained, and 27% are regularly burnt.[85] An example is the burning of blanket bogs on Walshaw Moor in West Yorkshire.[86]

39. The Committee on Climate Change also explained how land management practices have contributed to peat degradation and that this may lead to the loss of agricultural land:

> Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation due to soil erosion and the loss of organic carbon. Without further action, farmers may not benefit from the opportunities of longer growing seasons, and the natural environment will be severely harmed by climate change.[87]

40. They also noted how peats have degraded in the Fens and the implications of this:

> The loss of peat soils in The Fens has been occurring for hundreds of years. Today, only around 16% of the peat stock recorded in 1850 remains. […] The rate of peat loss has been between 10mm to 30mm a year. Climate change

79 Natural England, England's Peatlands
80 Sustainable Use of Soil, The Royal Commission on Environmental Pollution, 1996
81 Wildlife and Countryside Link (SHI61)
82 National Trust (SHI68)
83 Newcastle University (SHI63)
84 Sue Everett (SHI24); Wildlife and Countryside Link (SHI61)
85 Committee on Climate Change (SHI46)
86 Hebden Bridge Times, 'Walshaw Moor grouse shoot at centre of legal action over blanket bog burning'
87 Committee on Climate Change, Progress in preparing for climate change: 2015 report to Parliament

> is expected to accelerate these losses, with every 1°C rise in temperatures increasing the rate of loss by 30%. As a result, all the remaining deep peat soils in the Fens could be lost within the next few decades.[88]

41. The Soil Association note that "the communities in and around The Fens are reliant on agriculture either directly or indirectly", and that "while peat is complex to farm, this land is generally more profitable per hectare and carries a significantly higher land value than most arable soils."[89] Peat which is degraded becomes "wasted", usually leaving a thin layer of soil known as "skirtland".[90]

42. The Wildlife Trust for Lancashire, Manchester & North Merseyside told us that peat soils in Alt-Crossens (a large catchment between the Mersey and Ribble estuaries) have been degraded by land-use policy over a long period, and that this may result in the loss of peat soil from the catchment by 2040. They claim that cost-benefit analyses underlying peat management policies have not accounted for the ecosystems services provided by peat soils.[91]

43. Wildlife and Countryside Link said that there is a "strong argument for ceasing agricultural production on […] deep peat to ensure that carbon remains locked in these soils".[92] However, The CCC said that reversing the trend of degradation might not necessarily require ceasing agricultural production on peats:

> In the Fens and other areas of lowland deep peats, it would be possible for some form of agricultural production to continue in ways that conserve the peat resource. Reverting from intensive arable systems to extensive wet grasslands would conserve the peat and not increase CO2 emissions. Other potentially viable alternatives that would potentially conserve peat are the production of perennial biomass crops and agro-forestry. [93]

These ideas for reducing peat degradation will be informed by new data on peat emissions that we understand is currently being reported to Defra.[94]

44. The CCC expanded on how peat could be restored:

> Degraded peatlands can be restored, through measures such as blocking drainage ditches, re-seeding bare peat and reducing adverse management practices such as intensive burning and over-grazing. There is increasing evidence from field studies that restoration reduces carbon losses, both as CO2 and [dissolved organic carbon], as well as delivering biodiversity and landscape benefits. A number of water companies operating in the English uplands have been investing in peatland restoration in recent years to help reduce the carbon content in raw water, and therefore lower the costs of drinking water treatment.[95]

88 Committee on Climate Change (SHI46); See also Prof Chris Evans (SHI79) for discussion of the '16% remains' figure.
89 Soil Association (SHI62)
90 Cranfield University, An estimate of peat reserves and loss in the East Anglian Fens
91 Wildlife Trust for Lancashire, Manchester and North Merseyside (SHI35)
92 Wildlife and Countryside Link (SHI61)
93 Committee on Climate Change (SHI46)
94 SP1210, Lowland peatland systems in England and Wales-evaluating greenhouse gas fluxes and carbon balances
95 Committee on Climate Change (SHI46). CCC told us that water companies investing in peatland restoration include Yorkshire Water, United Utilities and South West Water.

45. The Soil Association call for the Government to set up a special climate and soil protection area covering the remaining deep peat in the Fens, with a target of reducing greenhouse gas emissions from the area by 80% by 2050. This echoes the recommendation of the 1996 Royal Commission on Environmental Pollution report, that "remaining areas of original lowland bog and fen habitat in the UK be strictly protected."[96] The Soil Association also called for "farming systems to conserve rather than degrade peat; and alterations in the drainage systems to help safeguard peat soils".[97] They said:

> It is impossible completely to halt the loss of these peat soils, but there are a number of actions that would dramatically reduce soil losses and greenhouse gas emissions. In other areas where farming has had an unacceptable impact on the environment and public interests, EU legislation has ensured that coordinated, often geographically defined action has to be taken, for example in Nitrate Vulnerable Zones or in implementing the Water Framework Directive through Catchment Sensitive Farming.[98]

46. Defra's Natural Environment White Paper (2011) stated an aim to "undertake a research programme over the next four years [into, among other things,] how best to manage our lowland peatlands in a way that supports efforts to tackle climate change. We will use the results of this research to set the direction of future action."[99] The most recent implementation update (Oct 2014) states that five research projects are underway, with two due to report in 2014 and three in 2016.[100]

47. Rory Stewart, Parliamentary Under Secretary of State at Defra, told us that the Government plans to improve the state of peatland. "[T]he objective is to begin to gently reverse the decline; so halt first and then make it better. We would like to get a situation where at the end of our planned period there is more healthy peat in the country than there is today." He described actions that are being taken to achieve this, including: protecting peat under Sites of Special Scientific Interest legislation; buying out peat works to stop extraction; reseeding peat bogs; and blocking inappropriately laid drainage ditches.[101] He noted that actions will be focused on 'bare peat' which, if left alone, would release much carbon into the atmosphere. Defra also reported progress between 2003 and 2013, with 97% of peatland blanket bog SSSIs being either in either "favourable" or "unfavourable but recovering" condition. Defra described this as a "major step forward" in the restoration of degraded peats. However, the Parliamentary Office of Science and Technology note that peat areas that are not SSSIs are "generally not covered by restoration schemes and are at risk of further damage".[102] Natural England have also found that there no difference between the rate of managed burning on SSSI and non-SSSI peatlands.[103]

96 Sustainable Use of Soil, Royal Commission on Environmental Pollution, 1996
97 Soil Association (SHI62)
98 Soil Association (SHI62); Committee on Climate Change (SHI46)
99 The Natural Choice: securing the value of nature, Defra, 2011
100 Natural Environment White Paper: implementation updates, Defra
101 Rory Stewart Q249
102 Securing UK soil health, POST, 2015
103 Natural England, The effects of managed burning on upland peatland biodiversity, carbon and water

Action to improve soil organic matter

48. Some witnesses called for targeted action to increase the level of organic carbon in soil. The Soil Association calls for a specific commitment of 20% increase in the next 20 years:

> Based on the widespread evidence from organic farming, we are calling for the UK Government to commit to increasing [soil organic matter] levels by 20% in the next 20 years in arable soils–a relative increase of just 1% a year. This is similar to the French Government's 4/1000 - '4 pour mille' initiative, announced at the Paris climate summit - a plan to increase global levels of soil organic carbon in all soils by 0.4% each year, in order to make a significant contribution to the offsetting of greenhouse gas emissions (a '4 per thousand' target).[104]

49. Defra has expressed support for the French initiative, noting that it joined the plan at COP21, and saying that "even a small increase in the soil carbon stock […] is crucial to improve soil fertility and agricultural production and to contribute to achieving the long-term objective of limiting the temperature increase to 1.5/2°C."[105] Defra's written submission did not indicate what action would flow from this, instead saying only that "this is being used as an opportunity to highlight research and good practice that has been carried out in the UK". We asked Rory Stewart, Parliamentary Under Secretary of State at Defra, how the goal would be achieved. He said that "our investments in peatland, grassland and agricultural soils" would increase soil organic matter. He added that the biggest contribution would be likely to come from peatland.[106]

50. Rory Stewart expressed confidence about the possibility of success in this area, saying that "we know how to improve soil organic matter". Peter Melchett (Soil Association) echoed this, telling us that methods to increase organic matter, and thus soil carbon, are already established. However, he noted that governments had not always recognised the need for action:

> How you get carbon back into soil is fairly settled science, I would say: you use green cover crops in the winter, you do not leave the soil exposed, you use, where you can, crops with deeper roots so you have more biomass to put back into the soil. You put the crop waste, the straw, ideally through a cattle shed and then it is farmyard manure or compost back into the soil. You use rotations that include grass, exactly as you say, because that will help. It is not rocket science. What seems to be very difficult is to get Governments of all parties to recognise the problem and to recognise the need for action. It is becoming more urgent. The potential is huge, we could put huge amounts of carbon back into soil.[107]

51. The Committee on Climate Change argued in 2015 that an action plan was required to address these issues:

104 Soil Association (SHI62)
105 Defra (SHI56)
106 Rory Stewart (Q239/240)
107 Peter Melchett, Q45

> Defra should take action to deliver its policy aspiration for all soils to be sustainably managed by 2030, publishing an action plan within a year of this report to describe how the goal will be achieved. The action plan should include proposals for establishing a scheme to monitor the uptake of soil conservation measures, with enforcement where soils are not being appropriately managed. The action plan should include specific proposals to reverse the ongoing loss of lowland peat soils, and be developed in partnership with the farming sector.[108]

Rory Stewart told us that the action plan on peat would form part of Defra's upcoming 25-year environment plan.[109] He regarded work on bare upland peats to be "low hanging fruit", with lowland peats involving more difficult trade-offs with economic activity.[110]

52. **Soil organic matter content and carbon levels are central to the ability of soil to provide essential services to society. Soil also has to the potential to help mitigate climate change: it should be part of the solution, not part of the problem. Carbon losses pose a threat to the sustainability of food production, with some of the most productive land in England at risk of becoming unprofitable within a generation due to soil erosion and loss of carbon. The imperative to increase carbon levels in soils is clear, and there is widespread agreement on how organic matter and thus carbon levels can be improved. Despite this, data shows that carbon levels in arable soils have been declining. For the Government to meet its ambition for all soils to be managed sustainably by 2030, and to ensure agricultural resilience and minimise the effects of climate change, urgent action is required to reverse this trend and increase carbon levels in all soils. If significant amounts of soil carbon continue to be lost into the atmosphere then this will make it harder and more expensive to keep temperature increases well under 2 degrees as set out in the Paris Agreement. Every tonne of carbon maintained in soil gives greater flexibility to the rest of the economy in meeting our carbon budgets.**

53. ***At COP21 the Government signed up to an initiative to increase soil carbon levels by 0.4% per year: as part of the 25-year environment plan, it should set out specific, measurable and time-limited actions that will be taken to achieve this goal.***

54. **Given the concentration of carbon in peatland soils, degradation and decline of peats is particularly concerning. Mismanagement of these soils could undermine the UK's efforts to manage climate change.** ***The Government should take tougher action to tackle land use practices which degrade peat, such as unnecessary burning and draining when crops are absent. It should set out what has been learned about lowland peat management from the research it undertook after the 2011 White Paper and explain how this will be used to inform future action. The Government should also step up its peatland restoration programme. The upcoming 25-year environment plan should explain what measurable and time-bound actions will be taken to first halt and then reverse peatland degradation while minimising the impact on agricultural capacity.***

108 Committee on Climate Change, Progress in preparing for climate change: 2015 report to Parliament
109 Rory Stewart, Q257-258
110 Rory Stewart, Q260

4 Agricultural soil protection: incentives and regulations

The cross compliance regime

55. It is in the interest of landowners to protect the soil on their land, as not doing so can affect their agricultural production. Rory Stewart, Parliamentary Under Secretary of State at Defra, emphasised this:

> The primary incentive to do the right thing is that it is good for their farm business. We have to do all we can to communicate to people that eroding your soil is effectively like burning your house down. You have a farm business and you are reliant on that soil in order to grow crops and maintaining a healthy soil is maintaining the basic bedrock of your business.[111]

56. However, research shows that 80% of the costs of soil degradation are experienced away from the site where the degradation takes place—for example, in increased flood risk, reduced water quality, and the effects of greenhouse gas emissions.[112] In addition, the benefits of soil health are not always felt by those maintaining the soil. Defra explained how this makes a level of Government involvement in soil protection necessary:

> Soil also provides wider ecosystem services to society, for example through carbon sequestration, water quality regulation, and flood regulation. It is imperative that these wider societal benefits are protected and enhanced, and yet it is not currently in the private interests of landowners to invest in doing so, nor is there any marketplace in which soil benefits can be transacted. Hence government has a clear role in protecting the wider social, economic and environmental benefits that non-degraded soil provides.[113]

57. Defra's key lever for ensuring protection of soil health is the cross-compliance rules for Rural Payments Agency payments. These rules, revised in 2015, require that those in receipt of payments keep their land in Good Agricultural and Environmental Condition (GAEC). Defra describes the "outcome-based" rules as follows:

> [A]nyone claiming a Common Agricultural Policy payment must comply with [cross-compliance]. The rules require a basic level of protection for soils through management techniques that: maintain minimum soil cover, particularly in the wetter winter months; prevent and ameliorate erosion; and retain levels of organic matter, through a ban on burning arable stubble, management of heather and grass burning and not carrying out improvements on uncultivated land. Where breaches are found, farmers can receive a penalty between 1-5% from their Basic Payment Scheme.[114]

58. While these requirements are related to payments under the Common Agricultural Policy, it is up to member states to decide the exact specification of GAEC parameters,

111 Rory Stewart Q241

112 Graves et al, The total cost of soil degradation in England and Wales

113 Defra (SHI56); See also Soil Research Centre, University of Reading (SHI77); The Permaculture Association Britain (SHI13)

114 Defra (SHI56)

including minimum requirements.[115] Three GAEC requirements address soil protection: GAEC 4 requires minimum soil cover unless there is an agronomic reason for not doing so, GAEC 5 requires limiting of erosion through land management reflecting site specific conditions, and GAEC 6 requires maintenance of soil organic matter level through appropriate practices.[116] These minimum standards replaced the previous requirement to complete and retain a Soil Protection Review. Defra told us that in 2015 only two breaches were identified under soil cross compliance rules, and that both were on the same farm. This contrasts with 478 breaches in 2014 for failing to complete the Soil Protection Review.[117]

59. We received evidence suggesting that the GAEC requirements are not adequate to ensure soil protection, and that they do not cover crucial elements of soil health.[118] Professor Mark Kibblewhite described the requirements as "minimal and inadequate" and suggested that they indicate that the Government emphasises minimising regulation above protecting soil.[119] The British Ecological Society noted that GAEC provides no regulations on soil fauna, microdiversity, or structure.[120] Other important aspects of soil health not covered by GAEC, which we heard are crucially important to soil health, include soil biota such as earthworms.[121] Dr Jacqueline Hannam (Cranfield University) also noted that the GAEC conditions do not encompass the full range of soil health issues, and doubted that the latest approach to cross compliance marked an improvement on previous initiatives:

> These GAEC rules replace the Soil Protection Review (SPR). However, non-completion of the SPR was one common reason for failure of cross-compliance inspections (and thus fines for non-compliance). This raises uncertainty as to whether the GAEC approach is the most effective at implementing soil protection guidance.[122]

However Martin Rogers (National Farmers' Union) said that the Soil Protection Review was a "solely written based exercise", that the new GAEC requirements involves "key practical management requirements", and that it marks a "step in the right direction".[123]

60. We also heard evidence casting doubt on the effectiveness of specific GAEC requirements. On GAEC 4, which requires that farmers provide minimum soil cover, Wildlife and Countryside Link told us that the list of agronomic reasons for not providing cover provides an overly "broad loophole" to avoid having to meet the standard.[124] GAEC 6, which requires maintenance of soil organic matter, was described by Prof Mark Kibblewhite as a "non-policy policy measure" since it mainly bans practices which are already abandoned and as such achieves no new improvement to inputs of organic matter to soil.[125] In addition, the University of Aberdeen said that because the GAEC conditions

115 MARS Joint Research Centre, GAEC
116 Defra, Guide to Cross Compliance in England 2016
117 Defra (SHI90)
118 See Wildlife and Countryside Link (SHI61); National Trust (SHI68); James Hutton Institute (SHI52); Dr Robert Evans (SHI27); Sue Everett (SHI24); Institute for Global Food Security (SHI64); Soil Security Programme (SHI48)
119 Prof Mark Kibblewhite (SHI12)
120 British Ecological Society (SHI58)
121 See Institute for Global Food Security (SHI64) for discussion of soil as a biological reactor. See also National Farmers' Union (SHI44); National Trust (SHI68); Promessa Soil (SHI04); Woodland Trust (SHI38)
122 Dr Jacqueline Hannam (Cranfield University, SHI41); See also University of Sheffield Grantham Institute for Sustainable Futures (SHI33)
123 Martin Rogers, Q31; See also Soil First Farming (SHI65)
124 Wildlife and Countryside Link (SHI61)
125 Prof Mark Kibblewhite (SHI12)

are qualitative descriptors they are difficult to assess on the farm, making implementation and assessment more difficult.[126] Indeed, Defra told us that no breaches of GAEC 6 had yet been identified.[127]

61. For other witnesses, the scale of inspections for GAEC was a concern. David Thompson (Committee on Climate Change) told us that "the inspection of whether those actions are being taken is pretty minimal", and Prof Mark Kibblewhite said that "there has to be serious doubts about the effectiveness of Defra's inspection regime, bearing in mind the large number of farms relative to inspectors and the impact of cuts to Defra's resources".[128] In this context, it should be noted that Defra aims to further "reduce the number of farm inspections" in its Single Departmental Plan, with the goal of reducing the regulatory burden on business.[129]

62. Other witnesses argued that the cross compliance rules lack ambition. The Centre for Ecology and Hydrology noted that while the conditions of GAEC are important for 'damage limitation', they are "significantly inadequate if soil health is to be positively promoted to the same degree as water and biodiversity."[130] Sue Cornwell (National Trust) echoed the view that a regulation scheme which only concentrates on preventing damaging practices does not achieve everything we need:

> Yes, you need to be clear about particularly damaging practices, and I think those things are picked up in the current good agricultural and environmental conditions requirements, but not doing certain things is only ever going to get you a very small part of the way to looking after your soils and managing your soils differently.[131]

63. Prof Jim Harris (Cranfield University) echoed this sentiment, explaining how soil protection is part of a wider system:

> I think that it is important that Defra sets the direction of travel for not only protection and conservation of what we have but restoration of natural capital and general soils in particular. It is very difficult sometimes to talk about soils in isolation. You have to think of them as part of a system, and I am interested across the whole spectrum from intensive agriculture through urban to natural systems. I think that there is an opportunity there to make some quite bold statements about wishing to improve, enhance and restore in addition to protect and conserve.[132]

64. Professor Chris Collins indicated that effective regulation of soil health would require evidence-based policy on how to define soil health:

> To ensure healthy soils we need to move away from regarding soil as a "growth medium" - it is an ecosystem in its own right that requires management to

126 University of Aberdeen (SHI60)
127 Defra (SHI90)
128 David Thompson (CCC) Q77; Prof Mark Kibblewhite (SHI12); See also University of Sheffield Grantham Institute for Sustainable Futures (SHI33)
129 Defra, Single Departmental Plan 2015 to 2020
130 Centre for Ecology and Hydrology, (SHI72)
131 Sue Cornwell, Q31. See also University of Sheffield Grantham Institute for Sustainable Futures (SHI33)
132 Prof Jim Harris, Q184

> maintain diversity of soil types and the biota within them. There needs to be clear policy direction, evidence based, that defines what soil health is, and critically the measures to be used to evaluate it.[133]

65. Martin Rogers (NFU) argued the importance of educating farmers in how to manage soil sustainably:

> It is vital that they have an agricultural knowledge and background so that they can ask some of the questions that may come from it" … "A lot of that is specifically about the management of cover crops because, time and time again, we say, "Use cover crops" but the question is always asked: how do I destroy cover crops? How do I treat them? How do I ensure that the cover crop I use is the best for my soil type? Finding what those questions are and directly answering them in farmer facing events is key. Documents or advice that is published goes some way but there always has to be that funding and support for that kind of activity.[134]

66. We heard evidence from Prof Dave Chadwick (Bangor University) suggesting that Wales has a more focused approach to regulation of agricultural payments:

> The Welsh Government has been slightly clever there and what it has done is it has targeted certain areas of Wales where it says, "This is the place where we need people and restoration". Whereas somewhere else it might be, "This is where we are willing to concentrate on water quality". While the menu of different interventions remains the same for the farmers, they get more payment for a particular intervention that delivers that ecosystem service in that area. It is a sort of targeted approach. [135]

67. Rory Stewart, Parliamentary Under Secretary of State at Defra, did not comment specifically on the criticisms of cross compliance. He did, however, indicate that Defra is open to "clear ideas" on what kinds of subsidy and incentive regimes could improve soil health.[136]

68. **There is reason to doubt that the current cross compliance regime is achieving its goal of preventing soil damage. In 2015 only two breaches of the soil rules were detected. Moreover, the Good Agricultural and Environmental Condition standards are not ambitious enough to support Defra's goal that all soils are managed sustainably by 2030, since they focus only on preventing damaging practices and not on restoration or improvement of soil quality. The requirements also fail to address important aspects of soil health such as soil biota and soil structure.**

69. ***The Government should produce and consult on proposals to increase the ambition, scope and effectiveness of cross compliance in order to mitigate the impact of agriculture on soil health and incentivise provision of wider ecosystems services such as water quality and flood protection. Revised requirements and incentives for landowners should be centred on restoration and improvement of soil quality and organic matter, and not merely a 'damage limitation' approach. The upcoming 25-***

133 Soil Security Programme (SHI48); See also Soil Research Centre, University of Reading (SHI77)
134 Martin Rogers, Q19
135 Prof Dave Chadwick, Q177. See also Reading Agricultural Consultants (SHI73)
136 Rory Stewart, Q262

year environment plan should indicate how the Government plans to ensure that the incentive structure for farmers will contribute to the sustainable management of all soils by 2030. In drawing up its partner 25-year plan for food and farming, Defra must ensure that measures to improve agricultural production do not lead to compromise on soil health. In particular, in meeting its goal to reduce burdens on farmers, Defra must not undermine the effectiveness of its policy levers to ensure soil protection.

Subsidies for maize for anaerobic digestion

70. In addition to concerns about the effectiveness of CAP subsidy monitoring, we have also heard evidence that some public subsidies encourage practices which damage soil health. Chief among these is the growth of maize for anaerobic digestion. The Soil Association said that maize is "probably the most rapidly expending crop in the UK", with an increase in area from 8,000 hectares in 1973 to 186,000 at present. Between 2008 and 2014 the area increased by 20%.[137] Around 20% of maize is used as an energy crop for anaerobic digestors (AD) that are used to produce energy. Maize can be grown to meet 'greening' requirements, and is subsidised under the Common Agricultural Policy.[138] It then receives a second subsidy through renewable energy initiatives. The Soil Association estimates that AD plants receive £50m in subsidies each year.[139]

71. Maize production can increase soil erosion. David Powlson (Rothamsted Research) told us:

> Any time that you have soil that is bare with nothing growing on it between crops, or big spaces between the plants, like in the situation of maize, all of those factors are likely to increase the likelihood of erosion, particularly under climate change where it is expected that there are likely to be rather more extreme events, such as rainfall.[140]

David Thompson (Committee on Climate Change) noted that not all of the growth in maize production is accounted for by AD. He also offered further evidence of the effects of maize:

> There was a study in the south-west of England that showed that in three-quarters of fields under maize, the soil was so damaged that the rain is unable to penetrate, so the water just runs straight off into rivers, into water courses.[141]

72. CLA told us that while "maize production can lead to soil and nutrient losses at harvest and during winter," there are strategies for mitigating this:

> Using early maturing varieties, sowing as early as possible, and planting under plastic can reduce the risk of harvesting in poor conditions later in the year.

137 Defra, Area of crops grown for bioenergy in England and the UK, 2008–2014

138 Greening supports action to "adopt and maintain farming practices that help meet environment and climate goals". See an explanation from the European Commission.

139 Soil Association (SHI62).

140 David Powlson (Q87). See also Soil Association (SHI62); Wildlife and countryside link (SHI61); Committee on Climate Change (SHI46)

141 David Thompson, Q45

> Certain management practices can also significantly reduce water, nutrient and sediment runoff during winter. Chisel ploughing, under-sowing and cover-cropping can reduce runoff compared with leaving maize stubble untouched.[142]

73. The National Trust suggested that we need to move to a "situation where crops that present a high risk of damage to soils are not grown in places where soils are vulnerable (e.g. maize should only be grown in low risk locations)".[143]

74. The Soil Association described maize for AD as a threat to food production, saying that the area of farmland projected for new maize crops for AD in the UK "would be sufficient to produce 2 billion loaves of wholemeal bread."[144] Peter Melchett (Soil Association) told the Committee that while AD production makes sense if (for example) slurry is used, it does not make sense to subsidise maize for this purpose:

> [T]he subsidies that are given to AD production, do not, up until now, distinguish between the source of the fuel that is put into the AD unit. An AD unit taking slurry from cattle or pig waste or chicken waste and turning it into gas and a fertiliser is a sensible use of the technology. Growing hundreds of acres of maize or sugar beet with huge inputs of fertiliser and pesticides, which is then subsidised from the public purse to the farmer putting it into an AD unit, which is subsidised from the public purse to the AD operator, makes no sense."[145]

75. Rory Stewart, Parliamentary Under Secretary of State at Defra, accepted that "maize planted incorrectly, harvested at the wrong time of year or in the wrong climatic conditions can contribute to soil erosion." He also emphasised that some consequences of poor land management related to maize can trigger breaches of cross compliance:

> If your maize processes are contributing to soil erosion, that is in breach of your cross-compliance regulations and the RPA can then fine you for doing that.[146]

However he claimed that the subsidy policy was outside his responsibility:

> That is really an issue for the Department of Energy and Climate Change. It is predominantly about energy policy, renewable energy policy and the different types of renewable energy policy, but we certainly within the Department are looking closely from our point of view at the costs and benefits of that kind of activity.[147]

76. In relation to this apparent clash of policy priorities between Government departments, we heard evidence that the Welsh devolved administration is making efforts to 'join-up' soils policy between Government departments. As part of the Wellbeing of Future Generations Act, soil quality is included as a key indicator alongside healthy life expectancy, water quality and air quality. Prof Dave Chadwick explained the benefits of this:

142 CLA (SHI39)
143 National Trust (SHI68)
144 Soil Association (SHI62)
145 Peter Melchett, Q44
146 Rory Stewart, Q277
147 Rory Stewart, Q277

> [T]here is more integration of the mainstream of soil within the different departments, so you are not just thinking of soil as just one thing in isolation. It is the realisation that soil is pivotal in the delivery of multiple ecosystem services. […] That multipurpose approach obviously gives good cost benefit, cost effectiveness. It brings the different departments together and—really importantly—it allows you to start to see where any win/wins might be or where any undesirable consequences might be.[148]

77. **Maize production can damage soil health when managed incorrectly, and incentives for anaerobic digestion should be structured to reflect this. The double subsidy for maize produced for anaerobic digestion is counterproductive and has contributed to the increase in land used for maize production. This subsidy regime represents a clear case in which better joined-up thinking across Government is required in order to ensure that soils are managed sustainably. The Government's ambition to manage all soils sustainably by 2030 cannot be met if Defra does not achieve buy-in from other departments to achieve the ambition.**

78. ***Renewable energy subsidies for anaerobic digestion should be restructured to avoid harmful unintended consequences. Revisions should either exclude maize from the subsidy altogether or impose strict conditions on subsidised maize production to avoid practices in high-risk locations which lead to soil damage. The broader cross-compliance regime has not proved sufficient to prevent such damage. Defra and DECC should work together to evaluate the impact of energy policy on soil health across the board. The upcoming 25-year environment plan should include specific plans for inter-departmental working and structures of accountability with the goal that soil protection is not simply the responsibility of Defra, but rather is a factor against which any policy can be measured.***

148 Dave Chadwick, Q178

5 Monitoring soil trends

79. Knowledge of the state of our soils is crucial to many of the issues discussed above, from the level of carbon in soils, to the effects of land management practices on soil quality. Defra emphasised the importance of soil monitoring:

> Soil monitoring provides evidence on the state of and change in our soils. National scale soil monitoring tells us about the 'population' of national soils, in terms of their ability to perform different functions, but not about soils at individual sites as there is not enough sampling at each site.[149]

80. However, there is currently no UK-wide scheme for monitoring changes in soil health. The Centre for Ecology and Hydrology explained that previous monitoring schemes have not been continued and that the EU scheme currently being undertaken cannot provide useful UK-level data:

> "In the past, several soil monitoring schemes have provided us with valuable information either for GB as a whole (Countryside Survey), England and Wales (National Soil Inventory), and Scotland (National Soil Inventory Scotland). To our knowledge, none have secured funding to continue into the future. In addition, a range of public bodies are responsible for monitoring specific aspects of soil health. […] Currently, only an EU level soil monitoring programme (LUCAS) is active within the UK as a whole. However, the LUCAS sampling strategy is too sparse and has an inappropriate sampling structure to provide meaningful change data at the UK level."[150]

81. This situation is not new. The Royal Commission on Environmental Pollution's 1996 report on soil lamented the lack of soil monitoring and recommended that a national scheme be set up:

> Limited monitoring of soil attributes is taking place in the UK at the relatively small number of terrestrial sites within the Environmental Change Network. We consider more extensive monitoring on an integrated national scale is an essential element of a UK soil protection policy. To complement the monitoring of air and water quality, we recommend the setting-up of a national soil quality monitoring scheme, for which responsibility should lie with central government.[151]

82. The Centre for Ecology and Hydrology also noted that research has been presented to the Government on effective ways to take forward soil measurement:

> A team of leading UK soil scientists involved in soil monitoring identified the most statistically efficient (and thus cost effective) approach as one with a sampling structure that ensures sampling effort covers as many land types as possible (Black et al. 2008). Combining this stratified sampling approach

149 Defra (SHI56)

150 Centre for Ecology and Hydrology (SHI72); See also Prof Mark Kibblewhite (SHI12); Dave Chadwick (Q184/187); David Powlson (Q99); British Ecological Society (SHI58); British Geological Society (SHI36); British Society of Soil Science (SHI30); Soil Security Programme (SHI48); The Geological Society (SHI51); The Permaculture Association Britain (SHI13)

151 Sustainable Use of Soil, The Royal Commission on Environmental Pollution, 1996

> with multi-purpose surveys (e.g. of vegetation and water) can also increase cost efficiency as it provides data relevant to a wide range of national and international environmental commitments as well as their inter-dependencies (e.g. has change in land management or plant species composition been observed where soil health has changed?). This approach recognises that soils do not act in isolation but are closely connected and impacted by land management and vegetation change.[152]

The study referred to here is 'Design and operation of a UK soil monitoring network' (2008), which was commissioned by the Environment Agency with Defra as collaborators. This report recommended that sampling options for combining existing schemes, including those in different UK countries, would achieve a "whole greater than the sum of its parts".[153] The Chartered Institute of Water and Environmental Management expressed a similar view, saying that any new monitoring scheme should ensure it draws upon the previous work of the National Soil Inventory and the Countryside Survey.[154]

83. Prof Jim Harris (Cranfield) noted that UK environmental research "punches above its weight" in this area.[155] Several witnesses also explained that effective soil monitoring is not an insurmountable problem and we should not be misled into thinking it excessively complex. We were told that a range of options for monitoring were possible based on available budget, and that the expertise for monitoring is already in place.[156] The James Hutton Institute argued that "current knowledge is sufficient to establish robust monitoring".[157]

84. A number of witnesses said that soil organic carbon was the most important indicator of soil health to measure.[158] The National Farmers' Union stressed, however, that soil health is multi-faceted, and called for flexibility and consideration of "the wide range of variables which affect soil condition." They rejected approaches which use a single indicator as a proxy for soil health.[159]

85. Lancaster Environment Centre said that monitoring should focus on properties relating to the services soil delivers:

> Soil health metrics should focus on vital soil properties that are critical to the provision of crucial ecosystem services (e.g. climate change mitigation, regulation of hydrology, nutrient dynamics, food security). Soils should be monitored at 5 year intervals in their entirety to the base of the soil, so that changes in biodiversity, chemistry, physical condition and stocks of macronutrients e.g. carbon and nitrogen, can be properly quantified. Monitoring needs to cover a full range of UK soils, landscapes and climates, including urban areas.[160]

152 Centre for Ecology and Hydrology (SHI72)
153 Environment Agency, Design and operation of a UK soil monitoring network
154 CIWEM (SHI15). See also Lancaster Environment Centre (SHI14); Scotland's Rural College (SHI22); STARS (SHI55)
155 Jim Harris (Q192)
156 Paul Hallett, Q82; David Powlson, Q85; Richard Bardgett, Q121. See also Dr Neil Humphries (SHI34)
157 James Hutton Institute (SHI52). See also Landscape Institute (SHI45); Wardell Armstrong LLP (SHI69)
158 Peter Melchett (Q70); Willie Towers (Q24); Paul Hallett (Q85/Q118); Richard Bardgett (Q121); David Powlson (Q85); Prof Rod Blackshaw (SHI7); Dr Franciska de Vries (SHI32)
159 National Farmers' Union (SHI44); See also East Malling Research (SHI57)
160 Lancaster Environment Centre (SHI14) See Stuart Norris (SHI2)

86. Prof Dave Chadwick recommended that soil should be measured alongside other key environmental indicators to ensure a joined-up approach:

> Otherwise, if you had one team measuring soil over here, another team measuring biodiversity over there, you don't get […] joining up until probably much later in the process.[161]

87. Lord Krebs (Committee on Climate Change) suggested that monitoring was required in order to measure progress against the Government's ambition that all soils be managed sustainably by 2030:

> "If you do not measure whether you are moving in the right direction, you will not know […] I do not see why there should not be a national monitoring scheme to ensure that if we have this ambitious target that Defra has that we know whether it is successfully implementing it.[162]

David Powlson (Rothamsted Research) echoed this view, saying that "if we do not measure things to do with soil over time you do not know whether they are getting better or worse, other than in an anecdotal way."[163]

88. Defra argued that since "soil properties change very slowly over time, more frequent monitoring is not justified". Rory Stewart, Parliamentary Under Secretary of State at Defra, said:

> The basic soil sampling in this country has been done in regular bursts taking place every decade or two decades in a regular set of sequences. The work done between the 1940s and the early 1980s created the soil map, the association series for the United Kingdom that laid out the different types of geology and soil across the country. Since then what we conduct is reviews that will happen every decade or two decades and we would intend to have another one of those reviews.[164]

89. On future monitoring schemes, Defra said it is working with partners to explore a future Countryside Survey which would take account of new monitoring techniques, though no decisions have been taken. Mr Stewart noted that he is "very open to sitting down with people and talking it through, but we do need to do a serious cost benefit analysis." Defra noted that it had been working since 2003 to develop a set of soil quality indicators for use in monitoring, and that soils will have a role in natural capital accounting:

> On individual ecosystem accounts, there is a focus on carbon in soils, using National Forest Inventory (NFI) data for woodlands and Countryside Survey data for farmland. Recognising its importance, consideration is also being given to a standalone peatland account.[165]

161 Prof Dave Chadwick, Q178
162 Lord Krebs, Q69
163 David Powlson, Q85
164 Rory Stewart, Q234
165 Defra, (SHI56)

Monitoring schemes in the devolved administrations

90. The Committee heard about soil monitoring schemes in Wales, which are performed in tandem with assessments of how successful Rural Development Programme subsidy payments are in promoting ecosystems services among farmers. This programme spends 2% of Rural Development Programme payments, as sanctioned by the EU, on evaluation. Centre for Ecology and Hydrology explained that this had been used as the basis for a rolling annual monitoring programme of soil and other natural resources through the Glastir Monitoring and Evaluation Programme (GMEP):

> Ongoing change is tracked relative to change over the last 30 years […] providing both national-scale reporting and objective assessments of the Glastir scheme benefits for soil health. […] GMEP ensures compliance with the recommended guidance from the EU for ca. 2% of the RDP to be used to assess the success / outcomes of payments to farmers. This multi-purpose survey approach and funding model could potentially be rolled across the UK providing a valuable national framework for a wide range of ad hoc evidence-based surveys relating to a range of policy initiatives such as agri-environment schemes, designations, etc."[166]

Prof Dave Chadwick (Bangor University) described the operation of the GMEP programme as a rolling program analysing 75 squares each year:

> We have been running now for nearly four years, and the statistical design means that 75 one-kilometre square areas are randomly selected each year. Within that there are two cohorts of squares: one set of squares that are called the wider Wales, where we try to get information. The sort of control population where there are not a lot of payments through ecosystem services through Glastir, and the other half is where there is a lot more payment. […] [T]he total programme costs around £8.5 million, or has cost for four years of running, and the soil component of that represents around 12% of that value. That is covering these 300 squares, one-kilometre grid squares, and, as I say, that will be repeated next year when we start the process again.[167]

91. The University of Aberdeen said that "much could be learnt from Scotland's follow-on soil survey" which revisited a subset of sites to measure changes over time using a combination of traditional methods and more in-depth analysis.[168]

92. **As Defra recognises, collection of data is key to developing effective policy. The lack of an ongoing soil national monitoring scheme undermines the Government's goals to managing soils sustainably. The lack of monitoring prevents us from having nation-wide knowledge about trends in the health of our soil. This gap is not new, and successive Governments have ducked the challenge since the Royal Commission on Environmental Pollution recommended a national monitoring scheme in 1996.**

93. **While ad hoc studies and one-off research are useful, they cannot replace a rolling national programme. We recognise that the slow-changing nature of soil properties must be borne in mind when designing soil monitoring, but this is not an excuse for**

166 Centre for Ecology and Hydrology (SHI72); White Rose Sustainable Agriculture Consortium (SHI71); STARS (SHI55)
167 Prof Dave Chadwick, Q185
168 University of Aberdeen (SHI60)

long periods without certainty as to when future monitoring will take place. The state of our knowledge about soil health would be better served by an ongoing programme. The evidence we heard suggests that such a programme would be feasible, affordable, and could deliver significant benefits. The Welsh approach of a rolling programme, with one quarter of sites evaluated each year, provides a useful model for this.

94. **Defra reports that work on developing soil quality indicators has been ongoing since 2003. It has also been in possession, since 2008, of a report detailing how to combine past monitoring programmes. By now Defra should be in a position to propose a set of indicators and a method of analysis. Our witnesses told us that it is not difficult to assemble a range of indicators to reflect soil health, and that soil organic carbon levels should be central to this.**

95. ***We recommend that the Government develop plans for an ongoing national-scale programme to monitor soil health, potentially aligned with and co-funded by EU payments as in Wales to provide the control for soil change within agri-environment schemes and other initiatives. Merely noting an intention to undertake a new survey in the future, as Defra does, is not adequate—a one-off enterprise each decade does not provide the strategic approach we need to maintain due focus on soil health. A new ongoing programme should ensure coverage of land which has previously reported as undergoing degradation and a suitable range of indicators to assess the provision of ecosystems services.***

6 Conclusion

96. Soil is crucial to society. Neglecting soil health could have dire consequences for food security, climate change, and public health. The Government's withdrawal of capital grants for clean-up of contaminated land has undermined the ability of councils to meet their statutory duties. This has consequences for inequality and public health. New Government funding for clean-up should match the level of the previous scheme.

97. Maintaining and improving soil organic carbon levels is crucial, both for the health of soil and for preventing excess greenhouse gas emissions. Every tonne of carbon retained in soil gives flexibility to the rest of the economy in meeting our carbon budgets. The Government should outline specific plans for meeting the 0.4% annual target it signed up to at COP21 and mainstream this aim into future land use scenarios and food & farming plans.

98. The cross-compliance rules which regulate agricultural soil health must be revised with greater scope, force and ambition. Currently the rules do not cover some important aspects of soil health, are accompanied by a minimal inspection regime, and focus only on preventing further damage to soil rather than restoring and improving soil health. The double subsidy for maize for anaerobic digestion is counterproductive to managing soil sustainably and should be withdrawn.

99. Effective policy on soil requires good data and regular monitoring of changes in soil health. The UK lacks a national-scale rolling monitoring scheme. The expertise required to implement such a scheme is in place, and the Government should make use of it to establish a national scheme in short order. Following the Welsh model, this could be co-funded by EU payments.

100. **Soil is crucial to society. Neglecting soil health could have dire consequences for food security, climate change, and public health. Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation through soil erosion and loss of carbon, and the natural environment will be seriously harmed. The importance of soil has not always been reflected in public discourse or Government policy, with soil receiving little attention compared to issues like air, water and biodiversity.**

101. ***Defra's upcoming 25-year environment plan should seek to rectify this long-standing deficit and place soil protection at the heart of environmental policy. Defra must also ensure that its accompanying 25-year plan for food and farming does not sit in tension with its environment plan. We must move away from viewing soil merely as a growth medium and treat it as an ecosystem in its own right. We call for more joined up soil policy between Government departments to ensure no clashes in priorities. As well as taking national action, the Government should remain open to action on a European level to ensure soil protection.***

Conclusions and recommendations

Funding for remediation

1. Defra's decision to withdraw Capital Grant funding for contaminated land remediation has undermined councils' ability to meet their statutory duty under the Environmental Protection Act. Despite this, Defra appears complacent about the issue. Although local authorities hold the statutory duty to remediate contaminated land under Part 2A, 83% of Part 2A projects between 2000 and 2013 relied on Defra's Capital Grant Scheme for funding. With this scheme to be fully withdrawn from 2017, and in the context of wider financial pressure, we have heard evidence that local authorities are having difficulty meeting this duty, making Part 2A "virtually unworkable". It is therefore not credible for Defra to suggest that withdrawing the Capital Grant Scheme has not had a detrimental effect on councils' ability to meet their statutory duty. The rationale Defra gave in 2014 for not producing an impact assessment for withdrawing the funding was entirely spurious: the fact that most Part 2A remediation depended on the funding is sufficient for its withdrawal to require an assessment. The decline of Part 2A has implications for both health inequality and regional inequality. Contamination in high-value areas such as London will continue to be remediated through planning, while sites in other cities such as Middlesbrough, Liverpool and York will not be identified or remediated at all. (Paragraph 23)

2. We are disappointed that Defra's recently-announced temporary funding for contamination clean-up does not match the scale of the problem and the possible implications for regional inequality and public health. Funding should match the previous scheme—the £17.5m made available in 2009–10 amounts to around £19.6m in 2016–17 prices—and Defra should consider an ongoing dedicated funding stream for Part 2A. Defra should undertake a detailed assessment of the effects of its earlier decision to withdraw capital grant funding for contaminated land remediation, including (a) the ability of local authorities to meet their statutory duties in the absence of this funding, and (b) the consequences for health and inequality. DCLG should make clear what proportion of funds allocated to local authorities through the Revenue Support Grant are in service of statutory contaminated land duties. (Paragraph 24)

Data gathering on contaminated land

3. The Minister was mistaken to describe data-gathering on contaminated land as voluntary, when it is in fact required by statute. The fall in response rate from 90% to 60%, coupled with the seven-year interval between publications, is not commensurate with the importance of the issue. Defra's approach to this dataset is completely out of step with its wider drive for better environmental data. The Government publishes hundreds of data indicators at local authority level on an annual compulsory basis, and there is no obvious reason why data on contaminated land should not be subject to the same arrangements. The fact that contaminated land is the responsibility of local authorities gives no reason for Defra to refrain from

collecting data. We urge the Government to redouble its efforts to collect adequate data on contamination, which will allow us to better understand the link to health and inequality. (Paragraph 27)

4. Defra should begin annual reporting of the state of contaminated land in England and Wales from 2017/18, in line with many other local authority-level data collections. All local authorities should be expected to respond, as the law requires. This data need not be as detailed as the current, occasional, Environment Agency surveys—but should cover at minimum (a) number of sites identified, (b) number of sites remediated including funding category, and (c) level of resource available at a local level to carry out Part 2A duties. Meanwhile, Defra should continue to seek data from councils who did not respond to the recent survey, and should provide reassurance on whether any authorities failed to respond to both of the two most recent surveys. (Paragraph 28)

Action to improve soil organic matter

5. Soil organic matter content and carbon levels are central to the ability of soil to provide essential services to society. Soil also has to the potential to help mitigate climate change: it should be part of the solution, not part of the problem. Carbon losses pose a threat to the sustainability of food production, with some of the most productive land in England at risk of becoming unprofitable within a generation due to soil erosion and loss of carbon. The imperative to increase carbon levels in soils is clear, and there is widespread agreement on how organic matter and thus carbon levels can be improved. Despite this, data shows that carbon levels in arable soils have been declining. For the Government to meet its ambition for all soils to be managed sustainably by 2030, and to ensure agricultural resilience and minimise the effects of climate change, urgent action is required to reverse this trend and increase carbon levels in all soils. If significant amounts of soil carbon continue to be lost into the atmosphere then this will make it harder and more expensive to keep temperature increases well under 2 degrees as set out in the Paris Agreement. Every tonne of carbon maintained in soil gives greater flexibility to the rest of the economy in meeting our carbon budgets. (Paragraph 52)

6. At COP21 the Government signed up to an initiative to increase soil carbon levels by 0.4% per year: as part of the 25-year environment plan, it should set out specific, measurable and time-limited actions that will be taken to achieve this goal. (Paragraph 53)

7. Given the concentration of carbon in peatland soils, degradation and decline of peats is particularly concerning. Mismanagement of these soils could undermine the UK's efforts to manage climate change. The Government should take tougher action to tackle land use practices which degrade peat, such as unnecessary burning and draining when crops are absent. It should set out what has been learned about lowland peat management from the research it undertook after the 2011 White Paper and explain how this will be used to inform future action. The Government should also step up its peatland restoration programme. The upcoming 25-year

environment plan should explain what measurable and time-bound actions will be taken to first halt and then reverse peatland degradation while minimising the impact on agricultural capacity. (Paragraph 54)

The cross compliance regime

8. There is reason to doubt that the current cross compliance regime is achieving its goal of preventing soil damage. In 2015 only two breaches of the soil rules were detected. Moreover, the Good Agricultural and Environmental Condition standards are not ambitious enough to support Defra's goal that all soils are managed sustainably by 2030, since they focus only on preventing damaging practices and not on restoration or improvement of soil quality. The requirements also fail to address important aspects of soil health such as soil biota and soil structure. (Paragraph 68)

9. The Government should produce and consult on proposals to increase the ambition, scope and effectiveness of cross compliance in order to mitigate the impact of agriculture on soil health and incentivise provision of wider ecosystems services such as water quality and flood protection. Revised requirements and incentives for landowners should be centred on restoration and improvement of soil quality and organic matter, and not merely a 'damage limitation' approach. The upcoming 25-year environment plan should indicate how the Government plans to ensure that the incentive structure for farmers will contribute to the sustainable management of all soils by 2030. In drawing up its partner 25-year plan for food and farming, Defra must ensure that measures to improve agricultural production do not lead to compromise on soil health. In particular, in meeting its goal to reduce burdens on farmers, Defra must not undermine the effectiveness of its policy levers to ensure soil protection. (Paragraph 69)

Subsidies for maize for anaerobic digestion

10. Maize production can damage soil health when managed incorrectly, and incentives for anaerobic digestion should be structured to reflect this. The double subsidy for maize produced for anaerobic digestion is counterproductive and has contributed to the increase in land used for maize production. This subsidy regime represents a clear case in which better joined-up thinking across Government is required in order to ensure that soils are managed sustainably. The Government's ambition to manage all soils sustainably by 2030 cannot be met if Defra does not achieve buy-in from other departments to achieve the ambition. (Paragraph 77)

11. Renewable energy subsidies for anaerobic digestion should be restructured to avoid harmful unintended consequences. Revisions should either exclude maize from the subsidy altogether or impose strict conditions on subsidised maize production to avoid practices in high-risk locations which lead to soil damage. The broader cross-compliance regime has not proved sufficient to prevent such damage. Defra and DECC should work together to evaluate the impact of energy policy on soil health across the board. The upcoming 25-year environment plan should include specific plans for inter-departmental working and structures of accountability with the goal that soil protection is not simply the responsibility of Defra, but rather is a factor against which any policy can be measured. (Paragraph 78)

Monitoring soil trends

12. As Defra recognises, collection of data is key to developing effective policy. The lack of an ongoing soil national monitoring scheme undermines the Government's goals to managing soils sustainably. The lack of monitoring prevents us from having nation-wide knowledge about trends in the health of our soil. This gap is not new, and successive Governments have ducked the challenge since the Royal Commission on Environmental Pollution recommended a national monitoring scheme in 1996. (Paragraph 92)

13. While ad hoc studies and one-off research are useful, they cannot replace a rolling national programme. We recognise that the slow-changing nature of soil properties must be borne in mind when designing soil monitoring, but this is not an excuse for long periods without certainty as to when future monitoring will take place. The state of our knowledge about soil health would be better served by an ongoing programme. The evidence we heard suggests that such a programme would be feasible, affordable, and could deliver significant benefits. The Welsh approach of a rolling programme, with one quarter of sites evaluated each year, provides a useful model for this. (Paragraph 93)

14. Defra reports that work on developing soil quality indicators has been ongoing since 2003. It has also been in possession, since 2008, of a report detailing how to combine past monitoring programmes. By now Defra should be in a position to propose a set of indicators and a method of analysis. Our witnesses told us that it is not difficult to assemble a range of indicators to reflect soil health, and that soil organic carbon levels should be central to this. (Paragraph 94)

15. We recommend that the Government develop plans for an ongoing national-scale programme to monitor soil health, potentially aligned with and co-funded by EU payments as in Wales to provide the control for soil change within agri-environment schemes and other initiatives. Merely noting an intention to undertake a new survey in the future, as Defra does, is not adequate—a one-off enterprise each decade does not provide the strategic approach we need to maintain due focus on soil health. A new ongoing programme should ensure coverage of land which has previously reported as undergoing degradation and a suitable range of indicators to assess the provision of ecosystems services. (Paragraph 95)

Conclusion

16. Soil is crucial to society. Neglecting soil health could have dire consequences for food security, climate change, and public health. Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation through soil erosion and loss of carbon, and the natural environment will be seriously harmed. The importance of soil has not always been reflected in public discourse or Government policy, with soil receiving little attention compared to issues like air, water and biodiversity. (Paragraph 100)

17. Defra's upcoming 25-year environment plan should seek to rectify this long-standing deficit and place soil protection at the heart of environmental policy. Defra must also ensure that its accompanying 25-year plan for food and farming does

not sit in tension with its environment plan. We must move away from viewing soil merely as a growth medium and treat it as an ecosystem in its own right. We call for more joined up soil policy between Government departments to ensure no clashes in priorities. As well as taking national action, the Government should remain open to action on a European level to ensure soil protection. (Paragraph 101)

Formal Minutes

Wednesday 25 May 2016

Members present:

Mary Creagh, in the Chair

Peter Aldous
Geraint Davies
Peter Heaton-Jones

Draft Report (*Soil Health*), proposed by the Chair, brought up and read.

Paragraphs 1 to 101.

Summary read and agreed to.

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

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

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

[Adjourned till Wednesday 8 June at 2.00 pm

Witnesses

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

Wednesday 2 March 2016	*Question number*
Willie Towers, James Hutton Institute, **Sue Cornwell**, Lead Natural Environment Adviser, National Trust, and **Martin Rogers**, Environment Policy Adviser, National Farmers' Union	Q1–36

Wednesday 9 March 2016	
Lord Krebs, Chair of the Adaptation Sub-Committee, Committee on Climate Change, **David Thompson**, Senior Policy Analyst supporting the Adaptation Sub-Committee, Committee on Climate Change, and **Peter Melchett**, Policy Director, Soil Association	Q37–79
Professor Paul Hallett, University of Aberdeen, Professor **Richard Bardgett,** University of Manchester, and **Professor David Powlson,** Rothamsted Research	Q80–133

Tuesday 12 April 2016	
Dr Karen Johnson, Durham University, **Professor Chris Collins,** Soil Security Programme and University of Reading, **Howard Price,** Principal Policy Officer, Chartered Institute of Environmental Health	Q134–173
Professor Dave Chadwick, University of Bangor, and **Professor Jim Harris,** Cranfield University	Q174–208

Wednesday 27 April 2016	
Rory Stewart MP, Parliamentary Under-Secretary of State, Department for Environment, Food and Rural Affairs, and **Maggie Charnley**, Natural Capital Committee Secretariat, Department for Environment, Food and Rural Affairs	Q209–295

Published written evidence

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

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

1 Adas UK Ltd (SHI0023)

2 ADBA (SHI0043)

3 Agriculture and Horticulture Development Board (SHI0075)

4 All Party Parliamentary Group on Agroecology (SHI0040)

5 Anonymous Contaminated Land Officer (SHI0086)

6 BASE-UK (SHI0054)

7 British Ecological Society (SHI0058)

8 British Geological Survey (SHI0036)

9 British Society of Soil Science (SHI0030)

10 Centre for Ecology & Hydrology (SHI0072)

11 Chartered Institute of Environmental Health (SHI0091)

12 CIWEM (SHI0015)

13 CLA (SHI0039)

14 Committeee on Climate Change (SHI0046)

15 Compassion in World Farming (SHI0042)

16 Correspondence between DEFRA and CIEH (SHI0087)

17 Cranfield University (SHI0041)

18 DEFRA (SHI0056)

19 DEFRA (SHI0090)

20 Dr Franciska de Vries (SHI0032)

21 Dr Neil Humphries (SHI0034)

22 Dr Neil Humphries (SHI0088)

23 Dr Oliver Knox (SHI0006)

24 Dr Tim Harrod (SHI0009)

25 Dr. Arwyn Jones (SHI0076)

26 Dr. Robert Evans (SHI0027)

27 Durham University (SHI0081)

28 Durham University (SHI0082)

29 East Malling Research (SHI0057)

30 Game and Wildlife Conservation Trust (SHI0026)

31 Heath Malcolm (SHI0080)

32 Institute for Global Food Security, Queen's University Belfast (SHI0064)

33 James Hutton Institute (SHI0052)

34 Jennifer Jeffes (SHI0028)
35 Lancaster Environment Centre (SHI0014)
36 Landscape Institute (SHI0045)
37 Microbiology Society (SHI0074)
38 Mr Ian Carr (SHI0001)
39 Mr Robert Palmer (SHI0010)
40 Mr Simon Cowell (SHI0059)
41 Mr Stuart Norris (SHI0002)
42 Mr. Steven Pye (SHI0016)
43 Mrs. Susan Atkinson (SHI0008)
44 National Farmer's Union (SHI0044)
45 National Trust (SHI0068)
46 Nerc Soil Security Programme (SHI0048)
47 Newcastle University (SHI0063)
48 Newcastle University Student and Staff Soil Science Society (SHI0031)
49 Novamont (SHI0083)
50 Professor Chris Collins (SHI0085)
51 Professor Chris Evans (SHI0079)
52 Professor Jim Harris (SHI0084)
53 Professor Lindsay Stringer (SHI0011)
54 Professor Mark Hodson (SHI0003)
55 Professor Mark Kibblewhite (SHI0012)
56 Professor Paul Nathanail (SHI0092)
57 Professor Richard Bardgett (SHI0049)
58 Professor Rod Blackshaw (SHI0007)
59 Promessa Soil (SHI0004)
60 RCUK (SHI0053)
61 Reading Agricultural Consultants Ltd (SHI0073)
62 Rothamsted (SHI0018)
63 Scotland's Rural College (SRUC) (SHI0022)
64 Smart Growth UK (SHI0029)
65 Soil Association (SHI0062)
66 Soil First Farming (SHI0065)
67 Soil Research Centre, University of Reading (SHI0077)
68 STARS (SHI0055)
69 Sue Everett (SHI0024)
70 Sustainable Food Trust (SHI0078)
71 The Geological Society (SHI0051)

72 The Permaculture Association Britain (SHI0013)

73 The University of Sheffield Grantham Centre for Sustainable Futures (SHI0033)

74 The Wildlife Trust for Lancashire, Manchester & North Merseyside (SHI0035)

75 The Woodland Trust (SHI0038)

76 University of Aberdeen (SHI0060)

77 University of Roehampton (SHI0021)

78 University of Sheffield (SHI0071)

79 Wardell Armstrong LLP (SHI0069)

80 Wildlife and Countryside Link (SHI0061)

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.

Session 2015–16

First Report	The Airports Commission Report: Carbon Emissions, Air Quality and Noise	HC 389
Second Report	The Future of the Green Investment Bank	HC 536
Third Report	EU and UK Environmental Policy	HC 537
First Special Report	Local Nature Partnerships: Government Response to the Committee's Twelfth Report of Session 2014–15	HC 377
Second Special Report	Climate change adaptation: Government Response to the Committee's Tenth Report of Session 2014–15	HC 590