**THE SCOTTISH SOIL FRAMEWORK**

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1. **Are you responding:** (please tick one box)  
   a) as an individual? go to Q2a/b and then Q4  
   b) on behalf of a group/organisation? X go to Q3 and then Q4

<table>
<thead>
<tr>
<th>Individuals</th>
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<tr>
<td>2a. Do you agree to your response being made available to the public</td>
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<tr>
<td>YES (go to 2b below)</td>
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<tr>
<td>NO, not at all We will treat your response as confidential</td>
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2b. Where confidentiality is not requested, we will make your response available to the public on the following basis (please tick one of the following boxes)  
   YES, make my response, name and address all available  
   YES, make my response available, but not my name or address  
   YES, make my response and name available, but not my address

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<th>On Behalf of Groups or Organisations</th>
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<td>3. The name and address of your organisation will be made available to the public. Are you also content for your response to be made available?</td>
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<td>X YES</td>
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THE SCOTTISH SOIL FRAMEWORK

Response from:
The Macaulay Land Use Research Institute, Scotland, U.K.

<table>
<thead>
<tr>
<th>General Comments</th>
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<tr>
<td>The introduction highlights that the Scottish Government is planning to adopt a progressive view that soil requires protection in its own right, and not simply to protect other media. This approach to protection of soil as a functioning system is needed to ensure future environmental quality and the sustainable delivery of ecosystem goods and services.</td>
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</table>

The Macaulay Institute welcomes this consultation document on the Scottish Soil Framework and the opportunity to contribute to it. In general we applaud its progressive nature and the consensus building approach and offer the following observations on the specific questions. Answers to the set questions are given below and there are additional points of detail in the Appendix that you may wish to consider when you revise the document.

<table>
<thead>
<tr>
<th>Question 1.</th>
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<tr>
<td>The Government is proposing the Scottish Soils Framework in order to provide a policy overview and a coordinating vision for future actions on soil protection. Do you agree this is desirable?</td>
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</table>

Yes. The framework starts to address a significant and constructive opportunity to enhance our future sustainability through better soil stewardship. A policy overview is highly desirable as the issues surrounding soil are broad-ranging and disparate and soil has had a tendency to be overlooked in specific policy / legislation. The framework is an opportunity to bring together these disparate aspects at a time when the importance of soil in securing food and fibre production, protecting our food chain, habitats and quality of water from contaminants is much more evident. There are also significant threats to the soil not hitherto appreciated (see Towers et al., 2006), although many of these threats especially those linked to climate change are as yet unquantified and have uncertainty associated with how important they may be. The framework starts to address a significant and constructive opportunity to enhance our future sustainability through better soil stewardship.

The vision at present is a little vague but we believe that the Framework provides the initial impetus to develop soil policy in Scotland. If it serves to bring people with different and perhaps conflicting perspectives together then the broad vision as expressed in the consultation provides a sound / common basis for developing future more specific actions and importantly has potential to stand the test of time.

The document is an excellent awareness raising document which brings out the positive contribution of soils to Scotland’s economy, environment and cultural heritage. We believe firmly that these positive aspects have been, if not ignored, then certainly underplayed in the past but also believe that they
have become increasingly important in the context of the ongoing related
issues of climate change, food and energy security. More emphasis on the
positive role of soils in underpinning our economic strategy and long term
sustainability would be welcomed. To take one example in relation to soils
ability to store carbon, we think there is as great a potential for Scottish soils
to gain soil carbon as to lose it, through judicious management and changing
land use.

**Question 2.**
*Do you agree that the distinct Scottish soil resource requires protection?*

We agree that the distinct Scottish soil resource requires protection with
specific reference to the multi-functional and multi-sectoral demands put on it.
Our perception is that individual sectors can at times have a narrow view of
soils and ignore the multiple benefits from soil. A good example of this is that
a soil in a specific location may be valued for and managed for a single
specific use e.g. arable production but the other services it provide e.g.
protection of water might have equal or greater societal benefit. The fact that
potential benefits and impacts can be manifested elsewhere mean a broader
consultation and approach to take account of trade-offs is required.

However, we also consider that soil protection should address the
conservation of key soil resources where there is a link to future sustainability.
Three examples are:

(1) Scotland possesses some of the most highly productive agricultural soils
for temperate crops in the world but it covers a very small proportion of the
total land area. We believe that this is a very valuable resource which is under
pressure from other sectors (e.g. planning) and we must ensure that this
limited soil capacity and availability is maintained into the future

(2) Scotland’s soil support for a number of highly valued habitats of both
national and international conservation status (e.g. blanket bogs, montane
vegetation, machair and native pine woodlands). These habitats are under
threat from land use, management, pollution, and increasingly, climate
change. Retention and future expansion of these habitats will depend upon
the establishment / maintenance of suitable soil conditions.

(3) Our peatlands are of global importance. Scotland has large terrestrial
stocks of carbon locked up in our peatlands and other soils rich in organic
matter. We have a global obligation to protect this carbon sequestration stock
and to enhance storage capacity where-ever possible.

**Question 3.**
*Do you agree with the analysis of the main soil functions presented here?*

The soil functions as described are very similar to those that appeared in the
EU Soil Framework Directive. However we do have some observations to
make.

Paragraphs 3.6 and 3.7. We believe that in this section there is an
overemphasis on soils’ role in protecting water and air quality relative to other
aspects. Whilst not seeking to diminish these important roles in any way, we
would like to see recognition that soil should be protected in its own right and
not just as a medium to protect the other environmental media. The focus on
water and air, and related air/water protection means that the protection of
other soil functions, in particular, the soils’ capacity to filter, buffer degrade
and adsorb other constituents such as heavy metals and organic compounds
has been missed. In this respect soil protects the human food chain and the
food chain of our wildlife and valued ecosystems. This is equally important as
protecting air and water. Soil is also a habitat for a vast and largely un-
explored biodiversity. Soil with air and water makes up our biosphere but it
contains and supports the vast majority of our biodiversity. For this reason
soil should warrant protection. Consequently the Framework should seek a
balance and not seek to justify soil protection in terms of protecting protect
water and air to the detriment of the soil itself.

Further and linked to the point made above, soil has a valuable role in
protection of the food chain from a range of hazardous substances including
pathogens that are currently present in the environment as well as new
emergent diseases and more toxic, potent and resistant strains of crop,
animal and human pathogens.

Paragraph 3.8. The role of the soil in supporting native, iconic Scottish
habitats could be given further emphasis as it supports the topic of Q2. We
support recognition of the role that soils play in tourism – the soil resource
defines the maximum limit of some of our iconic habitats for example machair
and the potential for any expansion in others for example native pine
woodland as well as our landscapes. Iconic habitats and landscapes are part
of what sells Scotland to tourists but most tourists visit our cities. It is perhaps
overstating matters to say that they underpin all of Scotland’s tourism industry
and in terms of direct interaction with tourists. Soils do however underpin
Scotland’s rural tourism industry and in many places where other economic
opportunities are scarce.

Paragraph 3.10. Clays and other minerals should be added to the range of raw
materials provided by soil.

Question 4.
Do you agree with our analysis of soils in the context of climate
change?

This section is rather mixed up and confusing with too little consideration of
issues other than those related to carbon inventory. This also reflects that the
climate change scenario is too simplistic and do not reflect the important
regional differences in weather patterns suggested by the climate change
models which will affect sectors / soil functions in different ways. As this
section currently stands, there is a slight emphasis on the ‘production’ function
of soils, a little on environmental interactions and none on the impacts on
biodiversity and above ground habitats (which do rely on below ground
processes). The effects of increased DOC concentrations on water quality are
also missing from the analysis.

In addition, the section is rather negative and missing the opportunity to
identify management options to enhance carbon storage in soils which not only helps to mitigate climate forcing but which will also enhance other functions of soil. As stated before our soils may have more capacity to gain C than to lose it. This opportunity also seems to be missing from Chapter 7. Other positive examples would be opportunities to increase agricultural production with a potential expansion of higher grade agricultural land.

We feel a useful mechanism to enhance this important section would be to analyse each soil function (from the previous section) and identify the benefits and negatives that climate change causes for each in turn. In this context, the section on Climate Change and Food Production could be incorporated into the Changes in Land Capability section under a heading of biomass production, or agriculture – with a following section on forestry.

**Question 5.**
Do you agree with the analysis of the pressures and threats faced by Scottish soils? If not, which other threats need to be considered?

Although the Institute was partly responsible for the comparison of the different threats to Scottish soils, the approach should evolve to take into consideration further developments. We continue to feel that threats which will have a broad influence on soils should be assessed differently to threats that are more localised or soil specific. For example, climate change will effect all soils and therefore will have over-arching influence on all soil threats while the threat of soil erosion is focussed on particular soils in specific locations under key circumstances. Also, we are aware that levels of evidence differs greatly between threats and the corresponding levels of certainty associated should be incorporated into future threat assessments.

Threats that are missing are the potential for sub and supra-optimal nutrients in soil. Where nutrients have been supplied in excess of the soil’s holding capacity e.g. through continued fertilisation, this is not only at the expense of water quality (often regarded as the main receptor at risk) but also at the expense of soil quality e.g. for the maintenance of habitat structure or soil biodiversity. This links to our comments on paragraphs 3.6 and 3.7 where there appears to be less attention paid to soil protection *per se* with an emphasis on the off-site effects.

Some soils have inherent sub-optimal nutrient levels for biomass production (linking to human health). With likely increased demand for local food this limitation is likely to become more important in the future with supply capacity becoming depleted without appropriate inputs. There are opportunities to both ameliorate soils where deficiencies occur and to emphasis the positive fortifying effects that can contribute to branding regional foods, for example where enhancing essential trace elements for plants and animals, which ultimately have health effects for humans.

We are aware of specific and important reductions in soil biodiversity (e.g. BAP fungal and ants species or reduced soil biodiversity after land conversion) but due to lack of baseline information for Scotland, we do not know how widespread or significant these reductions are. Without such baseline data, a precautionary approach to loss of soil biodiversity is sensible.
Greater efforts to obtain such data are required. This is important not only for loss of soil biodiversity per se. but also for ensured functioning of soils into the future since soil organisms are the driving force behind most soil processes. A better understanding to the role between soil biodiversity and soil function will help us to improve our defining of soil quality for different uses and, in particular, in deriving endpoints or targets for effective and sustainable soil management. This in someway mirrors previous developments in water quality protection under the EU WFD where “good ecological status” is the defined goal. A better understanding of soil biodiversity will be essential to put soil on the same footing.

**Question 6.**
*Do you agree with our analysis of the current role of soils in existing policy framework?*

**AND**

**Question 7.**
*Where do significant gaps in soil protection exist?*

We are in full agreement with the sentiments expressed in paragraph 6.6; soil has a number of policies in place to help protect it but limited co-ordination of them has limited their combined and possibly even their individual effectiveness.

As one of the key objectives of the Framework is ‘to raise awareness, encouraging better policy integration’, we feel that there is a strong argument for bringing much of the material within Annex B into the body of the document. As it stands the short analysis of existing policies (section 6.3) is quite separate from the detail in the Annex and we suggest that as the Annex B structure mirrors the headings in paragraph 6.2, the material within it could be easily transferred.

We are unsure of the ‘status’ of a number of the policies identified in Annex B. Some have legislative powers for example the 1989 Sludge Regulations and the Contaminated Land Regime, others are Codes of Good Practice such as the PEPFAA code and the Farm Soils Plan and others express aspirations such as the Scottish Forestry Strategy and the Scottish Biodiversity Strategy. We suggest that the section could be enhanced if these differences were clarified as their influence (or ‘clout’) in terms of promoting action to some extent depends on their status. We are aware of a number of other documents such as Planning Advice Notes (PANs) and National Planning Policy Guideline (NPPGs) that offer advice on soil protection in specific contexts and consideration should be given to their possible inclusion in the Framework.

It is noteworthy that none of the policies in Annex B have soil in the title. In that context we are not convinced that some of the protection measures identified in paragraph 6.3 actually do provide soil protection. The soil is seen as the pathway and provides protection for other receptors, primarily water courses. Soil protection needs to move towards identifying soil as the receptor and worthy of protection in its own right. Any move in that direction also needs to ensure that there are adequate provisions for the ‘policing’ of any protection strategy.
We feel strongly that agricultural land should be afforded more protection and such protection would resonate with other SG initiatives such as the Scottish Food Policy and the aspiration that we should source more locally grown food. Prime agricultural land (LCA classes 1 - 3.1) should be afforded the greatest protection but a system could be developed that allows differing levels of protection to different LCA classes that has flexibility to account for local environmental, social and economic conditions. As the Framework rightly states it is not possible to stop development on Greenfield sites, but greater consideration should be given to soil and all its functions in the spatial planning process. The Framework provides a real opportunity to raise awareness of the importance of soil to the National and Local Authority Planning communities.

**Question 8.**
**What are your views on the impact of climate change on the effectiveness of the existing soil protection policy framework?**

Climate change, depending on the scale and nature of the shift, would accentuate the effects of existing threats and could have quite profound effects on the effectiveness of some existing soil-related policies. For example farmers could increasingly find it difficult to meet the GAEC requirements related to organic matter levels in soil and minimising erosion and compaction in soils. Climate change might conceivably influence the uptake and fate of contaminants already within the soil and further additions to it; existing limits may not be relevant and require revision. The adaptability of the biodiversity within soils to climate change is uncertain as is the role of soils in flood alleviation.

**Question 9.**
**Views are invited on the vision and aim.**

We support the vision statement but it could perhaps be strengthened; soil is our key natural resource for long-term sustainability. Apart from its people, the land is Scotland’s greatest resource and soil is the vital component of that. Comparing water, air and soil, soil by itself is Scotland’s distinctive natural resource. Unlike air or water, its formation and functions uniquely reflect Scotland’s climate, geology, landscapes and cultural heritage. One aspect that might be missing is the need for remediation/restoration. There is a tacit assumption that current soil conditions just need sustaining or maintaining. But some soils may not be all that they could be; soil improvement (in its widest sense) may put ‘capital in the bank’ for future generations.

The Aim is very broad but entirely appropriate for a Framework document at this stage in policy development.

**Question 10.**
**Views are invited on the outcomes, to which specific activities contribute to. Should we be adding additional outcomes?**

The outcomes whilst largely very laudable in their ambition come across rather as a wish list. We suggest that if they are much more strongly linked to the activities, they will be easier to justify across the range of stakeholders.
We suggest some strengthening of some of the outcomes specifically:

- ‘soil organic matter protected and enhanced’
- ‘soil erosion reduced and where possible remediated’
- ‘greenhouse gas emission from soils reduced and uptake enhance’

We are somewhat unsure what is meant by ‘enhancing the soils capacity to adapt to climate change’. How might this be done? By increasing the soils’ carbon storage capacity through appropriate soil management for example we may be able to make soil more ‘resistant’ to desiccation or water logging but true ‘adaptation’ might only occur through the soils biodiversity adapting to climate conditions. A number of Scotland’s soils that support some of our iconic habitats e.g. montane and machair soils are perhaps at greatest risk and it is difficult to identify measures that would increase their capacity to adapt. An alternative strategy is to conserve what we can of their biodiversity. Hence, as this is an important topic, and is rightly highlighted, we think the terminology and concepts visited in this section should be re-defined and elaborated and developed further.

**Question 11.**

**Views are invited on the four work areas under which future activities will be carried out.**

We fully support the four Work Areas outlined in Figure 7.1. From our own experience in raising awareness (Work Area 1), we suggest that the positive aspects of soil should be emphasised and that novel types of methods and language are more successful in communication with the public and general stakeholders than formal scientific terminology.

A soil information system for Scotland would also be an important mechanism for raising awareness of soils and would also help deliver within Work Area 4.

With regards to Area 2 – and it continues the theme that runs through our response – we strongly support this but more recognition and coverage of soil as a receptor (i.e. soil protection in its own right), rather than as simply a pathway for other environmental media.

Area 3 seems to have two parts; the monitoring network might equally sit under Area 4.

**Question 12.**

**Have the right activities been identified to contribute to achieving the outcomes?**

Paragraph 7.9 states that the specific activities will contribute to achieving the outcomes. The linkages between the activities and outcomes are not immediately clear and we suggest that the linkages could be made clearer and more explicit. An example of what we mean is the connection between the Scottish Government seeking to explore mechanisms to collect reliable data on the loss of land to development (the activity) and the desire to reduce
pressure on Greenfield sites (the outcome). In our view, this would strengthen the Framework considerably.

The overarching activity should seek to raise awareness of the importance of soils through all stakeholder and social groups and not just focus on policy development. By focussing on the latter, there is a danger that the public may not understand why soils suddenly move up the policy agenda and there may be some resistance to that.

The inclusion of specific decision support tools such as Planet might suggest that there may be some vested interests involved.

**Question 13.**

*Are additional activities required?*

**AND**

**Question 14.**

*Which activities need to be prioritised?*

We agree that prioritisation is required and suggest that the overarching activity of awareness-raising is most important; if this is successful, many of the others should become much easier. Access to soil information at a number of different points is key to this. Soil is actually an excellent vehicle for education as it covers such a variety of core scientific (and non-scientific) disciplines and interests. We would also suggest this information exchange as a two way process where stakeholders would be encouraged to collect their own samples, contribute to the continual development of such an information system and thereby get a sense of ownership of it. Soils information needs to be kept up to date and fit for purpose for reporting purposes but also to be ready to respond to as yet unforeseen policy / management scenarios. This also highlights the inherent capacity of soil to deliver in the future requires to be protected.

It could be argued that tackling the areas of land sealing, the gathering of reliable information on development particularly on agricultural land, and the potential re-introduction of robust protection for prime agricultural land should be the initial priorities. Land sealing is irreversible.

We suggest that other activities should include:

- Retaining a watching brief on other policies where soils may have a role i.e. not policies necessarily related to soil protection as described in Chapter 6. The role of soil in LFA designation is a good example of this.
- Examining the connection between soils and human health – for example trace elements deficiencies, the threat from pathogens and chemical contaminants potentially from air borne soil particles.

Setting a national target for raising soil carbon levels. This would achieve a number of benefits related to climate change, biodiversity, soil quality, GHG emission and water quality.

**Question 15.**

*What are your views on future stakeholder engagement?*
We support the formation of a Soil Focus Group and indeed would be keen to contribute to it. The Soils Consultative Group set up to exchange knowledge on SG-RERAD research has provided an excellent forum for engagement and the information flow is genuinely two way. This and the constructive process of formulating the SSF via working groups suggest this would be useful way forward.

Learning lessons from the implementation of the WFD and other EU Directives (Habitats etc), we feel strongly that the soils area will need a greater level of resourcing within SEARS and the SG if it is is going to meet the future policy needs.
**THE SCOTTISH SOIL FRAMEWORK**

Response from:
The Macaulay Land Use Research Institute, Scotland, U.K.

**Appendix to Response**

**Points of Detail**

<table>
<thead>
<tr>
<th>P18 Section 1.1</th>
<th>In what sense is there a “semi-natural” component to soils? [C &amp; N are not “substances”].</th>
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</thead>
<tbody>
<tr>
<td>P18 Section 1.2</td>
<td>“rest of the UK” – also fairly unique within Europe “8 meters” – depends if you are referring to mean or maximum. If the former, then only certain basin bogs are this deep, if the latter then some blanket bog goes down to nearly 11 meters.</td>
</tr>
<tr>
<td>P21 Figure 1.1</td>
<td>Probably semantics, but is there no part of Scotland under natural vegetation (as opposed to semi-natural vegetation)?</td>
</tr>
<tr>
<td>P26 Section 2.3</td>
<td>But Scottish soils are similar to those encountered in Ireland and Scandinavia.</td>
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<tr>
<td>P26 Section 2.4</td>
<td>The opening sentence is slightly misleading. Even if we had only one soil type we would call on it to fulfill all functions. However some types are better at certain functions (might be interesting to draw up a matrix of type against function, if this has not already been done).</td>
</tr>
<tr>
<td>P26 Section 2.7</td>
<td>“majority of the soil carbon stock” – a bit of an exaggeration; latest estimates would put it at ca. 55% but this ignores C in England, Wales &amp; N. Ireland below 100cm.</td>
</tr>
<tr>
<td>P30 Section 3.2</td>
<td>Possibly, one doesn’t require the qualifier “terrestrial”.</td>
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<tr>
<td>P31 Section 3.7</td>
<td>As for Section 2.7</td>
</tr>
<tr>
<td>P34 Section 4.3</td>
<td>Again as for 2.7.</td>
</tr>
</tbody>
</table>
P35 Section 4.5
Perhaps worth highlighting the increased risk of fire in desiccated peatlands.

P36 Section 4.8
The reference to Figure 4.1 is not really appropriate and Figure 4.2 does not exist. In fact, we jump from Figure 4.1 to Figure 4.4.

“Restoration and re-creation of peatlands can result in increased methane emissions initially” – we are not aware of any evidence that this effect would be restricted to initial stages.

P39 Figure 4.4
This figure is not easy to understand. For example, what is “public”? Also it is not obvious that the 85% is made up of the sum emissions and uptake. The same would apply to the 2050 figure – presumably we would like to see even greater uptake off-setting a lesser (and more realistic) reduction in emissions.

Figure 4.5 is a bit fuzzy also.

P43 Table 5.1
While climate change can be a threat to soil, its action is only through the other threats, i.e. organic matter loss, erosion, etc. (with apologies to Towers et al.).

P44 Question 5.
Alongside ‘pesticides’ there are perhaps other organics – hydrocarbons, PCBS, etc.

P46 Figure 5.1
Should be Figure 6.1

P47 Section 6.3
“Part A installations” is rather jargonized.

P51 Section 7.7
“soil information” – is this referring to the soils database?