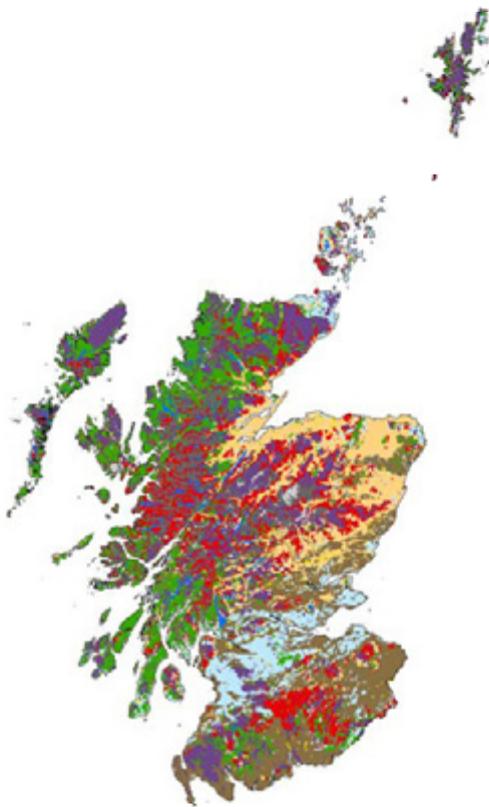

The Scottish Soil Framework



May 2009

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MINISTERIAL FOREWORD & EXECUTIVE SUMMARY



Ministerial Foreword



The Scottish Government has one, clear purpose: to focus the Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth.

Scotland's soils perform a large number of economic and environmental functions. Many industries, including farming and food production, forestry and tourism, depend on the sustainable use of soils. Soil management also plays an important role in sustainable flood management.

In Scotland we have a strong track record in soil protection. Research shows our soils are generally in good shape. However, there is no room for complacency, and pressures on soils need to be taken seriously in order to prevent soil degradation. The most significant of those pressures are climate change and loss of soil organic matter. Whilst there are uncertainties as to how exactly the future climate will impact on Scotland's soils, there is a risk that other threats like erosion, compaction, loss of biodiversity and nutrient leaching could be exacerbated.

At the same time there are increasing, sometimes conflicting calls on Scotland's soil resource: there is rising demand for locally produced Scottish food; increasing requirement for infrastructure development as well as for forestry cover and renewable energy production.

We need to prepare for these future challenges and enhance the soil's capacity to adapt to pressures under a changing climate. The Scottish Soil Framework was developed with key stakeholders, with the aim of raising the awareness about the services that our soils provide to society and the pressures they face.

The objective of the Framework is to instigate a process by which key stakeholders will work together to achieve better soil protection. The multi-functionality of soil requires partnership and coordination with key delivery partners. To bring about joint working, the Scottish Government will facilitate liaison amongst relevant organisations.

Scotland's soils are one of the Nation's greatest natural assets. They are valuable, but vulnerable. It is important that we find effective ways to use them sustainably. The Scottish Soil Framework will be an important step towards achieving the National Outcome on Natural Resource Protection and Enhancement.

A handwritten signature in black ink, appearing to read 'R. Cunningham'. The signature is fluid and cursive, with a large initial 'R' and a long, sweeping underline.

Roseanna Cunningham
Minister for Environment

EXECUTIVE SUMMARY

Soils are at the heart of all life: they cover most of the natural terrestrial world. Because of the long timescales involved in soil formation processes, and as some impacts such as development or pollution are essentially irreversible, soils should be considered as a finite, non-renewable resource.

Soil Functions

The soils of Scotland provide a wide range of environmental, economic and societal benefits. The term *soil quality* is conventionally defined as the ability or fitness of a specific kind of soil to carry out one or several of the following functions:

- Providing the basis for food, forestry and other biomass production
- Controlling and regulating environmental interactions - regulating water flow and quality
- Storing carbon and maintaining the balance of gases in the air
- Providing valued habitats & sustaining biodiversity
- Preserving cultural and archaeological heritage
- Providing raw material
- Providing a platform for buildings and roads

Pressures on soils

Due largely to the sustainable management employed by land managers over a prolonged period, Scotland's soils are generally in good health. However, compared with air or water, for which national, long-term datasets exist, for soils there is a lack of national trend data from which evidence of change or damage to soils might be determined.

According to recently published research, climate change and loss of organic matter are the most significant threats to Scottish soils. Both affect most soil functions with national impacts, which are difficult to reverse. In the case of greenhouse gas emissions, the impacts are global.

Construction leading to sealing, loss of biodiversity and deposition of acidifying and eutrophying air pollutants also represent significant threats to soils in Scotland. Threats most commonly associated with cultivation (erosion, loss of structure, compaction) do not pose high risks at the national scale. However, these do pose a threat locally and can have significant impacts, for example, loss of peatland habitat, damage to subsurface archaeological features and impacts on water quality.

Soil Protection Policies

In Scotland there is a significant body of policy in place relevant to soils, providing some direct or indirect protection of soils. However, no one legislative or policy tool has been developed specifically with the protection of soil in mind. Where policy or legislation does relate to soil, the extent is generally limited to the protection of a specific impact or function of that soil.

At European level, the European Commission has adopted the Thematic Strategy for Soil Protection following concerns about the level of soil protection within Members States. The Commission also proposed a Framework Directive for the Protection of European Soil, which sets out legislative proposals to prevent soil degradation, to preserve soil function and to restore degraded and contaminated soils.

Vision and Outcomes

Against this background, the Scottish Soil Framework has been developed in conjunction with advice from key stakeholders. Our vision is that **soils are recognised as a vital part of our economy, environment and heritage, to be safeguarded for existing and future generations.**

The main aim of the Framework is to promote the sustainable management and protection of soils consistent with the economic, social and environmental needs of Scotland.

The Framework identifies a wide range of activities that will contribute to 13 soil outcomes:

- SO1 - Soil organic matter stock protected and enhanced where appropriate
- SO2 - Soil erosion reduced and where possible remediated
- SO3 - Soil structure maintained
- SO4 - Greenhouse gas emission from soils reduced to optimum balance
- SO5 - Soil biodiversity, as well as above ground biodiversity, protected
- SO6 - Soils making a positive contribution to sustainable flood management
- SO7 - Water quality enhanced through improved soil management
- SO8 - Soil's productive capacity to produce food, timber and other biomass maintained and enhanced
- SO9 - Soil contamination reduced
- SO10 - Reduced pressure on soils by using brownfield sites in preference to greenfield
- SO11 - Soils with significant historical and cultural features protected
- SO12 - Knowledge and understanding of soils enhanced, evidence base for policy review and development strengthened
- SO13 - Effective coordination of all stakeholders roles, responsibilities and actions

The publication of the Scottish Soil Framework is the first important step to raise awareness of sustainable soil management thereby encouraging better policy integration. The Framework will set in train a process during which future activities will be identified and taken forward jointly with key delivery partners.

Soil Focus Group

In order to facilitate future activities, a Soil Focus Group will be established. The Group will act as a platform for liaison amongst key delivery partners and stakeholders and will advise on policy review and development in areas relevant for soil use and management. The Group will work together to develop and build on the activities set out in this Framework.

The Soil Focus Group will be flexible and able to adapt its working programme to respond quickly to changes in the policy context at both national and European level, where negotiations on the proposed Soil Framework Directive are ongoing, and provide advice to the Scottish Government accordingly.

Key to all future efforts is the need to continue to engage closely with land managers and stakeholders to improve the level of awareness of soil, and also with the research community, ensuring that all efforts are underpinned by sound evidence. The Scottish Government funds a substantial research portfolio *Protecting the Nation's Soils*. This reflects the key role that this natural resource plays in delivering economic and environmental benefits. At the same time, it highlights the scientific uncertainty on many fundamental soil processes. The full exploitation of the findings of soil research by stakeholders will be a significant step towards sustainable soil management.

CHAPTER 1

INTRODUCTION



CHAPTER 1: INTRODUCTION

- 1.1 The Scottish Soil Framework sets out the vision for soil protection in Scotland, and formally acknowledges the important services soils provide to society.
- 1.2 Scotland's soils provide food, biomass and raw materials. They store, filter and transform many substances, including water, nutrients and carbon. They serve as a platform for human activity and landscape, and as an archive of heritage and play a key role as a habitat and gene pool. Because of the socio-economic and environmental importance of these functions, it is important that Scotland's soils are managed sustainably – so that they retain the capacity to carry out the vital services on which we depend ^(1, 2, 3, 4).

Soil protection and the Government's Purpose

- 1.3 **The Scottish Government has made increasing sustainable economic growth its overarching purpose.** To achieve this purpose, the Government has identified 15 National Outcomes, including:

We value and enjoy our built and natural environment and protect it and enhance it for future generations.

Protecting Scotland's soils aligns with and supports the Government purpose of increasing sustainable economic growth and the National Outcome identified above.

- 1.4 The Government has also identified 5 Strategic Objectives, which play a key role in focusing the activity of Government and its delivery partners. Sustainable soil use contributes in particular to the *Greener* objective.

Because of its wide-ranging functions, sustainable soil use also contributes towards other Government Strategic Objectives, including the *Wealthier & Fairer*, *Healthier* and *Safer & Stronger* objectives. In particular, healthy and functioning soils are essential for wealth creation in forestry and agriculture.

Scottish Soils – The Current Policy Landscape

- 1.5 Scotland's soils are one of the Nation's greatest natural assets and are at the heart of most terrestrial life. However, unlike other key natural assets such as air and water, relatively few policies exist which are specifically targeted at the protection of soil itself. Existing policies (e.g. for environmental protection, agriculture, forestry, recycling of organic materials, planning) may all make a contribution to soil protection, but each focuses on a particular function of the soil, rather than on the soil itself. Because of this fragmented nature, existing policies are limited in their combined effectiveness to protect soils. In addition, they are spread across many policy areas and organisations. They do not constitute a coherent soil protection policy, because they do not cover all soils and all threats to soils.

- 1.6 Unlike air and water, which are widely accepted to be mostly public goods, soils and land are usually in private ownership. Whilst the majority of soils in Scotland are well managed, the costs resulting from those soils that are degraded are often not entirely borne by the immediate land users, but are also borne by society at large (e.g. greenhouse gas emission from soils; excessive nutrient runoff and poorly managed soils contributing to flooding).

The Scottish Soil Framework - Government's vision for Soil Protection in Scotland

- 1.7 Against the background described above, the Scottish Soil Framework has been developed with support from a wide range of relevant stakeholders, to raise the awareness about the services that soils provide to society, and the pressures that soils face.

- 1.8 The principal aim of the Scottish Soil Framework is to:

Promote the sustainable management and protection of soils consistent with the economic, social and environmental needs of Scotland

- 1.9 The Framework acts as an overview for soil protection in Scotland (Figure 1.1), bringing together key delivery partners, including Scottish Environment Protection Agency, Scottish Natural Heritage, Forestry Commission Scotland and Historic Scotland, as well as land managers, research organisations and other stakeholders working towards the soil outcomes described in detail in Chapter 7.

- 1.10 The Framework does not set out new policy measures that impact on land management. Equally, it does not contain detailed guidance for practitioners. It does, however, raise awareness of the need to improve policy integration by fostering a mainstreaming approach – changing the way existing functions are carried out, rather than adding new ones. The vision underlying the Framework is that:

Soils are recognised as a vital part of our economy, environment and heritage, to be safeguarded for existing and future generations in Scotland.

- 1.11 It is clear that achieving the soil outcomes can only be taken forward through joint effort with the key delivery partners and stakeholders listed above. At the heart of the Framework is the establishment of a Soil Focus Group, which will provide a platform for liaison and pooling of resources and information.

The Structure of the Scottish Soil Framework

- 1.12 Chapter 2 of the Framework describes the importance of soils and its functions, while Chapter 3 sets out the diversity of Scotland's soils. The pressures on soils

are identified in Chapter 4, with the role of soils in the context of climate change outlined in Chapter 5. The current policy framework for soil protection is described in Chapter 6. Finally, Chapter 7 outlines the future focus and activities to be taken forward in relation to outcomes.

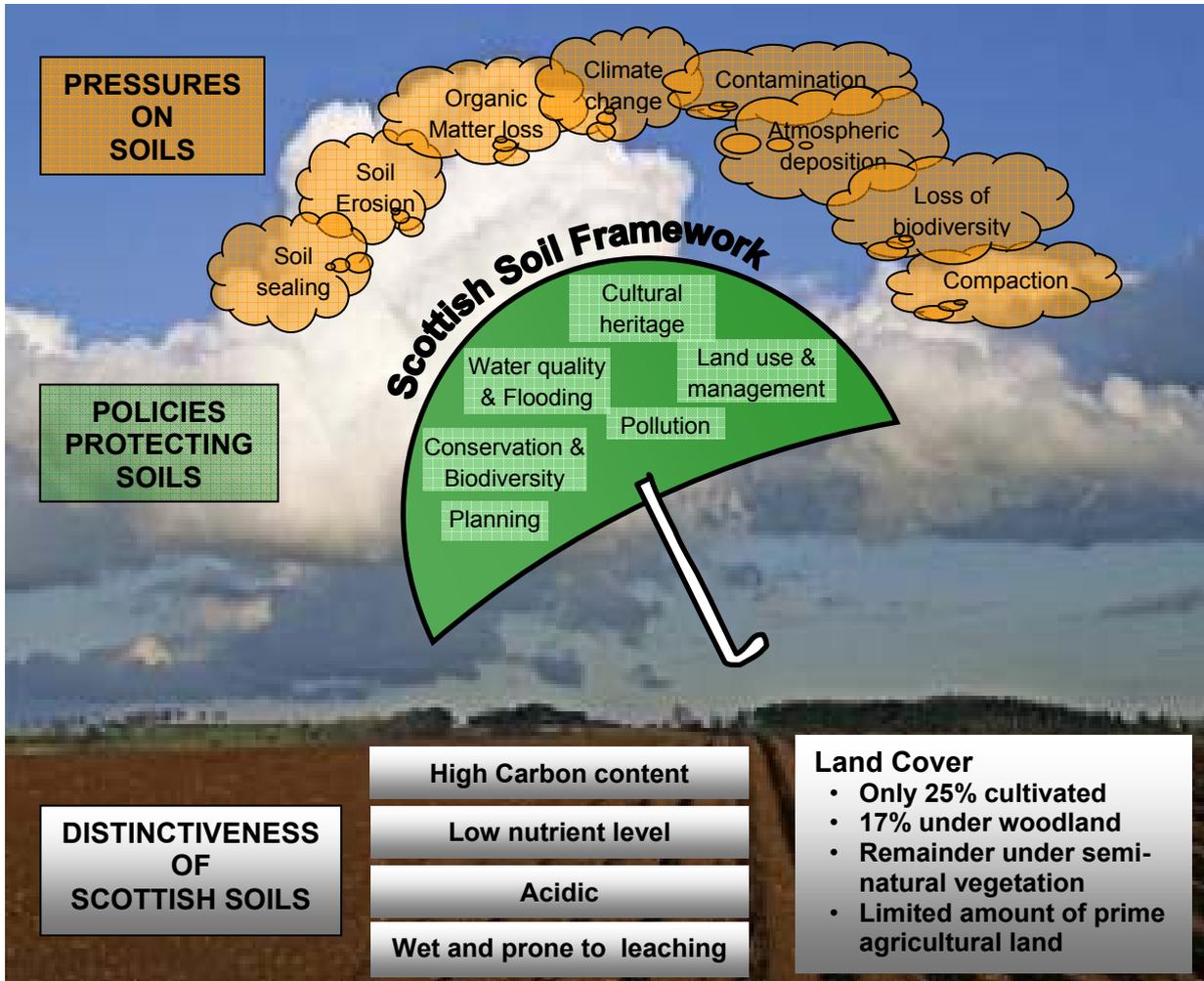


Figure 1.1 The Scottish Soil Framework

CHAPTER 2 THE IMPORTANCE OF SOILS & SOIL FUNCTIONS



CHAPTER 2: THE IMPORTANCE OF SOILS & SOIL FUNCTIONS

What is soil?

- 2.1 The word 'soil' means different things to different audiences. For many people soil is just dirt or mud under their feet; for farming communities it is the basis for their livelihoods; for developers it can be unwanted material or spoil; for engineers it forms the physical foundation for buildings and infrastructure. By contrast with various other aspects of our natural heritage, soils can be held under private ownership and be subject to varied land management and land use activities. There are clear economic and environmental values associated with the properties and uses of soils. Box 2.1 provides a broad definition of soil.

Box 2.1 Definition of Soil

Soil is a biologically active complex mixture of weathered minerals, organic and inorganic compounds, living organisms, air and water which provides the foundation for life in terrestrial ecosystems. Soil however is not merely the sum of these parts, but also a product of their interactions. Soil forming processes are dependent on these interactions and thus soil only forms where soil forming processes are active. The depth at which these processes cease or become insignificant varies but in general at depths between 1-2 metres below the ground surface. Material below this depth and above bedrock is referred to as the soil parent material.

- 2.2 Soils are at the heart of most terrestrial life: they cover most of the natural terrestrial world and form the foundation of all terrestrial ecosystems, supporting key processes in biomass production and exchange with atmospheric and hydrological (e.g. river and coastal) systems. Soils are valued both for their functional roles and for their intrinsic physical, chemical and biological features.
- 2.3 Although soils are a continually evolving, living and dynamic medium responding to external pressures and management, some activities such as development or pollution can mean their recovery or reformation cannot take place within human timescales. This means soils are a finite and essentially non-renewable resource.

Soil functions

- 2.4 Soils provide a wide range of environmental, economic and societal benefits. Soil quality is conventionally defined as the ability or fitness of a specific kind of soil to carry out the functions described in the subsections below. Ongoing research endeavours to produce much clearer criteria for defining soil quality and associated environmental standards in relation to key soil processes and functions.
- 2.5 The concept of soil functions ⁽⁵⁾ is a useful way of expressing the various roles that soils perform. However, it must be remembered that soil has an importance and value in itself, not necessarily or easily defined by its managed

applications. This aspect is highlighted by the growing interest in soil biodiversity, the historical records contained within soils (paleosols and paleoclimatic records) and in the social benefits accrued from activities such as gardening.

- 2.6 Soils are multi-functional, but most soils are managed specifically to optimise the delivery of one or two functions, which in turn may compromise their ability to perform the other functions. Soil functions are set out in greater detail below. It is important to note that soils are interlinked with air and water in such a way that they help regulate their quality. In particular, sustainable water management and soil management are intrinsically linked.

2.7 Providing the basis for food and biomass production



This is the most obvious and tangible of all the soil functions and the one to which it is easiest to attribute an economic value. The agriculture, forestry and horticultural industries are key parts of a sustainable rural economy. Healthy soils and sustainable management of existing soil resources enable these industries to produce high quality outputs. Although relatively small in extent,

Scotland's prime agricultural soils have produced some of the highest yields of wheat and barley in the world. Lowland soils in the west of Scotland support very productive pastures and the associated dairy sector. Soils also sustain a very vibrant and diverse forestry and woodland sector. In urban settings, soils provide the basis for significant food production as part of gardens and allotments.

2.8 Controlling and regulating environmental interactions - regulating water flow and quality.



Soils play a vital role in storing, retaining and transforming contaminants and preventing their discharge to water courses thus reducing diffuse pollution. River basin management is a requirement under the Water Framework Directive and the maintenance of key soil filtering and transforming functions are of fundamental importance in River Basin Management Plans.

Soils also play a key role in sustainable flood risk management. Soils retain water and reduce overland flow and thus provide a natural barrier to safeguard habitation.

2.9 Storing carbon and maintaining the balance of gases in the air.



Scotland has large areas of organic matter rich soils which are a major sink and potential source of greenhouse gases. They contain the majority of the UK's reservoir of terrestrial carbon. Warmer climates and more intensive land use can increase loss of carbon from soils to the atmosphere. The relationship between soils and climate are described in more detail in Chapter 5.

The majority of Scotland's nitrous oxide emissions (a more potent greenhouse gas than carbon dioxide) come from agricultural soils. In addition, agricultural soils can be an important source of ammonia which affects sensitive semi-natural habitats through eutrophication.

2.10 Providing valued habitats & sustaining biodiversity



Soils are a reservoir of huge biological diversity. Soils support a number of terrestrial habitats of international significance and indeed should be viewed as being an integral part of those habitats and associated landscapes including blanket peatlands, montane habitats, native pine woodlands and machair grasslands. These habitats underpin Scotland's rural tourism and sporting industry in parts of Scotland where

other economic opportunities are often limited.

The large and unexplored diversity of organisms in soil also represents a potentially valuable, but largely an as yet undiscovered genetic reservoir of organisms, enzymes, pharmaceutical and other bioactive compounds, which might be useful for a wide range of biotechnological industries.

2.11 Preserving cultural and archaeological heritage



Scotland has a distinctive range of soils as a result of both specific environmental influences and a long tradition of soil use. These soils should be seen as an intrinsic part of our culture.

Soils in themselves provide a record of past environment and climate as well as previous cultural influences on them. They also provide a protective cover for subsurface archaeological remains.

In some circumstances soils, such as machair soils or the heavily improved soils of gardens and designed landscape form an important element of the cultural landscape. In uplands, soil has retained the imprint of past land use practices (e.g. old rig and furrow patterns) and form part of the cultural landscape.

2.12 Providing raw material



Soils provide a direct source of minerals and other resources, such as peat, topsoil, sand and gravel. Peat has been used as a traditional fuel in Scotland since prehistoric times and is also particularly important for the Scottish Whisky industry. Fulfilling the role of raw material provision could lead to the destruction of soils, to the detriment of other soil functions. However any extraction

process, whether gravel, coal or other materials, should be properly planned and begin by stripping the topsoil and subsoil from the area concerned and storing them separately for re-use at the end of the process.

2.13 Providing a platform for buildings and roads

This function is different from the others in so far as once soil is used to fulfil a 'platform role', it loses, to a large extent, its capacity to fulfil its multi-functional role in the environment. The 'platform role' is in most cases connected with soil compaction and sealing (covering the soil with an impermeable surface), thereby reducing or destroying the ability of soils to provide environmental and ecological services. Soil is essentially a non-renewable resource and therefore the consequences of sealing are long term. Formerly sealed land can be restored, but can take many years before soils become fully functional.

2.14 A further concept which can be used to frame how soils provide environmental, economic and societal benefits is that of "ecosystem services". This concept is designed to identify explicitly the benefits that accrue from the wider environment (of which soil is a component) to society (Box 2.2).

Box 2.2 Ecosystem Services

The underlying principle of ecosystem goods and services is that human life depends on natural resources and that nature contributes to the fulfilment of human needs. The most prominent effort to establish an ecosystem service concept is the Millennium Ecosystem Assessment ⁽⁶⁾ which defines ecosystem services (and goods) as the benefits humans obtain from ecosystems. These services include:

- provisioning services (e.g. food),
- regulating services (e.g. climate),
- cultural services (e.g. recreation) and
- supporting services (e.g. soil formation) needed to maintain these other services.

Development of the concept is the subject of ongoing research and there is a growing interest in its application in policy development. Applying an ecosystem approach to policy and decision-making will improve delivery of public priorities through better management of natural resources, with fewer conflicts and unintended consequences.

CHAPTER 3

THE DIVERSITY OF SCOTTISH SOILS



CHAPTER 3: THE DIVERSITY OF SCOTTISH SOILS

- 3.1 The distribution of the principal soil groups in Scotland is shown in Figure 3.1. The characteristics of Scottish soils are determined by the cool maritime climate and the underlying geology, that is predominantly composed of acid rocks and which are generally resistant to weathering⁽¹⁾.
- 3.2 Scottish soils are, in general, more organic, more leached and wetter than those of most other European countries. Scotland contains greater proportions of podzols (dry and acid soils; 23.7% of the land area), peat soils (22.5%) and gleys (wet soils; 20.6%) than Europe as a whole. Figure 3.1 illustrates the contrast between soil types in the Central Valley and those in the Highlands and Southern Uplands. The Central Valley is dominated by mineral soils, whereas the Highlands and Southern Uplands are dominated by peaty soils (peat, peaty gleys and peaty podzols) especially in the west.
- 3.3 Scottish soils are estimated to contain approximately 3000 million tonnes carbon, which is the majority of the soil carbon stock of the whole of the UK^(7,8).
- 3.4 The diversity of soil types coupled with climate and topography explains the differences of soil and land use in Scotland compared to other parts of the UK, and accounts for the wide range of functions associated with Scottish soils. Almost all soils produce above-ground biomass, however the land cover map of Scotland (figure 3.2) shows that only around 25% of the area of Scotland is used for arable crops and improved grassland, with a further 17% under forestry.
- 3.5 Arable crops are primarily located in the eastern half of the country and improved grassland in the south west. These land uses are almost entirely associated with mineral soils. Although these soils are not particularly distinctive and are similar to cultivated soils elsewhere in the UK, they are valuable for their agricultural productivity.
- 3.6 The remainder of the country is under semi-natural vegetation, such as heather moorland, native woodland, blanket bog and montane habitats, land covers which are dominant in upland Scotland. These habitats are associated with highly organic soils. Many of these habitats are of high conservation value and are unique to Scotland and the soils that underpin them are rare in a UK, European, and in some cases, a global context.
- 3.7 Soils underlying the large areas of semi-natural vegetation in the uplands and moorlands are of great importance for wider environmental functions, such as carbon storage, biodiversity and water storage and filtration, as opposed to biomass & food production.

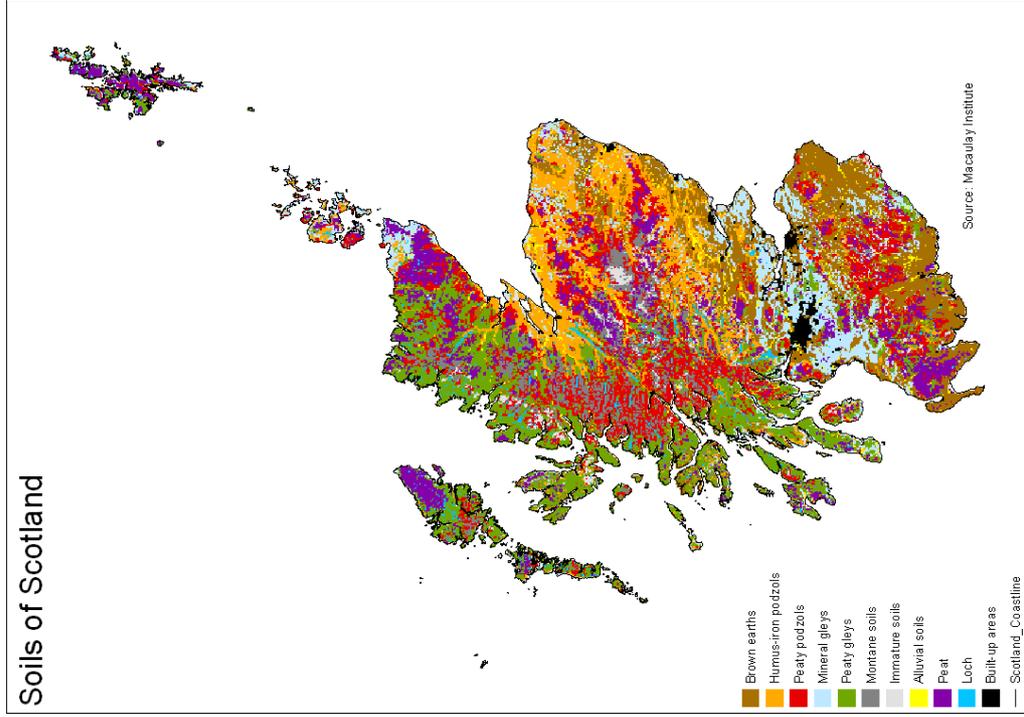


Figure 3.1 The soils of Scotland (MLURI)

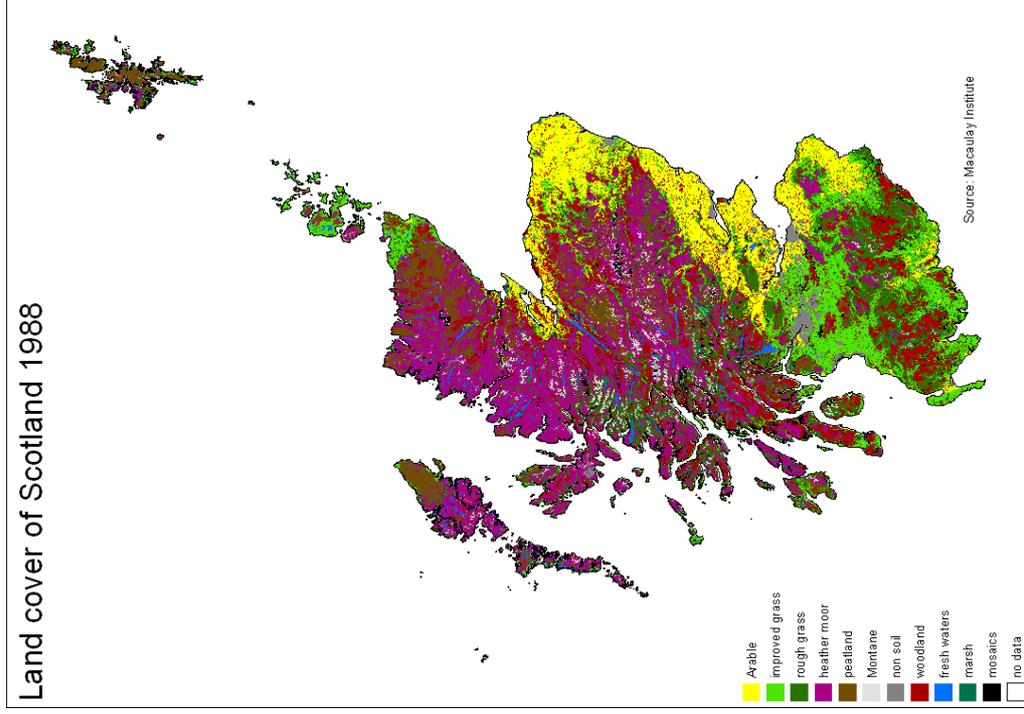


Figure 3.2 Land Cover Scotland 1988 (LCS88) (MLURI)

- 3.8 Recently, Towers *et al.* ^(9,10) have proposed a methodology to assess the potential conservation values of soils based on measurable criteria (rarity, complexity and diversity) for Scottish soil. There is a pressing need for this methodology to be developed further to include cultural heritage and historic environmental values.
- 3.9 In addition, the Land Capability for Agriculture classification, developed in the early 1980's as a systematic basis for defining areas of natural handicap in relation to agriculture in Scotland ⁽¹¹⁾ is currently under review to include impacts of climatic change on soil properties and hence soil functions.
- 3.10 The unique nature and diversity of Scottish soils calls for unique protection policies, tailored to specific soils properties, functions and locations. In particular the potential of soils to become significant sources of the greenhouse gases carbon dioxide, methane and nitrous oxide mean that specific sustainable management strategies are required.

CHAPTER 4 PRESSURES ON SOILS



CHAPTER 4 : PRESSURES ON SOILS

4.1 In 2001 SEPA published the *State of the Environment: Soil Quality Report* ⁽¹²⁾ which identified the main pressures on soils. Towers *et al.* ⁽¹⁾ undertook a comprehensive review on the state of and threats to the Scottish soil resource, which is summarised in Figure 4.1. Some of the impacts associated with these threats are also indicated.

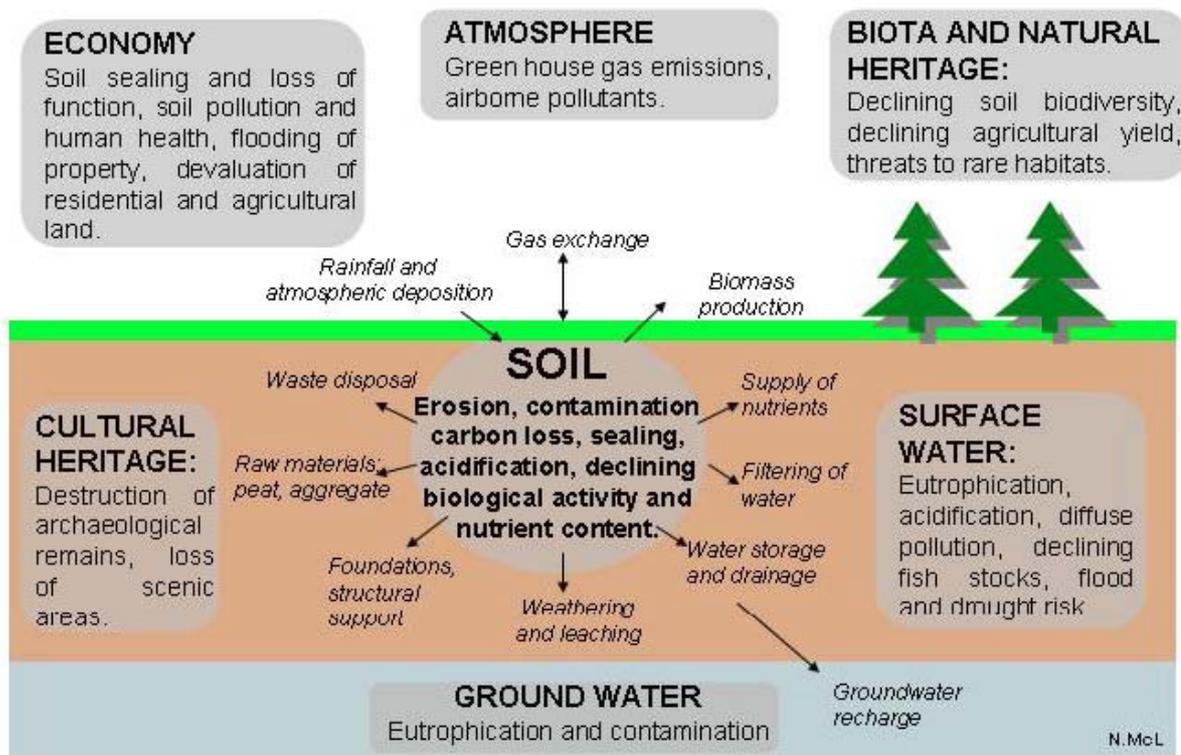
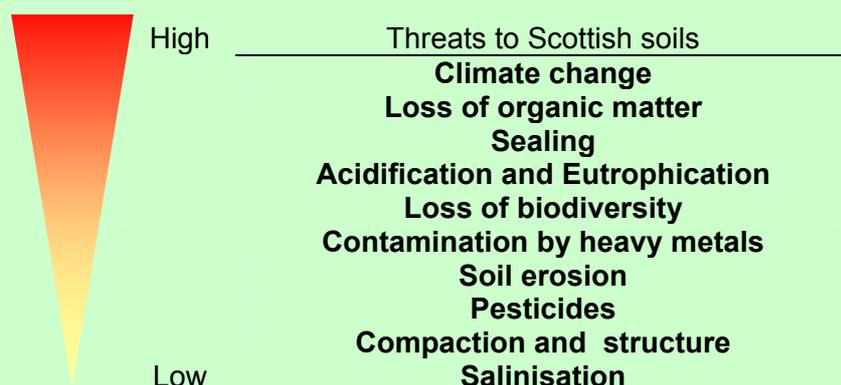


Figure 4.1 Soil threats and impacts (from SPICe Briefing 06/53)

- 4.2 Although man has clearly had an impact on the Scottish soil resource (including some large scale disturbances such as deforestation and urban growth), Towers *et al.* ⁽¹⁾ found that soils in Scotland are generally in good health due largely to the sustainable management employed by land managers over a prolonged period. The authors cautioned however that there was a lack, or in some areas absence of data from which to make robust conclusions. In particular there was a lack of trend data from which evidence of change in, and damage to soils might be determined.
- 4.3 Box 4.1 provides a summary of the analysis of national threats undertaken by Towers *et al.* ⁽¹⁾.

Box 4.1 Threats to Scottish Soils after Towers *et al.* (2006)

To determine the overall importance of each threat for each function, the consequence, extent (national or local), uncertainty and reversibility was scored on a simple three point scale. Presented here is a summary of the relative ranking of the threats on the basis of the evidence available at time of publication of the report. The analysis presented is at a national scale, an assessment of threats occurring at a local level could lead to a different ranking at a particular location.

Ranking of threats to soils across all soil functions at national scale

Climate change and loss of organic matter are the most significant threats to the functioning of Scottish soils. Both affect most soil functions with impacts which are national in their spatial occurrence and which are difficult to reverse. However, there are great levels of uncertainty associated with these linked threats.

Sealing is a serious threat in that once the soil is covered with an impermeable surface and development has taken place, it cannot perform any other functions.

Acidification & Eutrophication are most evident in water quality and above ground vegetation where the critical load approach has been used to determine the extent of damage to soils and ecosystems. Although there is evidence that pH in water is recovering due to sulphur abatement policies, it will take decades for soils to recover to previous levels. There have not yet been similar reductions in nitrogen emissions and deposition, so eutrophication remains a threat to upland soil quality.

Loss of soil biodiversity is difficult to assess due to the lack of an evidence base. But given that soil organisms are the driving force behind most soil processes, decline in soil biodiversity is thought to be a significant threat.

Contamination by heavy metals can be locally significant. Other contaminants such as persistent organic pollutants, pharmaceuticals, pesticides and hormones need to be considered in any future analysis.

Erosion, pesticides and compaction, associated with agricultural activity can be significant locally and it is local action that will resolve them. New evidence indicates that compaction may be a bigger threat than previously thought. There is also doubt about the effectiveness of ameliorative treatments. The risk of compaction is also likely to increase under a changing climate and with the use of heavier machinery (Hallet pers comm.).

Salinisation (the increased level of soluble salts in the soil profile) was not judged to be a current threat to Scottish soils. However, rising sea levels and the resulting impacts of seasonal incursion by sea water could also have a dramatic effect on coastal soils, and the integrity of many archaeological structures that are currently protected by soil.

- 4.4 The analysis undertaken by Towers et al. ⁽¹⁾ does not recognise the interaction between the threats for example the relationship between soil organic matter levels and soil erosion, whereby organic matter may help to reduce erosion risk in many soils. It is also important to bear in mind that the threats listed above are not static, as they may vary in their intensity over time. Management techniques and technological advances, such as the use of poly tunnels and heavier machinery can also increase the likelihood of specific threats.
- 4.5 Due to lack of evidence, threats like depleted or excessive nutrient levels in soils were not considered ⁽¹⁾. Emerging potential threats including nano-particles, acidification in previously cultivated land and moorland burning may require consideration in any future analysis.
- 4.6 Table 4.1 provides an indication of the relationship between the threats identified ⁽¹⁾ and the primary function(s) of soil discussed in Chapter 3. This analysis provides the broad context for Chapter 7 where planned activities and outcomes aimed at minimizing these threats and maintaining soil functionality are set out.
- 4.7 A common thread in the assessment of the pressures on soils is the lack of systematic baseline data in some cases and a lack of trend data for nearly all cases. Long term baseline data from field sites and/or national datasets are clearly essential to detect change and trends in Scottish soils with a view to assess the effectiveness of policies in place to protect soils.

Table 4.1 Threats to soils and their potential impact on soil functions: a preliminary analysis.

Threats to Scottish soils (Towers <i>et al.</i> 2006)	Function impacted (chapter 3)						
	Food & biomass production	Regulating water flow & quality	Carbon storage and gas balance	Habitats & biodiversity	Heritage	Raw Materials	Platform for building
Climate change	XX	XX	XX	XX	XX	X	
Loss of organic matter	XX	XX	XX	XX	X		
Sealing	XX	XX	XX	XX	XX	XX	
Acidification and Eutrophication	X	XX	X	XX	X		
Loss of biodiversity	X	X	XX	XX			
Contamination by heavy metals	X	X	X	XX			X
Soil erosion	X	X ¹	X	X	X		
Pesticides		X ¹		XX			
Compaction and structure	X	X ¹	X ¹	X	X		
Salinisation	X ¹			XX	X ¹		

XX major effect

X minor effect

¹ but locally important

CHAPTER 5

SOILS IN THE CONTEXT OF CLIMATE CHANGE



CHAPTER 5: SOILS IN THE CONTEXT OF CLIMATE CHANGE

Introduction

- 5.1 Soils and climate are intimately linked. Climate has a direct influence on processes of soil formation and partially determines the extent to which soils can perform individual functions. Soils also have the potential to influence climate through greenhouse gas (GHG) exchange with the atmosphere and by storing carbon. Climate change can therefore be expected to have a fundamental effect on soil properties and functions.
- 5.2 Current climate change predictions suggest that Scotland's climate will become warmer, with drier summers and wetter winters, and there will be an increased risk of storm events ⁽¹³⁾. These trends will vary locally e.g. the current east-west differences in rainfall pattern are predicted to get more extreme. In addition, sea level is expected to rise with more frequent and potentially damaging storm surges ⁽¹⁴⁾.
- 5.3 Carbon dioxide (CO₂), the principal GHG, is transferred between the atmosphere, land and oceans via a number of processes, collectively known as the carbon cycle (Figure 5.1). The rates of these processes are finely balanced and changing any one of them could have a significant effect on the concentration of CO₂ in the atmosphere as well as the amount of carbon in the soil.
- 5.4 In addition to CO₂, the GHGs methane (CH₄) and nitrous oxide (N₂O) are produced by processes occurring in soil and although they are emitted in smaller amounts than CO₂, their relative contribution to climate change is important as they have a much greater warming effect than CO₂. This is significant in a Scottish context given the large areas of peatland and fertilised agricultural soils which are the principal sources respectively for these gases.
- 5.5 In the Climate Change (Scotland) Bill, introduced to Parliament in December 2008, the Scottish Government is proposing challenging targets to reduce GHG emissions by 80% of 1990 levels by 2050 ⁽¹⁵⁾. Figure 5.2 shows Scottish emission levels in 2005 and the target for 2050. The combined agriculture, land use and forestry sector is relatively large in Scotland compared to other parts of the UK ⁽¹⁶⁾. Soil management practices which reduce GHG emissions and/or promote carbon storage in soil could therefore play an important part in achieving this target.

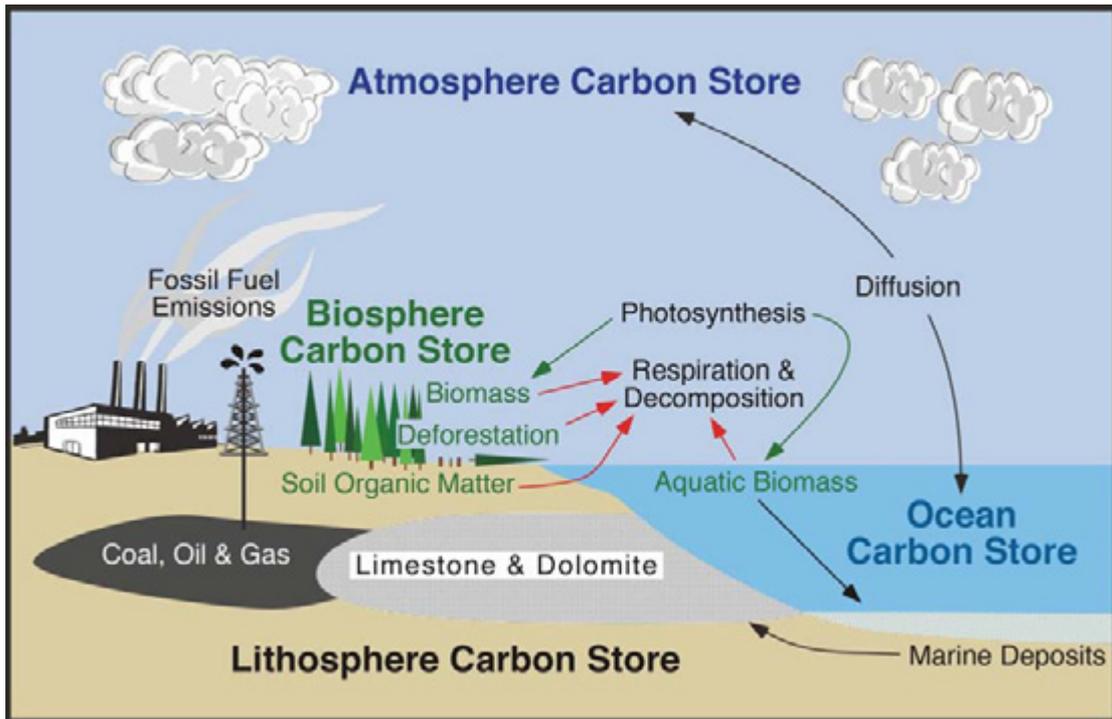


Figure 5.1 The Carbon Cycle (Dr. Michael Pidwirny, Associate Professor University of British Columbia Okanagan)

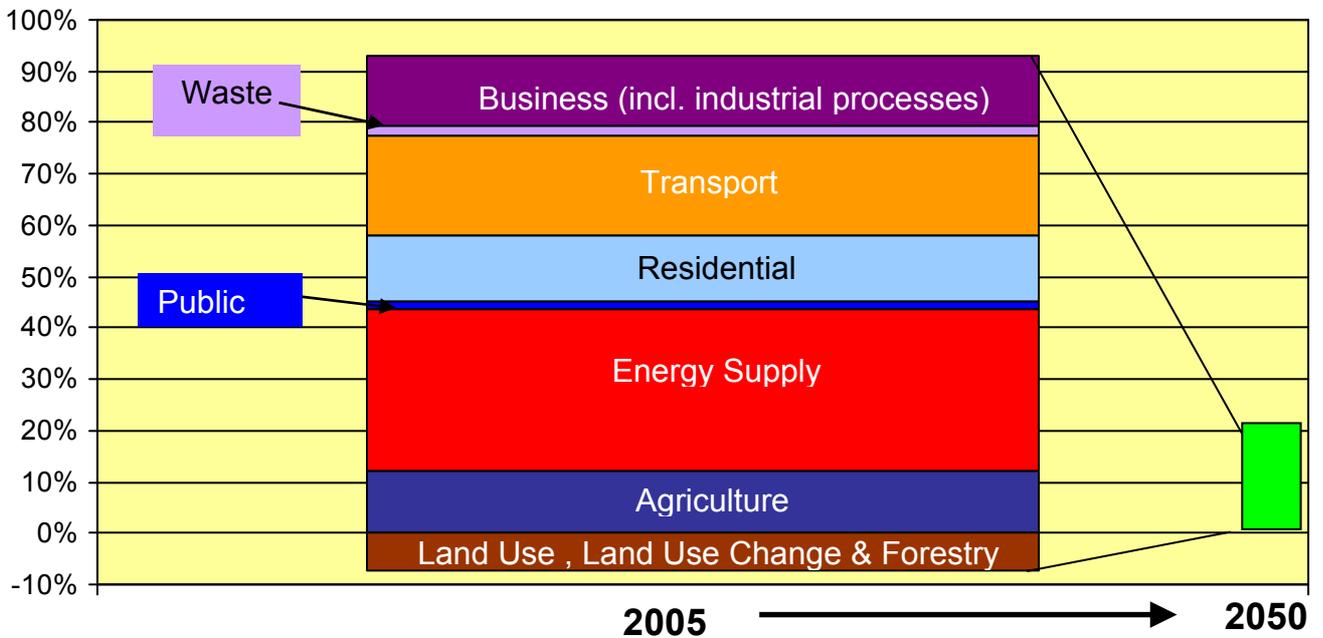


Figure 5.2 Total net GHG emission in 2005 in Scotland by sector, compared to the target for total net emissions in 2050.

Potential Impact of climate change on soils

- 5.6 Many of the direct impacts of climate change on soils are based on the premise that a warming climate is likely to have an impact on organic matter levels in soil. This is significant because soil organic matter comprises up to 50 % carbon and is the principal store of carbon in soil. It is considered likely that warmer temperatures will stimulate soil organic matter to decompose more rapidly than under present conditions, resulting in CO₂ emissions to the atmosphere and loss of carbon from the soil.
- 5.7 Soil organic matter content is a fundamental property of soil because it determines the soil's capacity to deliver many of its other functions, including storing, retaining and transforming water, nutrients and contaminants as well as sustaining biodiversity and storing carbon. Thus, any loss of soil organic matter will have wider consequences for the environment.
- 5.8 Table 5.1 provide some examples of how climate change may affect each of the soil functions identified in Chapter 2. It is not intended to be comprehensive, but to illustrate some potential impacts that climate change may have on our soils. As outlined above, many of these are directly related to the loss of soil organic matter.

Table 5.1 Examples of potential impacts of climate change on soil functions

Soil Functions	Potential impacts of climate change
Food and biomass production	Crop and grass yields may decrease due to drought; cropping flexibility may increase; increased storminess/drought/fire risk could impact on woodland expansion
Regulating water flow and quality	Soil's ability to store and retain water and buffer pollutants may be reduced. Possible increase in compaction and erosion risk, reducing soil fertility, decreasing crop yields and increasing risk of pollutants entering watercourses. Increased risk of flooding
Carbon storage and gas balance	Soil carbon stock may decline; increased potential for GHG emissions, including nitrous oxide
Habitats and biodiversity	Some valued soils which underpin important habitats are at risk from increasing temperatures (e.g. montane) and/or sea level rise (e.g. machair). Risk of invasion by non-native species above and below ground.
Heritage	Increased risk of soil erosion leading to exposure of artefacts; and loss of microscopic information from the body of soil
Raw materials	Not affected, potential minimal impact on peat provision
Platform for building	Increased risk of foundation subsidence; increased risk of flooding

Impact of soils on climate change

- 5.9 Not only does climate influence soil properties (and functions), soil also has a direct role in regulating climate via the uptake and release of GHGs and by storing carbon. These processes determine in part the composition of the atmosphere and thus the Earth's climate.
- 5.10 On a global scale, soils contain about twice as much carbon as the atmosphere and about three times as much as vegetation ⁽¹⁷⁾. Small changes in the global soil carbon store could therefore have a significant effect on atmospheric CO₂ concentrations.
- 5.11 Various processes influence the carbon flux between the land and the atmosphere (Figure 5.1). For example, plants capture CO₂ from the atmosphere and convert carbon to plant biomass via photosynthesis. Subsequently the degradation of fresh plant material slowly accumulates in soils as organic matter. Meanwhile, in soil, root respiration and decomposition of organic matter return carbon to the atmosphere as CO₂ (or as CH₄ under anaerobic conditions). However, the rates of these processes are themselves dependent on the prevailing climate.
- 5.12 Soils are also an important source of the greenhouse gas nitrous oxide (N₂O) with fertilised agricultural soils being responsible for the majority of Scotland's N₂O emissions ⁽¹⁸⁾.
- 5.13 As well as a changing climate, land management practices can influence the rate and magnitude of GHG emissions from soils. For example, GHG emissions are likely to increase as a result of ploughing grassland to create arable land or as a result of N fertiliser application to land under certain conditions. In fact, any disturbance of organic matter-rich soils, such as forestry operations or construction projects, may result in CO₂ emissions. There is however potential to offset some of these emissions by careful soil management such as minimising the period that the soil is bare and maximising the use of cover crops.

Contribution of Soil to Greenhouse Gas Inventories

- 5.14 Scotland is required under IPCC reporting requirements to report total greenhouse gas emissions in an annual inventory. GHG emissions are reported on a sectoral basis, two of which have direct relevance to soils: agriculture; and land use, land use change and forestry (LULUCF) ⁽¹⁶⁾ (Figure 5.2). By definition, the agriculture sector only deals with direct emissions and not with those associated with land use changes which are covered in the LULUCF sector. The LULUCF sector is the only one that can be a sink of greenhouse gases (Figure 5.2) Although the inventory considers all GHGs, it reports emissions in terms of CO₂ equivalent units (CO_{2eq}) to take into account the differences in warming potential.

5.15 The latest Scottish Greenhouse Gas Inventory estimated that soil carbon stock changes in land converted to cropland emitted 6.6 Mt of CO_{2eq} for 2006 while converting arable land to grassland in the same time period removed 2.8 Mt CO_{2eq} from the atmosphere. Specific land use changes can therefore help offset GHG emissions whilst others can exacerbate them.

Wider implications and policy relevance

5.16 The potential impacts of climate change on soil (and vice versa) are not restricted solely to soil but also affect the wider environment, as outlined in Table 5.1, and thus have to be considered by other policy areas. Policy areas most likely to be affected include Land Use and Management including Agriculture and Forestry, Water Quality and Flooding, Planning and Conservation and Biodiversity. These are discussed in general below and in more detail in subsequent chapters.

5.17 There are increasing concerns regarding food security and an increasing demand for food to be grown locally, both issues partially driven by climate change themselves. Climate change could potentially increase the area of prime agricultural land in Scotland suitable for intensive agriculture (Figure 5.3) and thus support increased food production. However, an extension of areas suitable for agriculture could impinge on areas of high conservation and / or biodiversity value. Increasing agricultural production could also result in increased GHG emissions resulting in a positive feedback to climate change.

5.18 An increase in the amount of land required for development as a result of a northwards migration of population may also result in a loss of prime agricultural land, thus reducing the area available for food production. To meet food production and food security objectives, there might be the need to afford prime agricultural land more protection from development.

5.19 Water quality is likely to be adversely affected by an increase in flooding and / or erosion events. Flooding and erosion can cause potential pollutants, such as sediment and nutrients, to be transported into water courses, potentially degrading both chemical and ecological water quality, and thus impact targets required under the Water Framework Directive. Both flooding and erosion can be mitigated to some extent by appropriate soil management and this is recognised in recent policy developments, for example in the Flood Risk Management (Scotland) Bill and also in cross-compliance requirements of Common Agricultural Policy reform (GAEC).

5.20 Renewable energy is used as an alternative to producing energy from the burning of fossil fuels, reducing GHG emissions and thus mitigating climate change and a number of these options impact on soil. Biofuels and biomass are part of the renewable energy portfolio of options that may offer positive contributions. The net GHG emissions associated with any land use change and fertiliser inputs required to grow energy crops need to be assessed in more detail ⁽¹⁹⁾. Similarly, the social and economic consequences of diverting land

away from food production need to be considered, alongside those of conservation and biodiversity.



Figure 5.3 Location of prime agricultural land (LCA classes 1, 2 and 3.1) a) current b) predicted under 2050's UKCIP02 Med-High Emissions (Macaulay Institute, work in progress)

- 5.21 In Scotland, optimal sites for wind farms are often on carbon rich soils which may also have high conservation value. GHG emissions may occur from soil disturbance during the construction process. It is therefore essential to consider the carbon trade-offs when developing carbon-saving energy systems on landscapes that store large quantities of carbon.
- 5.22 This chapter has outlined the complex nature of the relationship between soils and climate change, discussed the effects of climate change on soils and vice versa, as well as considering the impacts of these on the wider environment, and the implications for various policy areas. Chapter 6 and Annex B outlines in more detail the range of policies that impact in some way on soil; this is not a comprehensive inventory, but it exemplifies the cross cutting impact of soils.
- 5.23 Chapter 7 outlines a number of actions by different stakeholders that will contribute to a number of desired outcomes. Many of these actions are designed to promote both mitigation of climate change and adaptation to climate change through soil management and as a result help protect the wider environment as well as the soil resource itself.

CHAPTER 6

POLICIES FOR SOIL PROTECTION



CHAPTER 6 : POLICIES FOR SOIL PROTECTION

6.1 A number of policy instruments are currently in place which provide some aspects of protection to soils (Figure 6.1). However, no one legislative or policy tool has been developed specifically with the protection of soil in mind. Where policy or legislation does relate to soil, it is generally limited to the protection of a specific impact or function of that soil. It can be seen that these current policies are spread across many policy areas.

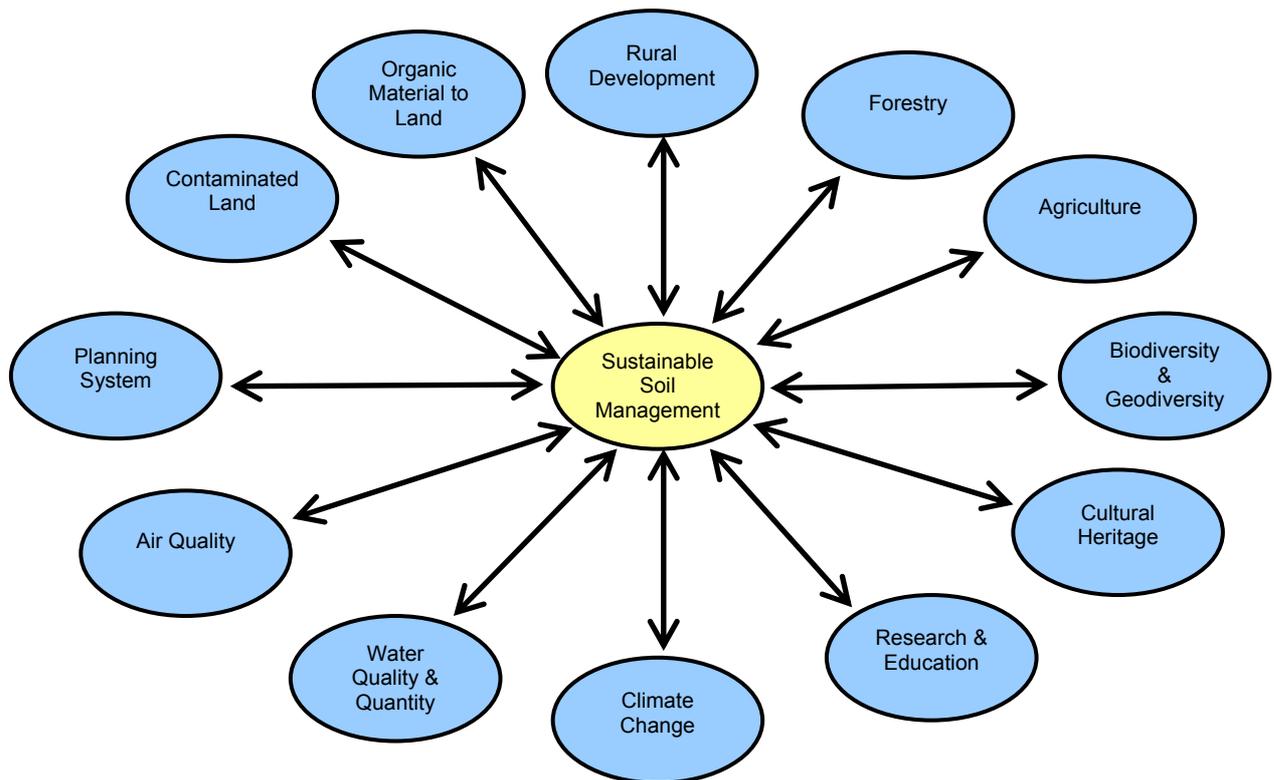


Figure 6.1 Main policy areas contributing to soil protection

6.2 The policies are set out in greater detail in Annex A. In short, current Scottish legislation and policies provide direct and indirect mechanisms for the protection of:

- soil from erosion, loss of organic matter and structural damage, as a consequence of poor land management practices;
- soil ecosystem and biochemical functions when used for the recovery of organic materials, including sewage sludge;
- soil where there is potential for impact from Part A industrial installations (Pollution Prevention and Control (Scotland) Regulations 2000);
- agricultural soil from nutrient enrichment and pollution;
- soil from acidification and eutrophication through atmospheric deposition;
- soil from the deposition of solvents;

- soil supporting protected species and habitats in designated sites;
 - soil holding archaeological remains;
 - soil subject to pollution that would lead to pollution of water or groundwater.
- 6.3 In addition, the application of Environmental Impact Assessment and Strategic Environmental Assessment to projects/plans/programmes and strategies also provides a means of assessing the impacts on soils.
- 6.4 The European Commission adopted in 2006 a Thematic Strategy for Soil Protection ⁽³⁾, which sets out the threats to soils in Europe and aims to promote soil protection measures amongst member states. In addition, a Framework Directive for the Protection of European Soil ⁽⁴⁾ to put in place a statutory mechanism to address soil degradation has been proposed. However, EU Environment Ministers have not to date been able to reach agreement on these legislative proposals.
- 6.5 Although there is a significant quantity of legislation and policy providing a range of protection and conservation tools for soils, the limited co-ordination and often ad hoc manner by which this protection has evolved makes the system in place for soil protection potentially confusing, and therefore limiting its combined effectiveness.
- 6.6 In conclusion, current policies that include some aspects of soil protection are fragmented and spread across many policy areas and organisations. They do not do not cover all soils and all threats to soils, and so do not constitute a coherent soil protection policy.

CHAPTER 7 FUTURE FOCUS, OUTCOMES & ACTIONS



CHAPTER 7 : FUTURE FOCUS, OUTCOMES & ACTIONS

- 7.1 Scotland's soils are one of the Nation's greatest natural assets. The purpose of the Framework is to ensure more sustainable management of this asset. In this Chapter, specific outcomes are listed that ensure continued ability of Scottish soils to contribute to environmental as well as economic and societal interests. The Framework also sets out a range of actions to which Scottish Government and delivery organisations are already committed. These will contribute towards achieving the soil outcomes. Additional actions are expected to be identified by the future Soil Focus Group.
- 7.2 The publication of the Scottish Soil Framework will be the first step in raising awareness of the need for sustainable management of soils, in line with the National Outcome on Natural Resource Protection and Enhancement.

Outcomes

- 7.3 This Framework has identified 13 Soil Outcomes and explains the threats which they address (Table 7.1). There is a high degree of connectivity between the outcomes: for example, the protection of soil organic matter will help reduce erosion, maintain soil structure and reduce greenhouse gas emissions. Soil organic matter content is key to the delivery of most soil functions (Chapter 2), as well as reduction of threats to soils (Chapter 4). Protection of soil organic matter is therefore one of the key outcomes of the Scottish Soil Framework.

Actions contributing towards outcomes

- 7.4 In order to achieve the 13 Soil Outcomes, a range of actions and the responsible lead organisations are outlined in Table 7.2. Several actions have a number of owners, indicating that joint effort is required. Scottish Government, through the Soil Focus Group will report publicly on progress on the actions and achievement.

Soil Focus Group

- 7.5 The realisation of the outcomes will depend critically on all stakeholders and delivery agents working jointly, sharing knowledge, information and resources, aligning roles and responsibilities for soil protection. To this end, a Soil Focus Group will be established, which will act as a platform for liaison amongst stakeholders. The Group will advise on policy review and development in areas relevant for sustainable soil use and management.

It is expected that the Group will contribute to the delivery of outcomes through

- awareness raising
- policy integration
- improving accessibility of information and data
- knowledge exchange and research.

Soil Focus Group - Programme of Work

7.6 The Group will work together to develop and build on the activities set out on this Framework, agreeing a detailed programme of work to be taken forward jointly by members. However, the following key areas are important priorities for Scotland, and will need specific consideration:

- **Climate Change** - soils are affected by a changing climate, and can themselves contribute to climate change through greenhouse gas emission.
- **Flooding** - soil management plays a central role in sustainable flood management.
- **National Food Policy** – there is a need for Scotland’s soils to retain their capacity to produce sufficient and high quality food.
- **Water Quality** – soil management and water quality are intrinsically linked.

7.7 The Soil Focus Group will be flexible to adapt and respond to changes in the policy context at both national and European level, where negotiations on the proposed Soil Framework Directive are ongoing, and will provide advice to Scottish Government accordingly. It is also expected that the Group will revisit the information contained in the expert reports produced during the development of the Soil Framework ^(a). Terms of Reference for the Soil Focus Group are set out in Annex B.

Research - Links to Soils Research Consultative Group

7.8 The use of sound information and evidence to underpin our actions is essential to achieving the Soil Outcomes. Continued engagement between stakeholders and the research community is key to this. Scottish Government funds a substantial research portfolio Protecting the Nation’s Soils. This reflects not only the key role that soils play in delivering both economic and environmental benefits, but also the lack of knowledge and scientific uncertainty on many fundamental soil processes.

7.9 As part of this research portfolio, the Soils Research Consultative Group provides a forum for key stakeholders and Scottish Governments Main Research Providers. It aims to facilitate communication between scientists and research users: for scientists to provide information on key research outputs on a regular basis; for the stakeholders to advise the research community on their priorities and to support their activities where appropriate. Given the key role which evidence plays in policy making, the Soils Research Consultative Group will be closely linked to the Soil Focus Group. Some key research outputs from Scottish Government funded research are set out in Box 7.1.

^a (<http://www.scotland.gov.uk/Publications/2008/06/27092800/0>)

Box 7.1: Key Research Outputs

- **Risk Maps** for soil erosion, soil compaction, organic matter decline and vulnerability to heavy metal pollution
- **Opportunity Maps** indicating the suitability for recycling organic materials.
- **Soil Monitoring:** recommendation on tools, methods and procedures
- **Guidance on soil management** to minimise emission of greenhouse gases and to increase carbon sequestration
- **Scotland's greenhouse gas emission reduction target:** estimation of potential for soils to sequester carbon
- **Web delivery of soil data & information** to the wider public
- **Land Capability for Agriculture:** production of updated and fully digital national maps

Table 7.2 Summary of Actions

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
Overarching				
Establishment of Soil Focus Group	Soil Focus Group, an informal group consisting of stakeholders including SNH, HS, FCS, SEPA, SRPBA, NFUS, Crofters Commission, Environment LINK, local authorities and SG policy leads and other key stakeholders will define the programme of work to be taken forward in the context of the Soil Framework	2009	<u>Primary:</u> Outcome 13 <u>Secondary:</u> All other outcomes	SG Soils Team
Awareness raising in policy development	The Scottish Government together with the Soil Focus Group will identify ways to increase the awareness of soils during all stages of policy development to safeguard Scottish soils and encourage increased linkage with other policy development.	Ongoing	<u>Primarily:</u> Outcome 12, 13 <u>Secondary:</u> All Outcomes	SG Soils Team in conjunction with Soil Focus Group
Reporting & review				
Five year review of Framework	This document will be reviewed and updated as appropriate after 5 years.	By 2014	<u>Primary:</u> Outcome 12, 13 <u>Secondary:</u> All Outcomes	SG Soils Team in conjunction with Soil Focus Group
Progress reports	Regular reports will be produced to update stakeholders on relevant developments, where progress has been made and where next efforts need to lie.	Ongoing	<u>Primary:</u> Outcome 12, 13 <u>Secondary:</u> All Outcomes	SG Soils Team in conjunction with Soil Focus Group
Knowledge exchange and awareness raising				
State of Scotland's Soil report 2011	The Scottish Government will support SEPA in publishing a State of Scotland's Soils report in partnership with external organisations in 2011.	2011	<u>Primary:</u> Outcome 12	SEPA, SNH, SG Soils Team in conjunction with Soil Focus Group, Main Research Providers

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
Conference on the outcomes of existing research programme	The Scottish Government will host a conference to publicise the outcomes of the programme of research 'Protecting the Nation's Soils'	By 2012	<u>Primary:</u> Outcome 12 <u>Secondary:</u> All other outcomes	Main Research Providers, SG Soils Team, SG RERAD
Training on soil protection	The Scottish Government will continue to support SEPA in providing training on soil protection to their staff and to other organisations.	Ongoing	<u>Primary:</u> Outcomes 1-9	SEPA SG Soils Team
Raising the public awareness of soil	The Scottish Government will work with others to develop novel materials that help to create a better public awareness of soils.	By 2011	<u>Primary:</u> Outcome 12,13 <u>Secondary:</u> All other outcomes	SG Soils Team Soil Focus Group
Research, information and soil monitoring				
Information availability	Web delivery of soil information will be available from the National Soils database at the Macaulay Institute allowing stakeholders the ability to compare their soils data with National data.	Piloted during 2009 Final delivery 2011	<u>Primary:</u> Outcome 12 <u>Secondary:</u> All other Outcomes	Main Research Providers, SG Soils Team, SG RERAD
Scottish soil monitoring network	The Scottish Government will help to develop a soil monitoring network, taking account of recommendations on suitable tools, methods, & procedures for soil monitoring in Scotland from Scottish Government funded research as well as findings of the UK Soil Indicators Consortium.	By 2011	<u>Primary:</u> Outcomes 1-8, 10, 12	SG Soils Team in conjunction with Soil Focus Group, SG RERAD Main Research Providers, SEPA

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
Land use and management				
Common Agricultural Policy Health Check	The Scottish Government will consult on the implications for Scotland of the Health Check of the Common Agricultural Policy, in consultation with external stakeholders, to deliver an effective outcome for Scotland. This will include proposed changes to Cross Compliance requirements.	2009	<u>Primary:</u> Outcomes 1,2,3 <u>Secondary:</u> Outcomes 4,5,6,7,8	SG Rural Group SG Soils Team in conjunction with Soil Focus Group
Scotland Rural Development Programme review	The Scottish Government will evaluate the effectiveness of existing measures and, in the light of emerging research evidence, review soil measures as part of the SRDP. This will focus on measures helping to maintain and enhance carbon storage in soils, restore and protect peatlands and also measures to protect water quality.	To be confirmed	<u>Primary:</u> Outcomes 1,4,7 <u>Secondary:</u> Outcomes 2,3,5,6,8	SG Rural Group SG Soils Team in conjunction with Soil Focus Group
Revision of the PEPFAA Code	The Scottish Government will revise the Prevention of Pollution From Agricultural Activities Code, including specific soil protection advice.	Late 2009	<u>Primary:</u> Outcomes 1,2,3,4,5,7 <u>Secondary:</u> Outcomes 8,9	SG Rural Group
Review Land Capability for Agriculture Assessment	The Scottish Government will review the Land Capability for Agriculture (LCA) Assessment in the light of implications of climate change and produce an updated and fully digital LCA assessment.	Ongoing	<u>Primary:</u> Outcome 8 and 10 <u>Secondary:</u> Outcomes 1 to 7	SG RERAD, Macaulay Institute
Use of land for development - data collection	The Scottish Government will explore mechanisms to collect reliable data on the use of land (in particular prime agricultural land) for new development, and in the light of this information consider whether the existing policy for prime agricultural land needs to be reviewed.	To be confirmed	<u>Primary:</u> Outcome 8 & 10 <u>Secondary:</u> Outcomes 1 to 7	SG RERAD SG Soils Team SG Planning
Review of Sewage Sludge Directive	The Scottish Government will participate fully in the proposed review of the Sewage Sludge Directive taking into account latest research results on the impacts of metals on soils.	Ongoing	<u>Primary:</u> Outcomes 5,8 <u>Secondary:</u> Outcomes 1,9	SG Waste & Pollution Reduction Division; SEPA

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
Review controls on Sewage Sludge for land restoration	Guidance on the use of sewage sludge for land restoration and in forestry will be completed in 2010	2010	<u>Primary:</u> Outcomes 5,7,9 <u>Secondary:</u> Outcome 1,8	SEPA
Support annual reporting of monitoring of organic material to soil regulated activities	The Scottish Government will support SEPA in the delivery and annual reporting on risk based soil compliance monitoring of regulated activities involving use of organic materials on soils.	Ongoing/ annual	<u>Primary:</u> Outcomes 5,7 <u>Secondary:</u> Outcome 8,9	SEPA
Ensure forestry good practice guidance to promote sustainable soil management (SSM) remains fit for purpose	Forestry Commission Scotland will continue to work through Forest Research to develop best practice guidance to promote the understanding and delivery of SSM measures in the forestry sector.	Ongoing	<u>Primary:</u> Outcomes 1,2,4,6,7,8 <u>Secondary:</u> Outcomes 3,5	Forestry Commission Scotland
Review UK Forestry Standard and the supporting Guidelines	Review UK Forestry Standard and the supporting Guidelines - Forestry Commission Scotland will undertake a comprehensive review of the UK Forestry Standard and its associated suite of Guidelines (such as the Forests & Soils Guidelines and Forests & Water Guidelines), to ensure that they remain fit for purpose.	By 2012	<u>Primary:</u> Outcomes 1,2,3,4, 5,6,7,8,11	Forestry Commission Scotland
Delivery of sustainable forest management	FCS will work to ensure the effective implementation of the UKFS and its associated suite of Guidelines.	Ongoing	<u>Primary:</u> Outcomes 1,2,3,4, 5,6,7, 8	Forestry Commission Scotland
Delivery of the Scottish Forestry Strategy	FCS will work with its partners to deliver the actions laid down in the Scottish Soils Framework and the annual SFS implementation plans to promote and deliver the sustainable management of soils.	Ongoing	<u>Primary:</u> Outcomes 1,2,3,4, 5,6,7,8 & 13	Forestry Commission Scotland
Stump harvesting guidance	Publish interim guidance on site selection for stump harvesting.	2009	<u>Primary:</u> Outcomes 1,2,3,4, 5,6,7 & 8	Forestry Commission Scotland

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
Water Quality and Flooding				
Consider role of soils in flood risk management	As part of draft legislation on Flood Risk Management introduced to Parliament in 2009, SEPA and responsible authorities will specifically consider the role soil management plays as part of sustainable flood risk management.	By 2010	<u>Primary:</u> Outcome 6 <u>Secondary:</u> Outcomes 1,2,3,4&7	SG Flooding Policy Team; SEPA and responsible authorities
Formalise links between soil management and water protection measures	A formal linkage will be made between the SSF and the WFD River Basin Management Plans for the Scotland and Solway Tweed basin districts to ensure maximum benefit for both soil and water quality is realised from the proposed measures.	2009	<u>Primary:</u> Outcome 7 <u>Secondary:</u> Outcome 2	SEPA SG WFD Team SG Soils Team
Conservation & Biodiversity				
Soils within designated sites	SNH and the Scottish Government will consider how soils and below ground biodiversity can be given more consideration in the management of sites designated for their nature conservation interest.	Ongoing	<u>Primary:</u> Outcome 5 <u>Secondary:</u> Outcomes 1 & 11	SNH SG Soils Team SG Habitats Division
Peat protection	Scottish Government together with key stakeholders will consider ways to coordinate peat protection and restoration in Scotland.	Ongoing	<u>Primary:</u> Outcome 1, 4, 5 <u>Secondary:</u> Outcomes 2, 13	SG Soils Team in conjunction with Soil Focus Group
Soils as part of broader geodiversity management	Development of Scottish geodiversity framework activities will give appropriate consideration to soils' values and functions.	ongoing	<u>Primary:</u> Outcome 2, 3, 6 <u>Secondary:</u> Outcomes 13	SNH with support from Soil Focus group
Pollution				
Review of policies to prevent acidification & eutrophication	The Scottish Government will participate fully in both the National Emission Ceilings Directive and the Protocols under the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Transboundary Air Pollution these reviews to	2009	<u>Primary:</u> Outcome 5, 9 <u>Secondary:</u> Outcome 1, 8	SG Air Noise & Nuisance Team

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
achieve an effective outcome for Scottish soils.		2009	<p><i>Primary:</i> Outcome 9 & 10</p> <p><i>Secondary:</i> Outcome 5, 7, 8</p>	SEPA SG Soils Team
State of Contaminated Land Report	The Scottish Government will support SEPA in the preparation and publication of a State of Contaminated Land Report in 2009.	2009	<p><i>Primary:</i> Outcome 9 & 10</p> <p><i>Secondary:</i> Outcome 5, 7, 8</p>	SEPA SG Soils Team
Cultural Heritage				
Specific and general historic environment guidance review	The Scottish Government, through Historic Scotland, will consider the need for specific historic environment guidance on soils and for more reference to soils in historic environment guidance in general.	Ongoing	<p><i>Primary:</i> Outcome 11</p>	Historic Scotland
Proposed EU Soils Framework Directive				
Active participation in Soils Framework Directive negotiations	The Scottish Government will actively participate in the negotiation of the EU Soil Framework Directive to achieve a proportionate and effective outcome for Scotland.	Ongoing	<p><i>Primary:</i> All Outcomes</p>	SG Soils Team
Climate Change				
Enhance knowledge on carbon dynamics in soils	The Scottish Government will continue to support research on trends in soil organic matter and greenhouse gas emissions from soils as affected by climate and/or land use and management.	Ongoing	<p><i>Primary:</i> Outcomes 1&4</p> <p><i>Secondary:</i> Outcomes 2,3,5,6,7&8</p>	SG RERAD SG Climate Change Division SG Soils Team
Identify soil management practices that optimise soil carbon sequestration	Produce guidance for the sustainable use of soils and protection of soil carbon including an assessment of the realistic potential for Scottish soils to sequester carbon and to contribute to the SG 80% GHG emissions reduction target.	Ongoing	<p><i>Primary:</i> Outcomes 1, 4 & 12</p> <p><i>Secondary:</i> Outcomes 2,3,5,6,7&8</p>	SG Soils Team in conjunction with Soil Focus Group and main research providers

ACTION	DETAIL	DELIVERY DATE	RELATED SOIL OUTCOMES	OWNER
SNH guidance on soil carbon in peatlands	SNH will review its involvement in activities and policies relating to the soil, taking into account of the need to protect soil organic carbon, as a means of mitigating climate change.	2010	<u>Primary:</u> Outcomes 1&4 <u>Secondary:</u> Outcomes 2,3,5,6,7&8	SNH
Forest Carbon Standard and Climate Change Guidelines	The Forestry Commission will produce new Forests and Climate Change Guidelines which will provide over-arching principles of good carbon management and standards for the industry.	2010	<u>Primary:</u> Outcomes 1&4 <u>Secondary:</u> Outcomes 2,3,5,6,7&8	Forestry Commission Scotland
Forest Carbon review	Forest Research will publish a review to summarise the key information on the stocks and fluxes of carbon and the fluxes of other greenhouse gases in UK forests and how these are affected by forest dynamics, management and operations. This will include forest soil considerations.	2009	<u>Primary:</u> Outcomes 1&4 <u>Secondary:</u> Outcomes 2,3,5,6,7&8	Forestry Commission Scotland
Climate Change Action Plan	FCS will work with its partners to deliver the actions identified in the Climate Change Action Plan to contribute to the sustainable management of forest soils.	By 2012	<u>Primary:</u> Outcomes 1, 4, 13 <u>Secondary:</u> Outcomes 2,3,5,6,7&8	Forestry Commission Scotland
Sustainable Forest Management	Publish guidance on the use of Lower Impact Silvicultural Systems (LISS) as a climate change adaptation measure, including soil considerations.	In 2009	<u>Primary:</u> Outcomes 1&4 <u>Secondary:</u> Outcomes 2,3,5,6,7&8	Forestry Commission Scotland

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Photo & Illustration Sources

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ANNEX A: POLICIES IN PLACE FOR SOIL PROTECTION

Land Use and Management

- A.1 The way soil is used and managed influences the quality of land, water and air environments as well as biodiversity. Although only approximately 25% of Scotland's soils are cultivated, most of Scotland's land cover is under some form of agricultural or forestry management. Agricultural and forestry land use has considerable potential to affect soil erosion, soil organic matter, habitats and biodiversity depending on the type of farming as well as the nature of the soil and weather conditions, vegetative cover and land management practices.
- A.2 The 2003 **Common Agriculture Policy** reform decoupled agricultural support from production, with increase emphasis on rural development, environmental benefit, animal health and welfare and food safety. Farmers now receive Single Farm Payments provided they meet cross-compliance requirements which include Statutory Management Requirements as well as Good Agricultural and Environmental Conditions (GAEC), which include a number of soil protection measures (table A.1).

Table A.1 Good Agricultural and Environmental Conditions (GAEC) relating to soil

Soil erosion	
GAEC 1	Post-harvest management of land
GAEC 2	Wind erosion
GAEC 3	Soil capping
GAEC 4	Erosion caused by livestock
GAEC 5	Maintenance of functional field drainage systems
GAEC 6	Muirburn Code
Soil organic matter	
GAEC 7	Arable crop rotation standards
GAEC 8	Arable stubble management
Soil structure	
GAEC 9	Appropriate machinery use

- A.3 Land managers may also qualify for payments in recognition of work done to deliver additional public benefits such as environmental enhancement, better recreational access or improved animal health and welfare. Scotland has pioneered the concept of Rural Development Contracts to deliver different types of payment and this is further developed in the **Scotland Rural Development Programme for 2007-2013**. A number of the measures encouraged through Rural Development Contracts have positive implications for air, land and water. Specific measures for soils include testing soil, nutrient planning, creating wetlands, converting arable land to grassland and leaving

uncultivated buffer strips alongside watercourses to minimise diffuse pollution of water and to retain eroded soil in the field. It is also important to note that many measures will have cross-cutting benefits for a number of environmental concerns, e.g. measures put in place to combat diffuse pollution may also benefit climate change mitigation and soils, as they often focus on reduction of erosion and surface water run-off and minimising fertiliser loss. Equally, measures aiming to protect and enhance peatlands for biodiversity or conservation reasons, will ultimately have benefits in climate change mitigation, and in protecting Scotland's peat resource.

- A.4 The Prevention of Environmental Pollution from Agricultural Activity (**PEPFAA Code**)⁽²⁰⁾ provides practical guidance to help farmers minimise the risk of pollution and comply with CAP requirements. The **4 Point Plan**⁽²¹⁾ and **Farm Soils Plan**⁽²²⁾ provide straightforward guidance for land managers on ways to minimise pollution and benefit businesses through good soil management.
- A.5 The **UK Forestry Standard**⁽²³⁾ (UKFS) and its supporting guidelines sets out the framework for sustainable management of all forests and woodland in the UK. These documents are currently undergoing comprehensive review. This review will draw out more clearly the legal obligations of forest managers and the management standards expected as part of good forestry practice. The revised Standard will also identify woodland management practices that can contribute to tackling the impacts of climate change. The updated Forests & Soils Guidelines will identify the importance of forest soils and outlines good practice requirements to protect and enhance forest soils through sustainable forest management practices considering its interactions with water, biodiversity, and air quality.
- A.6 The UKFS underpins the **Scottish Forestry Strategy (2006)** (SFS) which sets out a strategic framework for the long-term development of forestry in Scotland. The SFS is supported by annual implementation plans which identify smart targets to help deliver the SFS. These documents recognise the importance of protecting and enhancing Scotland's soils resource and outlines the key actions that the forest industry and its partners need to take achieve this.
- A.7 Sewage sludge use in agriculture is governed by the Sewage Sludge Directive (86/278/EEC) which has been transposed into national legislation through the **Sludge (Use in Agriculture) Regulations 1989** (as amended in 1990), complemented by a **Code of Practice for Agricultural Use of Sewage Sludge 1996**. It seeks to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to prevent harmful effects on soil, vegetation, animals and man.
- A.8 The Scottish Government strongly supports recovery of organic materials to land, rather than disposal. It envisages that recovery to land will continue to be a vital route for recovery of waste: indeed, to reach our target of 70% recycling and composting of municipal waste by 2025 it is clear that a great deal more compost, in particular, will have to be used in future. It is important to realise, however, that wastes are only a small fraction of organic materials going to

land. Some 90% of all organic material going to land in Scotland is livestock manure and slurry, used in accordance with good agricultural practice.

Water Quality & Flooding

- A.9 The **Water Framework Directive** (2001/60/EEC) has introduced the most important changes to Scottish legislation protecting the water environment since 1974 when the Control of Pollution Act was passed. It has extended environmental protection for point and diffuse sources of pollution as well as impacts associated with water abstractions, dams and engineering work.
- A.10 Protection of soils is closely linked to the protection and improvement of Scotland's water environment. The presence of suspended sediments and turbidity, through soil erosion, in watercourses can seriously diminish water quality and can damage aquatic life, including salmon spawning grounds. Soil from farmland is often rich in nutrients such as phosphates (P compounds), which when released into the aquatic environment may contribute to the eutrophication of waters.
- A.11 The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR), as amended, now provide controls to protect banksides from erosion through the use of **General Binding Rules** (GBRs). The Water Environment (Diffuse Pollution) (Scotland) Regulations (2008), which have amended CAR, apply to rural land use activities; these aim to protect surface waters including wetlands and groundwater from the effects of diffuse pollution.
- A.12 Under **CAR** discharges (run-off) from new developments both during and following construction, will generally be required to be drained by a Sustainable Drainage System (SUDS). The main driver for this provision is the control of diffuse pollution. SUDS are designed to slow flows and remove pollutants; and attenuation should minimise run-off losses and can thus facilitate the settling of soil.
- A.13 The **Flood Risk Management (Scotland) Bill** will modernise the flood risk management system in Scotland. The Bill will shift the emphasis to a catchment focused approach to managing flood risk and clarify the roles and responsibilities to create a fully integrated approach to flood management. The Bill will also transpose the EC Floods Directive which came into force in December 2007. There is a strong interrelation between soil deterioration and the increased number of extreme floods as soils sealing, soil compaction and capping exacerbates flooding as the capability of soils to absorb water decreases and water runs off more quickly. Appropriate soil management therefore is a central plank for the development of a sustainable approach to flood risk management.

Conservation & Biodiversity & Geodiversity

- A.14 The **Scottish Biodiversity Strategy *It's In Your Hands*** ⁽²⁴⁾ presents a 25 year vision and framework for action to protect Scotland's biodiversity. Delivery of the strategy includes a focus on maintaining healthy and productive ecosystems, developing actions to sustain and support the complex web of conditions and organisms that contribute to productive soils.
- A.15 Around 15% of Scotland is covered by national and international **conservation designations**, which include National Scenic Areas, Sites of Special Scientific Interest, National Nature Reserves, Biosphere Reserves and Natura 2000, Ramsar and World Heritage Sites. When National Parks and local designations such as Local Landscape Areas (LLAs) and Local Nature Conservation Areas (LNCAs) are added, over ¼ of Scotland is under some level of protection for its natural heritage, biodiversity or landscape and geodiversity values. Although soil itself is often not directly protected under such designations, management agreements and operations often offer soil protection in order to protect and enhance the biodiversity, geodiversity and landform value of the sites.

Pollution

- A.16 Due to the transboundary nature of airborne pollutants which can cause acidification & eutrophication, the best means of tackling the problem is through concerted action across Europe. The main policy tools to reduce soil acidification and eutrophication are the **National Emission Ceilings Directive** (NECD, 2001/81/EC) and the **Protocols under the United Nations Economic Commission for Europe (UNECE) Convention on Long Range Transboundary Air Pollution**.
- A.17 The NECD sets ceilings for each Member State for emissions within their boundaries of: sulphur dioxide (SO₂); nitrogen oxides (NO_x), volatile organic compounds (VOCs) and ammonia (NH₃). These 4 pollutants are primarily responsible for acidification, eutrophication, and ground-level ozone. The UK's main policies and measures for achieving the air quality obligations for health and ecosystems are set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Both national and European measures will contribute to reducing the emissions of pollutants which, when deposited, lead to soil acidification and eutrophication.
- A.18 The **Contaminated Land Regime**, established under Part IIA of the Environmental Protection Act 1990 places a duty on local authorities, as the primary regulators, to carry out inspections for the purpose of identifying contaminated land within their areas and to take action to secure its remediation. Contaminated land is land which appears to the enforcing authority to be in such a condition that there is a significant risk of harm to human health or the wider environment. The main objective of the Contaminated Land Regime is to provide an improved system for the identification and remediation of land where contamination is causing, or is likely to cause, such risks, assessed in the context of the current use and

circumstances of the land. In this way the regime plays an important role in cleaning up historically contaminated soils, but it is not designed to prevent new contamination. There are a range of other measures specifically aimed at achieving this, most significantly **Pollution Prevention and Control (PPC)** and **Waste Management Licensing**, which are regulated by SEPA. SEPA's other responsibilities in relation to contaminated land consist of duties to act as the enforcing authority, securing remediation of land which is designated as a special site. SEPA also maintain a public register of special sites, and publishes a national report of the state of contaminated land.

Cultural Heritage

- A.19 The **Scottish Historic Environment Policy (SHEP)** published by Historic Scotland states that the historic environment encompasses built heritage features (ancient monuments, archaeological sites and landscapes, historic buildings, townscapes, parks, gardens and designed landscapes, as well as marine heritage) and the context or setting in which they sit, and the patterns of past use, in landscapes and within the soil, and also in our towns, villages and streets.
- A.20 Present policies for the historic environment in Scotland address soil as the neutral matrix in which artefacts and environmental evidence are embedded, over and into which buildings and sites are constructed, and which in time comes to seal sites which have been destroyed or have decayed. However, the preferred approach for important archaeological sites and deposits is "preserve in situ", which generally accords well with soil conservation objectives.

Built/Engineered Development

- A.21 The re-use of brownfield land is promoted in a number of **National Planning Policies** as well as in the development plans prepared by planning authorities. Nevertheless some development on green field sites is unavoidable if Scotland is to meet the demand for development, especially housing, taking into account the need for sustainable economic growth.
- A.22 The planning system also provides significant protection to the soil resource through policies aimed at preventing inappropriate development in a wide range of areas, including:
- ◇ parks, open spaces and playing fields;
 - ◇ regional parks;
 - ◇ green belts ;
 - ◇ areas designated nationally for their natural heritage value (including Sites of Special Scientific Interest, National Parks and National Scenic Areas)

- ◇ areas designated locally for their natural heritage value (including areas of great landscape value and local nature reserves).

A.23 Planning also controls development in residential gardens and other private open spaces, and is a major means of delivering sustainable urban drainage systems (SUDS).

Environmental Assessment

A.24 Two of the main instruments used by the planning system to identify whether a proposal is likely to have significant environmental effects on soil are:

- a. Environmental Impact Assessments (EIA), which is for specified individual projects.
- b. Strategic Environmental Assessments (SEA), which is normally used for higher level public plans, programmes and strategies, (e.g. planning authorities' development plans).

EIA and SEA are also applicable to projects, plans and strategies outwith the planning system.

A.25 The **Environmental Assessment (Scotland) Act 2005** ensures that all public plans, programmes and strategies that are likely to have significant environmental effects, if implemented, are subject to environmental assessment. The findings of that assessment must be outlined to the public within a consultation, along with any measures to prevent, reduce and as fully as possible offset significant adverse effects and to consider reasonable alternatives, where relevant. **Strategic Environmental Assessment (SEA)** legislation ⁽²⁵⁾ ensures greater consideration of the environment in the preparation of plans, programmes and strategies, thereby gaining the opportunity to minimise unforeseen environmental impacts.

A.26 In both types of assessment, the likely impacts on soils are a consideration. As consultation is at the heart of SEA, it ensures that those that are affected by, likely to be affected by or having an interest in a plan, programme or strategy, are provided with an opportunity to have a meaningful and transparent input into the decision making process.

Climate Change

A.27 The then Scottish Executive's response to climate change, Scotland's Climate Change Programme *Changing Our Ways* ⁽²⁶⁾ was published in March 2006. The programme recognised the important role soils play in the context of climate change, both in relation to mitigation and adaptation. A new programme will be required to deliver the more ambitious objectives proposed for inclusion in a Scottish Climate Change Bill that was introduced to the Scottish Parliament at the end of 2008.

A.28 The **Climate Change (Scotland) Bill** ⁽¹⁵⁾ aims to create a long-term framework for the current and successive administrations in Scotland to ensure that emissions will be reduced by 80% by 2050. Whilst it is not intended to allocate sector specific targets for reducing emissions, it is intended that the Bill will assist in realising the mitigation potential for all sectors, including emissions from soils. **Scotland's Climate Change Adaptation Framework** will identify strategic principles and priority actions as a means of providing leadership, guidance and consistency of approach to government and non-government decision-makers. The Framework will also identify roles and responsibilities for public and private decision makers across Scotland and outline the levels of risk being applied to manage climate change. The Framework was issued in draft for consultation in 2008, and re-drafted for further consultation in April 2009. A final Adaptation Framework will be published in autumn 2009. Because of the complex interactions between soils and climate as set out in Chapter 5, the above climate change policies all recognise that protecting soils is an important way of combating climate change.

A.29 It is becoming increasingly recognised that the world's forest sector can help tackle climate change through six simple measures: protecting what we already have; reducing deforestation; restoring forest cover; using wood for energy; replacing other materials with wood; and planning to adapt to our changing climate. The **Forestry Commission Scotland Climate Change Action Plan 2008–2010** describes the actions FCS will implement to increase the response and contribution of Scottish Forestry to the challenges of climate change. It focuses on what needs to be done both as early actions and to increase preparedness.

Research

A.30 Strategic soils research is funded by the Scottish Government as part of its long-term research programme on environment, land use and rural stewardship which runs over 5 years to 2010 ^(b). Part of this programme focuses on "Protecting the Nation's Soils", and comprises two inter-related approaches (Figure A.1) addressing assessment and management of the soil resource of Scotland. The programme is expected to provide the following overall outcomes:

- ◇ Up-dated status of quality and trends in Scotland's soil resource
- ◇ Improved understanding of cycling of greenhouse gases and feedbacks to drivers of climate change
- ◇ New tools and methods to assess soil quality, including its biodiversity
- ◇ Maps showing which areas of soils are under threat
- ◇ Evaluations of socio-economic value of soil and implications of threats to it.

A.31 In addition Scottish Government funds specific projects to provide evidence in the short term on important aspects like carbon release from peaty soils under

^b <http://www.scotland.gov.uk/Topics/Research/15597/2546>

various climate and land use scenarios. Similarly, Scotland is connecting with soil research agendas at UK and European level.

A.32 Research outcomes will make an important contribution to our understanding of fundamental soil processes and will provide vital evidence for policy development.

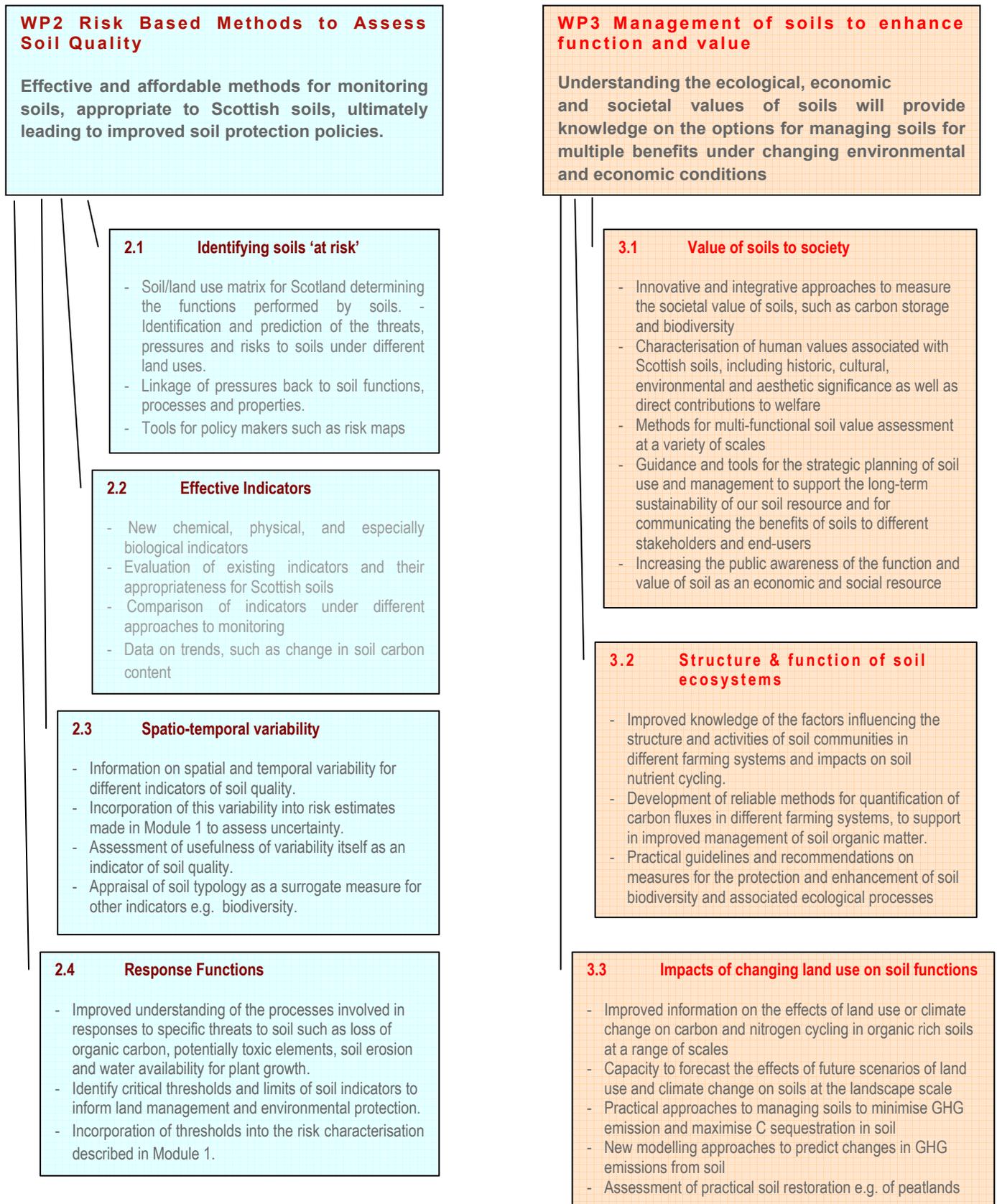


Figure A.1 Scottish Government strategic research. Objective 8: *Protecting the Nation's soils*. Work Packages 3.2 and 3.3 (<http://www.programme3.net/>).

ANNEX B: SOIL FOCUS GROUP

Draft Terms of Reference

B.1 The Soil Focus Group's (SFG) overall aim is to bring together the key delivery partners and stakeholders in the Scottish Soil Framework, and to advise the Scottish Government on the Framework's implementation. The Group will be established as an informal forum with members invited onto the Group by the Scottish Government (it is not a non-departmental public body).

Aims

B.2 The Group will be asked to:

- raise awareness of the Scottish Soil Framework, and provide a platform for liaison and pooling of resources and information amongst key delivery partners and stakeholders.
- develop and build on the activities set out in the Scottish Soil Framework, identifying additional actions where necessary. Priority areas are likely to include: climate change, flooding, national food policy and water quality.
- provide progress reports on the actions outlined in the Scottish Soil Framework, and their contribution towards specific soil outcomes, in order to support Scottish Government reporting.
- advise on the review, development and integration of policies in areas relevant to soil use and management.
- advise the Scottish Government on implications of changes in the soils policy context at both national and European level.

Membership

B.3 The Group will be chaired by the Scottish Government, with a secretariat also provided by Scottish Government. Membership will include representatives from the Scottish Environment Protection Agency, Scottish Natural Heritage, Forestry Commission Scotland, Historic Scotland, Crofters Commission, National Farmers Union Scotland, Scottish Rural Property & Business Association, Environment LINK, Local Authorities, as well as Scottish Government policy and research leads, land managers, research organisations and other stakeholders.

B.4 Members should be able to draw on the expertise and resources of their particular constituent organisations to help deliver the objectives of the Group.

B.5 Membership of the Group will not attract any remuneration.

Duration & Working Pattern

- B.6 The Group will not have a fixed lifespan and will be reviewed after 2 years, approximately half way through the lifespan of the Scottish Soil Framework.
- B.7 The Group will convene at regular intervals to be decided by liaison between the Secretariat and members as far as possible, and will also maintain contact, share information and conduct business via email between meetings. It will seek advice from appropriate experts and will have the authority to delegate specific pieces of work to group members and organisations.
- B.8 The Group will report regularly to Scottish Government on progress towards achieving the actions and outcomes outlined in the Scottish Soil Framework.

Secretariat

- B.9 The Secretariat will be provided by the Scottish Government's Water, Air, Soils & Flooding Division.
- B.10 The Secretariat will provide direct administrative support to the Group, including arranging meetings, recording outcomes, preparing and commissioning papers and managing the Group's work programme.
- B.11 In line with the principles of open government and to assist Members, papers and proceedings will be available on the Scottish Government's website.

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