

Chapter 7

Land and Soil



Land and Soil

Introduction

Soil is a biologically active, complex mixture of weathered minerals, organic matter, organisms, air and water. This mixture supports a range of critical functions such as supporting terrestrial ecosystems and biological diversity, agricultural food production, flood alleviation, water filtration and storage, and carbon capture. Soils form over long time periods and should be considered as finite resources to be protected and managed carefully.

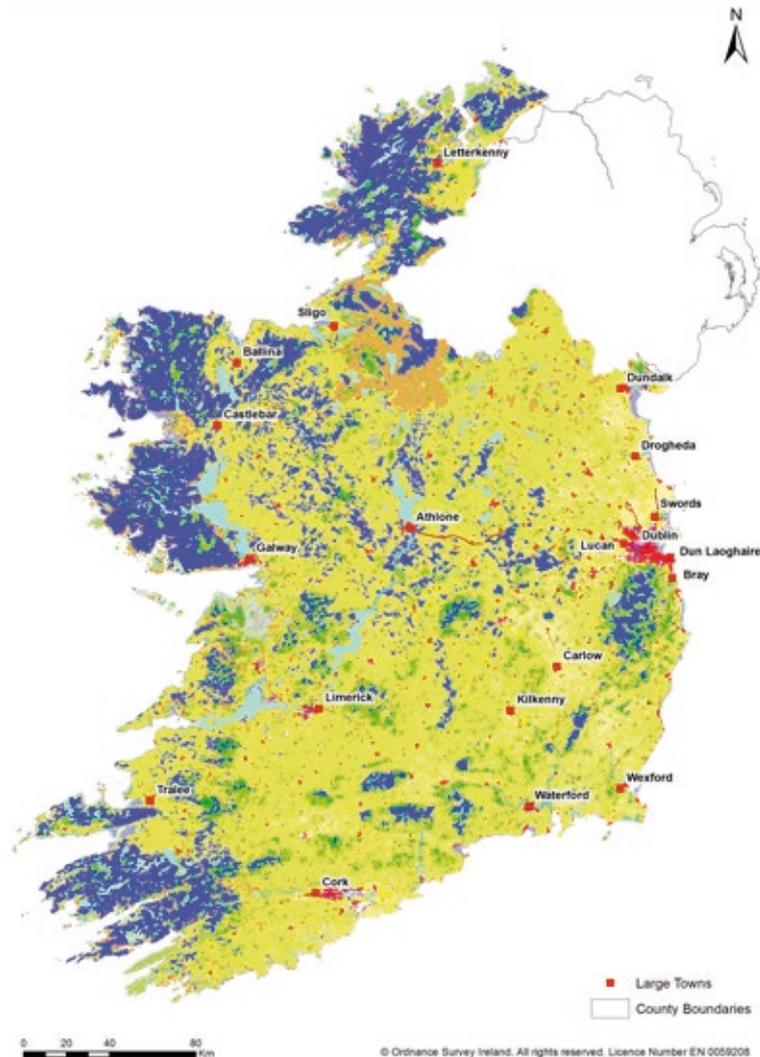
The environmental roles and functions provided by different soils are increasingly being recognised. Soil type and overlying surface conditions within water catchments play a key role in determining the risk of water pollution, through preventing nutrient runoff and the treatment of septic tank effluent. There is now a greater awareness of the need to protect soils and manage their use in a sustainable manner and of the wider benefits that can accrue.

Ireland's soils, land use and landscape have been shaped by natural processes and human interventions throughout our history, leaving us with a rich mix of geological features, soil types and land cover. This section examines the key land cover types, sectoral activities, challenges and pressures that shape Ireland's landscape and the state of our environment, as well as highlighting some key research activities providing better mapping of land and soil and understanding of the critical interactions between soil, land use and environmental protection.

According to a recent EEA report, land take for urban, infrastructure and industrial purposes exceeds 1000 km² per year in the EU, with half of this surface being defined as "sealed", i.e. the connection between the atmosphere and the soil surface is interrupted. This sealing effect can impact on natural exchanges occurring between soils and the atmosphere which influence the natural function and associated biodiversity of soils (EEA, 2016).



Figure 7.1 CORINE 2012 Land Use and Land Cover Map (Source: EPA GIS stock)



The Current Situation

Land Use and Land Cover

The interactions between land use and land cover shape our environment.

The interactions between human activity, such as farming, forestry and the built environment, are interlinked with processes that shape the environment, landscape and biodiversity of the country. Land cover describes what is visible on the land surface. Land use describes the use(s) the land has been put to from a human perspective. CORINE is a pan-European land use and land cover (LULC) mapping programme and is the main source of national-scale LULC information. The most recent assessment in 2012 shows that agriculture is the primary LULC type within Ireland (67.36% national land cover), followed by wetlands (15.56%) and forestry (9.37%) (Figure 7.1 and Table 7.1).

Land Cover and Land Use Datasets

More detailed mapping will improve the knowledge base and decision-making capability.

No single detailed integrated national baseline LULC dataset currently exists in Ireland. The existing data either lack the appropriate resolution (e.g. CORINE¹) or are sector-specific subsets of the data produced by various agencies (e.g. forestry data produced by the Forest Service). A national working group is developing a co-ordinated national mapping programme to address this gap. This programme will be essential to monitor, report and assess the environmental impacts of different land cover and land uses. This is illustrated in the water environment, where LULC can, for example, influence susceptibility to flooding and its impact on water quality and water-related ecosystems.

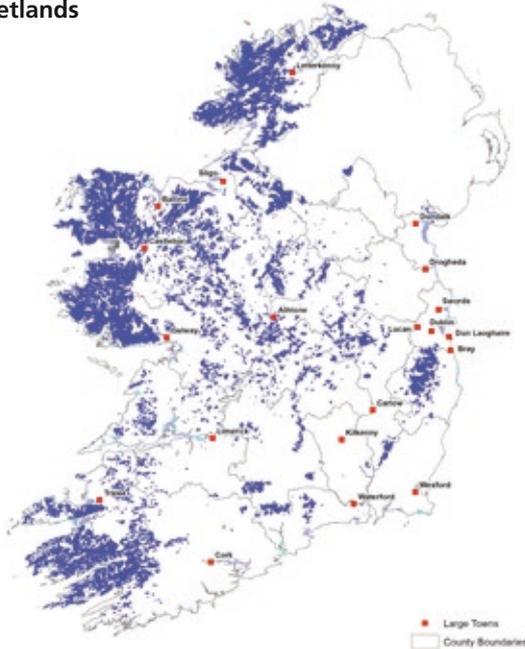
1 Co-ORdinated INformation on the Environment.

Table 7.1 2012 CORINE Land Cover, Land Use and Land Use Change (Source: EPA, 2014a)

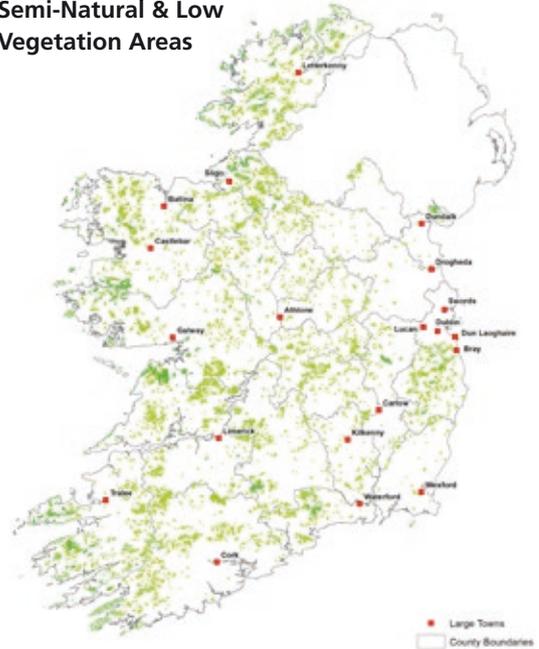
CORINE land cover and land use classes	CORINE 2012 summary		
	% of national area	% change since 2006	% change since 1990
Agricultural areas	67.36%	-0.11%	-0.11%
Wetlands	15.56%	-0.04%	-2.95%
Forest	9.37%	0.11%	2.05%
Semi-natural and low vegetation	3.16%	0.00%	0.27%
Artificial surfaces	2.46%	0.04%	1.01%

Figure 7.2 CORINE Landcover Maps (Source: EPA GIS stock)

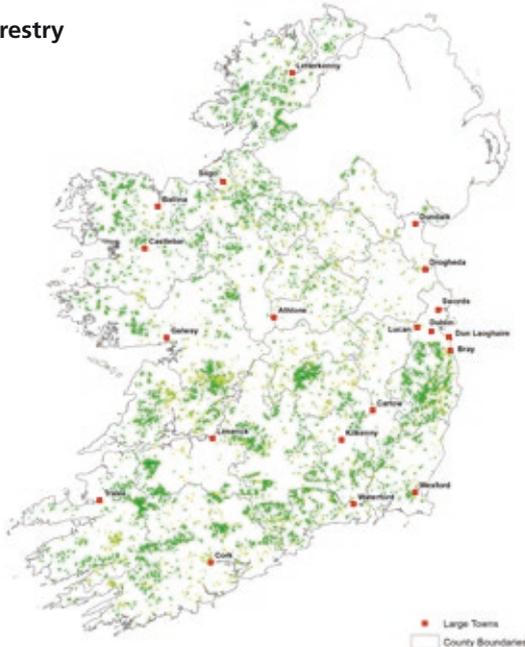
Wetlands



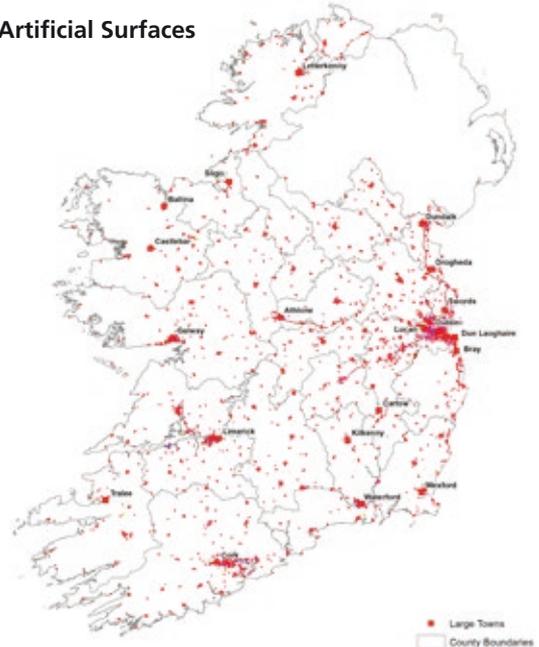
Semi-Natural & Low Vegetation Areas



Forestry



Artificial Surfaces



Land Cover Data Reporting Variation

CORINE data are presented at a baseline resolution of 25 ha for all land cover classes. Where more detailed sectoral data are available, these are referred to in the sections below. Although it may appear that some CORINE data values are contradictory, this is simply the result of variations in the quality and extent of data available or the mapping resolution used.

Agriculture

Agriculture accounts for the majority of national land use.

Agriculture accounts for 67.36% of the national land cover. The main agricultural class is pasture (54.67% national land cover), followed by land principally occupied by agriculture (primarily pasture), which is interspersed with areas of natural vegetation (6.99%), arable land (4.85%) and areas with complex cultivation patterns (0.84%) (EPA, 2014a). Analysis of LULC change between 2006 and 2012 shows that the primary agricultural changes were as expected, with an internal class change from pasture to arable and vice versa (38.49% of total national change), followed by afforestation of pasture lands (8.32%). The balance of change between agricultural classes has resulted in only a small reduction (-0.11%) since 2006.

Teagasc's Soil Quality Assessment Research Project describes that "the objectives of Food Harvest 2020 place a demand on soils to support the intensification of agriculture to meet global food security objectives. Simultaneously, greening objectives of the Common Agricultural Policy insist that increases in production must be achieved in a sustainable manner".

Peatlands

Peatlands provide a range of environmental benefits.

Peatlands provide a range of functions, including maintaining biodiversity and water quality, carbon storage and sequestration, agriculture, forestry, water regulation,

recreation and flood attenuation. According to the Rural Development Programme (DAFM, 2014a), peat soils cover 20.6% of Ireland's land area. Near-intact peatlands may actively sequester, on average, 57,400 tonnes of carbon per year over the whole country. The National Peatlands Strategy (DAHG, 2015a) sets out how to sustainably manage and protect/conservate our national peatland resource. This strategy estimated that Irish peatlands store some 1,566 million tonnes of carbon, representing approximately 64% of the total soil organic carbon stock present in Ireland.

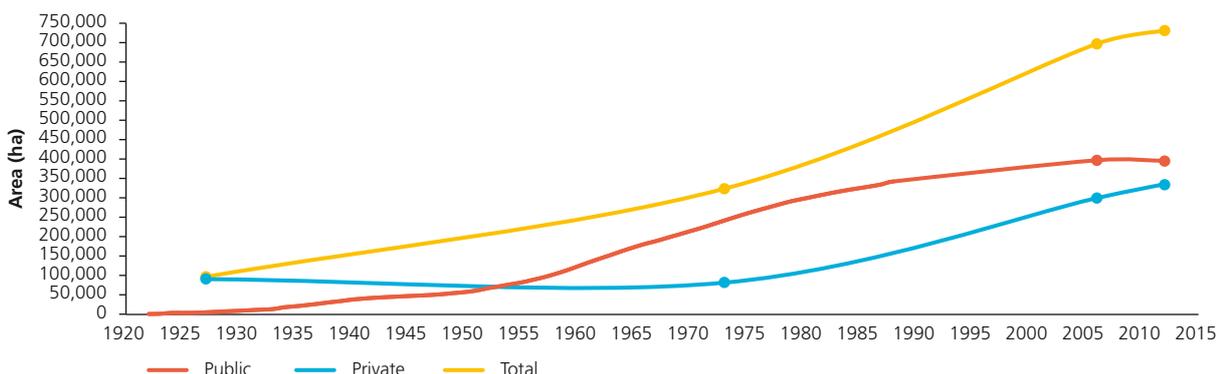
Forestry

Forestry levels in Ireland are low compared with the EU.

Forests provide many environment-related functions, including carbon sequestration and storage, water regulation and support for biodiversity, in addition to their commercial value. Ireland's National Forestry Programme 2014-2020 has identified four key needs for Ireland's forestry sector. These are (1) permanently increasing Ireland's forest cover, (2) increasing and sustaining forest-based biomass production to meet renewable energy targets, (3) supporting forest holders in actively managing their plantations and (4) optimising the environmental and social benefits of new and existing forests. To meet these needs, a series of "woodland and afforestation" schemes have been prepared by the Department of Agriculture, Food and the Marine (DAFM). This afforestation scheme requires a minimum 10% broadleaf component to be included. In addition, a national broadleaf target of 30% has been set for the overall "Afforestation and Creation of Woodland" measure in the National Forestry Programme.

Ireland's 2015 Forestry Annual Statistics Report (DAFM, 2015b) describes forest cover to be at its highest level in over 350 years, with forestation estimated at 10.5% of the total land area. Despite this, Ireland still has one of the lowest afforestation levels in the EU. The national forest estate is an important carbon reservoir, amounting to 381 million tonnes of carbon in 2012, an increase from 348 million tonnes in 2006. The Rural Development Programme 2014-2020 (DAFM, 2014a) also reports that

Figure 7.3 Forest Area Change, 1922-2014 (Source: DAFM, 2014b)





broadleaf planting as a proportion of total afforestation increased from 23% in 2003 to 31% in 2012. The latest edition of Ireland's Forests' Annual Statistics Report (DAFM, 2015b), indicates that broadleaf afforestation currently comprises approximately 23% of all afforestation. Figure 7.3 shows the change in national forest area up to 2014.

Soil Health

Soil health is important nationally for a range of functions.

Healthy soil provides us with clean air, food and water, supports ecosystem services, the growth of plant and animal life and provides the foundations for human habitats and structures. The threats to soils under current land use, management and climate conditions are low by international standards (EPA, 2014d). Soils can act as barriers to subsurface contamination. Where geological bedrock is exposed or soils are thin, the potential exists for pollutants to permeate deeper into the ground and have wider impacts on aspects such as groundwater quality.

The EU Seventh Environment Action Programme (which came into force in 2014) commits Member States to increase efforts to reduce soil erosion, increase soil organic matter and remediate contaminated sites by 2020 (EC, 2013). The Water Framework Directive (2000/60/EC) (WFD) and the Floods Directive (2007/EC/60) create planning mechanisms that can support actions to improve soil quality and combat land degradation, including measures to put green infrastructure in place (EEA, 2016).

There is little specific legislation relating to soil protection in Ireland, apart from that for key habitats/ecosystems associated with peat soils and site-specific regulation linked to industrial and waste facilities. However, the 2011 Environment Impact Assessment Regulations for On-Farm Development include requirements for environmental impact assessments for soil operations. In addition, the European Communities (Environmental Liabilities) Regulations 2008 establish an environmental liability framework based on the "polluter pays" principle to prevent and remedy environmental damage, including damage on, in and under land.

Soil Biodiversity

Biodiversity of soil plays a wider role in our environment.

Approximately one-quarter of all living species live in our soils (e.g. fungi, bacteria and invertebrates). They play a crucial role in regulation of the atmosphere, water quantity and water quality, pest and disease incidences in agriculture, natural ecosystems and human diseases. Soil biodiversity provides for food production, pollution control and development of pharmaceuticals.

Soil organic matter has a key role in maintaining soil functionality, water and air quality and carbon sequestration. Proper land use management is essential to prevent soil-stored carbon being released into the atmosphere, where it would contribute to climate change. Continuous tillage practices may also reduce soil organic matter content; to address this, the DAFM produced guidelines in 2010 to implement sustainable agricultural management practices.

Drivers and Pressures

Changes in Land Use and Land Cover

Some important changes over the past two decades.

Land is subject to many, often competing, sectoral demands. National policies, such as in forestry, agriculture, peatlands and the built environment, influence land use change and resource management. The effects of poor land use management practices can be particularly evident in aquatic ecosystems (e.g. siltation and nutrient runoff and spread of invasive species). Between 1990 and 2012, the amount of forestry increased (due to afforestation programmes) and wetland areas decreased by 2.95% (due to extraction in peatlands, agricultural drainage, etc.). Significant urbanisation also occurred between 1990 and 2006; however, between 2006 and 2012, the rate of urbanisation decreased significantly (reflecting the economic downturn). Urbanisation is expected to increase again with continued economic recovery.

Both single rural housing and suburban growth can both impact on soils and landscape and need to be carefully managed. Ireland has adopted a "core strategy approach" to the development of settlements with the adoption of the Regional Planning Guidelines (2010-2022). The benefits of a core strategy development approach are also recognised at EU level. The European Environment Agency has stated that "compact urban development and resource efficient approaches to the built-environment can provide opportunities to alleviate environmental pressures and enhance human wellbeing and also protect from the impacts of climate change" (EEA, 2015).



The Central Statistics Office (CSO) has estimated that the number of one-off houses in 2011 stood at approximately 433,564. The number of dwellings with septic tanks built between 2006 and 2011 fell from 50,011 in 2006 to 30,895 in 2011; the number with other individual systems rose from 16,689 to 19,074 over the same period. Between 2002 and 2011, the proportion of houses built that are stand-alone decreased from 28.1% in 2002, to 27.1% in 2006 and further, to 26.3%, in 2011 (CSO, 2012).

Strategic Planning and Sector Issues

Population growth

Population increase and settlement growth are the principal causes of land use changes in urban areas. This has implications for soil quality, climate, biodiversity integrity, air quality, flood risk and water quality. Ireland's population is projected to reach 5.1 million in 2031, with the most significant increase predicted for the Greater Dublin Area (CSO, 2013). Forward strategic planning and

new infrastructure are needed to ensure that growth is sustainable and does not add to the environmental pressures that are already evident in delivering drinking water, treating urban waste water and tackling air pollution.

Agriculture growth

Achieving the aims of Food Wise 2025 (DAFM, 2015b), without damaging the environment upon which agriculture depends will be a significant challenge. Many significant actions are included in this plan, which relate to sustainable food production and management and protection of soil quality. This key challenge for Ireland's environment is covered in more detail in the section on "Economy and Agriculture", but it is clear that the health of both our soils and our agriculture sector are intrinsically linked and dependent on one another.

Decline in peatlands

Table 7.2 shows that, between 2007 and 2013, there was a decline in the range, area, structure and functions and status of Ireland's peatlands (DAHG, 2014).

According to the National Peatlands Strategy, only 10% of the original raised bog and 28% of the original blanket peatlands resource are suitable for conservation (as natural peatlands). Land drainage, reclamation for agricultural purposes and peat extraction have all impacted peatlands. The damage caused by these activities also has a negative effect on climate mitigation, as it prevents carbon sequestration and reduces the available carbon stock as, when drained, peat oxidises and CO₂ is released. The emergence of climate change as a key social, economic and environmental issue has brought fresh impetus to the need to preserve remaining functional peatlands and to accelerate the restoration of damaged peatlands.

Table 7.2 Changes in Peatlands Between 2007 and 2013 (Source: collated from DAHG, 2014)

Conclusion	Active raised bog		Degraded raised bog		Active blanket bog	
	2007	2013	2007	2013	2007	2013
Range	Bad	Bad	Favourable	Favourable	Favourable	Favourable
Area	Bad	Bad	Favourable	Bad	Bad	Bad
Structures and functions	Bad	Bad	Inadequate	Inadequate	Inadequate	Bad
Future prospects	Bad	Bad	Inadequate	Bad	Bad	Bad
Overall status	Bad	Bad	Inadequate	Bad	Bad	Bad

Status code: ■ = Bad ■ = Inadequate ■ = Favourable



Forestry Expansion Programme and associated environmental challenges

According to the National Forestry Policy Review (DAFM, 2014b) annual afforestation has decreased from over 20,000 ha in 1996 to just over 7,000 ha in each of the past 3 years (2012-2014). This Policy Review seeks to increase afforestation by setting an annual afforestation target of 10,000 ha/year by 2015 and a target of 15,000 ha/year for the period 2016-2046. Since 1990, Ireland has had one of the highest rates of increase in forest expansion in the EU. This rapid increase may potentially give rise to additional environmental pressures and requires sensitive environmental management. Afforestation and harvesting may adversely affect natural vegetation, soils, biodiversity and landscape resources. These activities can also impact on water quality through acidification and nutrient mobilisation. However, if carried out in an environmentally sensitive manner and in the right places, expanding our national forestry cover can bring multiple benefits across society, the environment and the economy.

The challenge will be to establish and maintain a sustainable level of broadleaf planting to protect environmental sensitivities (e.g. biodiversity and water quality) while still providing for an economically viable commercial forestry resource.

Soil quality or contamination

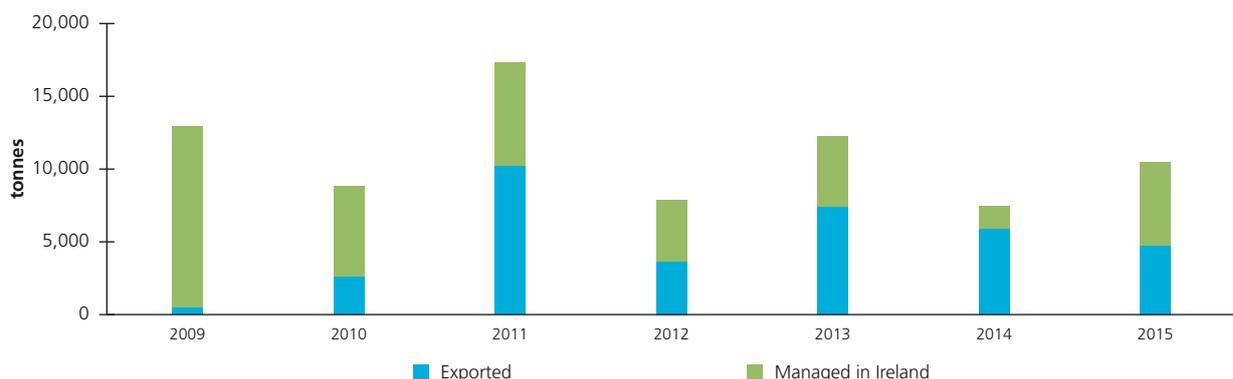
Six key degradation processes can impact on soils: soil sealing, erosion, organic matter decline, compaction, salinisation and landslides. EPA research (EPA, 2014d) shows that the main soil quality pressures in Ireland appear to relate to surface sealing (urbanisation). Human activity is also a significant driver of degradation through poor (or inappropriate) land management practices. However, in Ireland, the overall area of artificial surfaces remains low compared with that in other EU Member States.

Soil contamination can occur as a result of unauthorised waste-related activities, historical activities, leakages and accidental spillages of chemicals. There is currently no specific contaminated land policy in Ireland and therefore no legislation in place to deal with it. However, according to national legislation dealing with Integrated Pollution Prevention and Control (IPPC)/Industrial Emissions Directive (IED) and waste, the EPA is responsible for enforcing the remediation of contamination identified at EPA-licensed facilities and the licensing of remediation activities that fall under the above legislation.

The National Waste Report for 2012 (EPA, 2014c) shows the treatment of contaminated soil off-site in Ireland fell by 40% in 2012 compared with 2011. This correlates with the downturn in the construction industry. Figure 7.4 shows the reported off-site management of contaminated soils from 2009 to 2015 (EPA, 2014c, with additional recent data included).

The Environmental Liabilities Directive (ELD) (2004/35/EC) and related national regulations establish a framework for environmental liability based on the “polluter pays” principle. This includes preventing environmental damage to soils. A recent European Commission report on the implementation status (by Member States) of the ELD has been published (EC, 2016). This report shows that implementation varies across Member States, with some countries (including Ireland) having very few instances of implementing the ELD. One recognised issue is that there is no common understanding of the definition of “significance threshold” for environmental damage.

Figure 7.4 Offsite Management of Contaminated Soils from Ireland 2009-2015
(Source: EPA, 2014c With Additional Recent Data Included)



Responses

Spatial Planning

Good planning decisions are those that are integrated and also provide for a better environment.

Spatial planning strongly influences land use. Good planning decisions can incentivise more efficient resource use in the built environment and avoid the intrusion of inappropriate urban infrastructure into natural areas. According to the European Environment Agency's State of the Environment report (EEA, 2015), integrated spatial planning "can optimise economic development opportunities, ecosystem services, reduce human exposure to environmental pressures and reduce social inequities ... the challenge is to design a future urban environment with public appeal while meeting the needs of the population". The importance of clean and well-protected "green" and "blue spaces" such as parks, ponds and wild areas in the urban landscape is now recognised as a key part of urban landscapes that are needed for healthy communities. The real benefits of these areas to health are covered in Chapter 8.

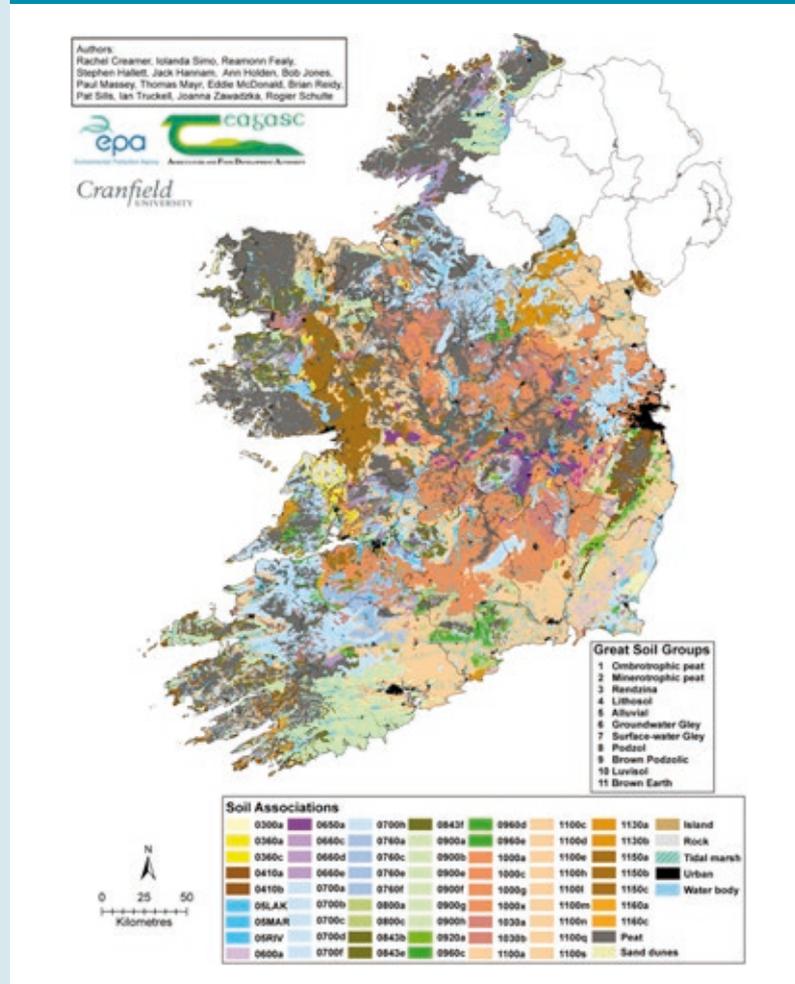
Land Cover Mapping

Mapping at greater resolution is needed to pick out local issues.

Addressing the national level resolution gap in land cover mapping remains a challenge and requires collaboration between many organisations and government departments. An EPA study in 2010 (G. Smith, EPA, December 2010, personal communication) found that there is still a need for a national high-resolution (1–5 ha scale) land cover dataset to characterise and assess LULC adequately, as small areas of biodiversity, water bodies and rural/one-off housing are indiscernible at a 25 ha scale. At an EU level, Action 5 of the EU Biodiversity Strategy (EC, 2011) calls on Member States to map and assess the state of ecosystems and their services. A dedicated EU working group has been established to deliver this action.

Irish Soil Information System

Figure 7.5 National Soil Map of Ireland (Source: EPA, 2014b)



Since the last EPA State of the Environment report in 2012 was published, availability of soil data has increased. One area which has seen significant improvement has been the establishment of a national soil map as part of the EPA-funded Irish Soil Information System Project, published in 2014.

The overall objective of this project, undertaken by Teagasc, Cranfield University and University College Dublin, was to assess the national distribution of soil types and prepare a national soil map that would identify and classify soils using a consistent national classification. In addition to the map, a collection of tools to access and interact with the soils data were developed. The various soil types have been assessed taking into account their environmental and agronomic responses. This should assist soils management planning and related policy implementation. This map is now publicly available at: <http://gis.teagasc.ie/soils/>.

National Landscape Strategy

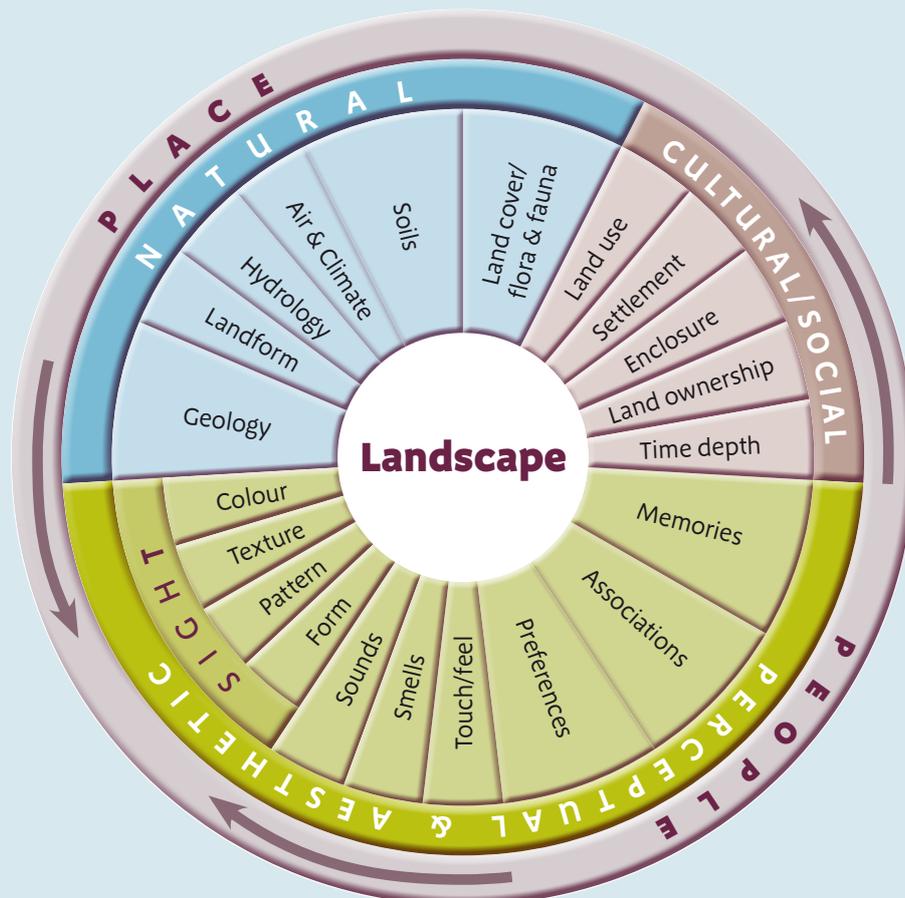
Protecting and enhancing the landscape while positively managing change.

The European Landscape Convention (ELC) seeks to strike a balance between management planning and landscape protection. In Ireland, this is being provided for through the Planning and Development Act Regulations 2000-2010 and Local Government Reform Act 2014. The National Landscape Strategy (NLS) (DAHG, 2015b) also seeks to ensure that Ireland complies with the ELC by establishing principles for protecting and enhancing the landscape while positively managing changes.

The National Land Cover and Habitat Mapping Programme is considering developing detailed land cover maps that will be essential to assess the potential impacts on our landscape resource of land use planning.



Figure 7.6 The Landscape Wheel (Source: Natural England)



The NLS specifies a commitment to ensuring that sector-specific policies and legislation within the remit of relevant bodies are consistent with the objectives of the strategy. These include:

- implementing ELC recommendations into the planning process;
- preparing “State of Landscape Report(s)”;
- providing a national and sectoral-level landscape policy framework to protect, manage and plan for the sustainable stewardship of our landscape.

A consistent landscape characterisation framework approach at a national level to inform planning authorities is required. An increased awareness of landscape matters, community participation and the establishment of a consistent methodology to assess, monitor and report on the state of landscape are also recommended. By integrating the NLS into land use planning, sustainable landscape management practices can be progressed.

According to the Heritage Council, the implementation of the NLS should prove to be a turning point in landscape awareness and management. The development of bespoke agri-environmental (locally led) schemes aimed at promoting high-nature-value farming and the development of landscape partnerships, with support under future leader programmes or from national agencies, may also become a growing trend. In keeping with the emphasis placed by the ELC on public participation, the development of Local Authority Public Participation Networks (PPNs) and participative processes, such as community-led village design statements, coupled with the United Nations Economic Commission for Europe (UNECE) Aarhus Convention and its adoption in domestic legislation and policy, are likely to shape future trends.

National Peatlands Strategy

The National Peatlands Strategy is a key strategy that establishes the framework for the future use of our bogs.

The National Peatlands Strategy sets out the actions required and partners responsible for its management and implementation. In 2015, Bord Na Móna (BNM), one of the strategy partners, announced its intention to cease peat harvesting activities by 2030 and focus on supplying renewable energy. It is also notable that between 2009 and 2014, BNM restored 1,136 ha of drained raised bog (BNM, 2015). In 2016, BNM launched its Biodiversity Action Plan 2016-21, which supports the ongoing restoration and management of peatlands.

Identification and Clean-up of Contaminated Land

EPA-licensed sites are required to implement aftercare provisions closure to remove any remaining residual soil contamination.

Appropriate financial provisions may also be required for some licensed sites to ensure that any residual contamination is appropriately managed. The WFD also requires measures to be taken where identified contaminated lands pose a threat to water quality.

Agriculture

Agriculture policies could have a significant bearing on land use in the future.

Food Wise 2025 includes many sustainability-related actions to improve the environmental footprint of the agriculture sector. A wider discussion of this topic and the related environmental challenges is presented later in this report. By fully implementing the environmental-related elements of Ireland's National Rural Development Programme 2014-2020, adverse environmental effects (including on soils, water quality, etc.) can be minimised.

The EU Common Agricultural Policy and schemes such as Agri-Environmental Option Schemes, for example, encourage farming practices that maintain soil fertility and levels of organic matter. Teagasc's SQUARE Project is developing a toolbox for farmers to use to assess soil structural quality, soil functional capacity/quality and impacts of soil structural degradation on its functional capacity. This will be a useful management tool to minimise nitrogen and phosphorus losses.



River Catchment-based Flood Risk Assessment and Management

The flooding along parts of the Shannon catchment experienced in 2015 was widely reported in media news reports that outlined the severe impacts on local communities and business. This flooding has highlighted the need for a wider debate and a national solution to managing flood risks in catchments and managing land use in areas at risk of significant flooding. The national Catchment-based Flood Risk Assessment and Management (CFRAM) programme currently aims to assess the existing flood risk of inland watercourses and coastlines in Ireland and consider flood alleviation options. The programme is also considering the potential for significant increases in flood risk arising from climate change, ongoing development and other pressures that may arise in the future. The CFRAM programme is the vehicle for delivering on the main requirements of the European Floods Directive. This directive applies to inland waters as well as coastal waters.



According to the Office of Public Works (OPW), the national body co-ordinating this work, the objectives of the CFRAM programme are to identify and map the existing and potential future flood hazard and flood risk in the communities at risk, to identify viable structural and non-structural options and measures for the effective and sustainable management of that flood risk and to prepare a series of flood risk management plans that set out the policies, strategies, measures and actions that should be pursued by the relevant bodies (including the OPW, local authorities and other stakeholders) to achieve the most cost-effective and sustainable management of existing and potential future flood risk.

The CFRAM programme covers the whole of the country, divided into seven large areas called River Basin Districts. Each River Basin District is then divided into a number of units of management, and one flood risk management plan will be prepared for each unit. The CFRAM programme is specifically focused on a number of areas where the risk has been determined to be potentially significant, which are referred to as “areas for further assessment”, and on the sources of flooding that were determined to be the cause of significant risk within those areas. Detailed draft flood mapping for those areas for further assessment was put out to public consultation in late 2015.

Draft flood risk management plans will be accompanied by strategic environmental reports, which will document the strategic environmental assessment process. The environmental reports will identify, evaluate and describe the likely significant effects on the environment of implementing the measures set out in the draft flood risk management plans. The environmental reports will also document how the plans have been prepared, with a view to avoiding adverse environmental effects and will also, where appropriate, set out recommendations as to how adverse effects can be mitigated, communicated and monitored. A Natura impact statement will also accompany the draft flood risk management plans to set out the findings of the Appropriate Assessment in relation to the impacts of the plans on Natura 2000 sites. Following completion of the consultation process, the draft flood risk management plans will be finalised taking into account comments received, as well as comments on the environmental report and the Natura impact statement.

Work on the CFRAM programme also involves significant overlap and co-ordination with activities related to the WFD, including specific aims to support the objectives of the WFD, consideration of multiple-benefit mitigation measures (such as land use management and natural water retention measures) and joint liaison between the OPW, EPA and the Water Policy Advisory Committee.

The OPW has commenced consultation on the draft flood risk management plans for units of management during 2016.

National Forest Review Policy

Forestry growth under a number of strategies is likely.

The Forestry Act 2014, once enacted, will support the development and management of sustainable forest management practices (Oireachtas, 2014). The National Forest Policy Review identifies climate change mitigation, along with sustainable increases in wood production and contribution to renewable energy source production as key drivers of continued afforestation.

The National Peatland Strategy reports that afforestation of unenclosed lands (mostly comprising peaty soils) peaked in 1995 with over 6000 ha planted. Since then the trend has decreased significantly, with approximately 100 ha of unenclosed lands planted in 2013. Coillte has contributed in restoring approximately 3250 ha of peatland habitat up to 2015, through initiatives including co-funded EU LIFE projects.

In 2010, the Forestry Commission of Scotland advocated forest “zoning” mapping when preparing forestry and woodland strategies. This mapping highlighted the most environmentally favourable areas for afforestation. A similar approach in Ireland may be beneficial to maximise environmental and economic benefits. Work undertaken by both the Forest Service, through its Forest Inventory Production System (FIPS) and the EPA, through its WFD characterisation work, could assist in identifying these areas. The aforementioned national land cover mapping initiative would also provide information that would help with this.

Research

Investment in research will provide information about the interactions between soil protection and wider environmental protection.

The EPA research programme funds research that informs land and soil policy development and implementation, enforcement and sustainable use. The range of projects funded includes desk and medium-scale studies, scholarships and fellowships. A number of key significant soil and land use-related research projects are listed below:

- LANDMARK Project: a pan-European project seeking to unearth pathways to sustainable land management
- H2020 INSPIRATION:² integrated spatial planning, land use and soil management research action project (EC, ongoing)
- Irish Soil Information System Project (EPA, 2014b)
- Towards Landcover Accounting and Monitoring Research Project³
- Soil Status and Protection Research Project⁴

- Soil Contamination Guidance (EPA, 2013)
- Carbon Restore: assessing the carbon restoration potential of Irish peatlands (EPA, 2012)
- BOGLAND: Sustainable Management of Peatlands in Ireland (EPA, 2011)
- HYDROFOR Project: ecological quality impacts of forest operations on water (EPA, 2014e)
- Potential Threats to Soil Biodiversity in Europe (JRC, 2016)
- The Direct and Indirect Impacts of EU Policies on Land (EEA, 2016).

Conclusion and Future Challenges

Soils, land cover and landscapes are resources that need to be protected, monitored and managed.

Soils, land cover and landscapes are resources that need to be protected, monitored and managed, from high-level national and sectoral land use plans through to local management activities on farms, forest plantations, peatlands, urban and rural settlements. We must also support continued collaborative research to inform decision making that may affect soils, land use and landscapes. Ireland has a rich and productive soil resource that supports significant food production and other social, economic and environmental uses, and it is important that we protect this precious resource for future generations.

In the absence of an EU Soils Directive and associated national soil legislation, the challenge remains to ensure a consistent approach to protecting and managing our limited soil resource, in the context of supporting environmentally sustainable economic and population growth.

Establishing and implementing an integrated national land cover, land use and habitat mapping programme is essential to assist in reporting and assessing the impact of different land cover and land use types on the environment. Providing a single agency with a mandate to develop this programme would help streamline its delivery. It will also be necessary to secure cross-organisational and governmental funding to support its implementation.

It is useful to quote again the European Environment Agency advice that “compact urban development and resource efficient approaches to the built-environment can provide opportunities to alleviating environmental pressures and enhance human wellbeing and also protect from the impacts of climate change” (EEA, 2015). The challenge is to design a future urban environment with public appeal that incorporates climate-proofing aspects, along with green areas and wild spaces for wildlife and people, while also meeting the needs of the population.

² www.inspiration-h2020.eu/

³ www.landmapping.wordpress.com/talam/

⁴ www.erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=3121

Forward strategic planning for land use and new infrastructure is needed to ensure that growth is sustainable and does not add to the environmental pressures that are already evident, such as the gradual loss of wetlands over the past two decades or capacity issues in delivering drinking water and treating urban waste water.

Land drainage, reclamation for agricultural purposes and peat extraction have all impacted peatlands, leaving only 10% of the original raised bog and 28% of the original blanket bog peatlands resource suitable for conservation (as natural peatlands). The damage caused to bogs is also damaging for climate mitigation. These issues point towards a pressing need to work on the implementation of the National Peatlands Strategy, in order to leave the best examples of the remaining unique and unspoilt boglands as a legacy for future generations.

By integrating the NLS into land use planning, sustainable landscape management practices can be progressed. As with the wider environment, there are a range of issues that affect landscape. Ensuring the sustainable management of landscape remains a key challenge, particularly in the context of evolving social and economic needs as well as climate change issues. The accomplishment of this overarching aim will be possible only through the establishment of consistent characterisation frameworks to assist local authorities and national agencies in engaging in infrastructure development. More initiatives to develop greater awareness of landscape and that facilitate local community participation are also a requisite for success in this area. Assessing the state of the Irish landscape to capture additional information is a key issue for future practice; such measurements may include the rate of Landscape Charter Assessment at a regional level, and the take-up of these assessments in decision making, policies and legislation, scenic designations, local community landscape initiatives, accessibility and awareness.

The flooding that parts of Ireland experienced in 2015 has highlighted the need for a wider debate and an integrated approach to managing flood risks in catchments. The national CFRAM programme that is under way aims to assess the existing flood risk of inland watercourses and coastlines in Ireland. The programme is also considering the potential for significant increases in flood risk due to climate change. The CFRAM programme, co-ordinated by the OPW, will be the principal solution for delivering on the main requirements of the European Floods Directive and should lead to better solutions to tackle flooding while minimising impacts on the wider environment.

Land is subject to many, often competing, sectoral demands. National policies, such as those for forestry, agriculture, peatlands and the built environment, influence land use change and resource management. Both single rural housing and suburban spread can impact on soils and landscape and need to be carefully managed. Achieving the aims of Food Wise 2025 (DAFM, 2015b), without damaging the environment, will be a significant challenge. Many significant actions included in the Food Wise implementation plan relate to sustainable food production and management and protection of soil quality. The implementation of all these sectoral plans and policies should be carefully monitored to ensure a sustainable approach to land use that does not negatively affect the environment, the wider economy and communities.

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