



Theme F. Soils and Land-Use

EPA 2020 Vision:

Goal 4: Protected Soil and Biodiversity

The soil of Ireland will be protected from contamination and loss and will support dependent plants and animals. Our biodiversity will be protected and managed for future generations to enjoy.

STRIVE Programme 2007-2013 Strategy:

Theme F. Soils and Land-Use

The soils research programme will help to protect and ensure a sustainable use of soil by getting a better understanding of soil and its functions and by preventing the threats to soil and mitigating their effects. Research activities in this thematic area will aim at supporting sustainable urban and land-use policies.

Overview

The overall aim of this thematic area is to: *"help to protect and ensure a sustainable use of soil by getting a better understanding of soil and its functions and by preventing the threats to soil and mitigating their effects. Research activities in this thematic area will aim at supporting sustainable urban and land-use policies."*

The research will focus on the key challenges outlined in the EPA 2020 Vision and Ireland's Environment 2008 including: soil data coverage of Ireland, state of Irish soils (assessment, quality indicators and pressures), national soil quality – monitoring network, management and remediation of contaminated soils in Ireland, application of sewage sludge to land, and the update of the national landcover inventory.

A range of research activities are planned in the coming years with a big focus on building research capacity and capability in Ireland, increased dissemination and communication, and on maximising our investment through collaboration with other stakeholders.

It is envisaged that the programme will have developed significant research expertise in support of the preparation of a National Soil Protection Strategy, the identification and meeting of the requirements of the proposed Soil Framework Directive, as well as the preparation of an updated national landcover inventory.

1. Background and Policy Drivers

1.1. Background

1.1.a. Soils

The soil of Ireland is an immensely valuable, and finite, national resource, which forms and evolves slowly over very long periods of time. However, it can easily be damaged and lost. Soil is a biologically active, complex mixture of weathered minerals (sand, silt and clay), organic matter, organisms, air and water that provides the foundation for life in terrestrial ecosystems.

Our knowledge and understanding of many issues relating to soil functions is limited, due to the lack of data on which to base this judgment. Soil protection measures and sustainable land management practices should be integrated into national policies. In addition, many land-based activities, while not impacting directly on soil quality, have the potential to impact significantly on water or air quality – nutrient loss from soil to water, ammonia emission to the atmosphere, soil organic carbon losses, etc.

1.1.b. Land Use

Land is subject to many competing demands. We rely on our land resource for food, energy (increasingly), agriculture and forestry, recreational opportunities and cultural amenities and, overall, for a good living environment. Current land use is the result of a sequence of past human interventions on the natural landscape; decisions made today will shape the environment of the future, whether in cities, towns, suburbs, rural villages, or on the land. The rate and nature of land use changes indicate where future environmental pressures are likely to arise. By European standards, Ireland has experienced a relatively high rate of land use change since the early 1990s. While agriculture remains the predominant land use, improved economic conditions and population growth (due mainly to immigration) have led to a dramatic increase in the extent of built-up areas, with growth rates surpassing those of all of our European neighbours. Population growth rate, global warming concerns and competing demands on land for the production of food and biofuel crops have highlighted the importance of environmentally sustainable land use policies and practices.

1.2. Policy-Drivers

1.2.a Soils

There is little legislation relating directly to soil and soil protection. However, in 2006, the European Commission published the final Thematic Strategy for Soil Protection (COM(2006)231 final) and a proposal for a directive establishing a framework for the protection of soil (COM(2006)232). The overall objective of the strategy is the protection and sustainable use of soil, based on the guiding principles of preserving soil functions, preventing further degradation and restoring degraded soils to a level of functionality consistent with current and intended use. The European Soil Thematic Strategy should guide and frame Ireland's approach to developing its own soil protection strategy.

In the proposed Directive, there are a series of specified obligations aimed at a shared objective which is the identification of the location and extent of the problem of soil degradation and the obligation to act upon it. These obligations are:

- Identification of risk areas for erosion, SOM decline, salinisation, compaction and landslides
- Adoption of a programme of measures for these areas
- Development of an inventory of contaminated sites
- Adoption of a National Remediation Strategy
- Establishment of a Soil Status report
- Development of a mechanism for funding the remediation of 'orphan sites'
- Increasing Awareness raising
- Giving priority to the rehabilitation of brownfield sites and the use of soil saving construction techniques.

The proposed Directive will require Member States to take specific measures to address soil threats, but it leaves to Member States the freedom to implement this requirement.

Different EU policies (for instance on water, waste, chemicals, industrial pollution prevention, nature protection, pesticides, agriculture) are contributing to soil protection (See Appendix 1). But as these policies have other aims and other scopes of action, they are not sufficient to ensure an adequate level of protection for all soil in Europe.

National legislation

The national legislation related to soils is very fragmented and soils considerations are included into adhoc regulations:

- Planning & Development Act
- Mining Laws
- Health & safety Laws
- Waste management Act, 1996
- Derelict Site Act, 1990
- Air pollution
- IPPC Regime
- Water Law
- TORT Law

1.2.b. Land Use

Land-use planning and management are essential to better reconcile land use with environmental concerns. It is a challenge that involves various policy levels and different sectors. Monitoring and mediating the negative environmental consequences of land use while sustaining the production of essential resources is a major priority of policy-makers around the world (<http://www.eea.europa.eu/themes/landuse/policy-context>).

Land-use planning and management decisions are usually made at local or regional level. However, the [European Commission](#) has a role to play in ensuring Member States take environmental concerns into account in their land-use development plans. The goals are:

- to analyse the [environmental impact](#) of proposed developments;
- to improve the [geographic information](#) flow about land-use issues;
- to develop and implement European [urban environment strategy](#);
- to improve the planning, management and use of Europe's [coastal zones](#).

European economies depend on natural resources, including raw materials and space ([land resources](#)). The EU [thematic strategy on the sustainable use of natural resources](#) includes space as a resource. It applies to areas of land and maritime space that are needed for production purposes (e.g. minerals, timber, food) and for various socio-economic activities. These interests are often competing for the same territorial resource. Efforts to modify land-use practices to reduce non-point pollution of air and water include [integrated river basin](#)

[management](#) and, in particular, the [Nitrates Directive](#). Flooding caused by the construction of impervious surfaces (e.g. buildings and roads) and provoked by extreme weather events is addressed by a new [European Floods Directive](#). The cross-cutting nature of land use is also emphasised by the EU [rural development](#) and [regional policies](#). The UNFCCC Kyoto Protocol promotes among others practices that reduce emissions of methane and nitrous oxide from agricultural land. EU policies on [climate change adaptation](#) are directly relevant to current and future land-use practices and economic sectors depending on this.

Government at all levels is becoming increasingly aware of the importance of having access to accurate, up-to-date land cover and land use information of sufficient details. National land cover and land use data requirements are driven by policy, operational and research information needs. As such, there is no national land use policy. Disparate and uncoordinated national sectoral policies have been developed. In rural areas, these cover fields such as tourism, agriculture, rural employment, depopulation and forestry. Areas covers by land use considerations include:

- Good farming Practices
- Rural Environment Protection Scheme (REPS)
- EU Biofuels Directive
- Renewable Energy (REFIT, 2006)
- Forestry
- Coastal Zone (ICZM implementation)
- Strategic Environmental Assessment (SEA) Directive

2. Overall Aim

The overall aim of this thematic area is to: *"help to protect and ensure a sustainable use of soil by getting a better understanding of soil and its functions and by preventing the threats to soil and mitigating their effects. Research activities in this thematic area will aim at supporting sustainable urban and land-use policies."*

The research will focus on the key challenges outlined in the EPA 2020 Vision and Ireland's Environment 2008 including: soil data coverage of Ireland, state of Irish soils (assessment, quality indicators and pressures), national soil quality – monitoring network, management and remediation of contaminated soils in Ireland, application of sewage sludge to land and update of the national land cover inventory.

A key indicator of success for this thematic area will be evidence of increased research capability & capacity building in these areas, support provided towards the preparation of a National Soil Protection Strategy, the update of the national landcover inventory, and towards meeting the requirements of the proposed Soil Framework Directive.

3. Our Approach

3.1. Research Needed to Meet the Goals – Key Planned Activities (2009/2010)

The research will focus on the key challenges outlined in the EPA 2020 Vision and Ireland's Environment 2008 including:

- Soil data coverage of Ireland,

- State of Irish soils (assessment, quality indicators and pressures),
- National soil quality monitoring network,
- Management and remediation of contaminated soils in Ireland,
- Application of sewage sludge to land, and
- Update of the national landcover inventory.

3.1.a. Soils

It is proposed during the 2009-2010 period to mainly concentrate the research efforts towards:

- **Building Research Capacity** in the Soils area should be one of the main objectives of our research programme (PhDs and Research Fellowships).
- **Management and completion of on-going research projects** and to revise this document in light of their findings (See Appendix 2).
- **Communication and Dissemination** - co-ordinate and plan soils research in Ireland, enhance expertise by co-operation and disseminate information
- **Involvement of Irish representatives on international working group** – link with the JRC (Joint Research Centre), the EEA (European Environment Agency) or ESBN (European Soil Bureau Network)
- Encourage **FP7 involvement** in relevant calls of Irish researchers
- **Workshops** (see next Section)

Research efforts are also required to provide support towards the preparation of a **National Soil Protection Strategy**, and towards identifying and meeting the requirements of the **proposed Soil Framework Directive**. Depending on funding available, the following **research areas** should be considered:

- Contaminated land in Ireland
- Long-term impacts of Soil Applications (*Link with WRM Thematic Area*)
- Modelling for the identification of risk areas
- Development of a key set of indicators for soil monitoring
- Review of existing EU and Irish legislations including provisions on soil protection
- Review of the requirements of the proposed soil Framework Directive

Some of these areas could be addressed by **Joint calls** developed with DAFF, Teagasc and NPWS in areas of mutual interest. In addition, research gaps identified in the EU Thematic Strategy and the EPA Soils Research Workshop held in 2006, and the research priorities arising from it, will remain key reference points for developing soils related research projects (See Appendix 3).

3.1.b. Land Use

Datasets relating to different aspects of land use and land cover in Ireland have been produced and maintained by various agencies, institutions and individuals. A significant research effort is required to bring these data together to form a consistent picture of changing land use in Ireland within a robust methodology that addresses data quality control.

The research activities proposed for 2009/2010 include the:

- Establishment of a **National Land Use Assessment Centre** (link with the EPA Environmental Research Centre) - The Centre will aim at increasing the supply of scientists trained in interdisciplinary research, for example trained in both remote sensing and ground-based approaches to assessing land cover and land use changes.

- **Management and completion of on-going research projects** and to revise this document in light of their findings (See Appendix 2).
- Research towards the update of the **national landcover inventory**
- **Workshops** (see next Section)

Other research gaps identified include:

- Applications of Sustainable tourism indicators (ERTDI Report 80, 2007)
- Settlements patterns & sustainability (ERTDI Report 74, 2007; STRIVE Report 1, 2008)
- Temporal and spatial distributions of landcover and land use at local, regional and national scales
- How may changes in land use, management and land cover affect local, regional and national environmental and socio economic conditions
- Develop new integrative concepts for Urban Development, taking into account global change, the need for sustainable use of resources, including construction resources and energy, the relationships between urban, peri-urban and peripheral areas in view of maximising human welfare, minimising resource and energy use and vulnerability against hazards
- Development of adaptive land-use management support systems
- Urban Development in a changing global environment (vulnerability of various urban areas, different urban populations and goods, enhancement of the resilience against natural hazards, overheating of urban areas and the role of land use and urban green spaces, modification of urban biodiversity, role of policies and governance in coping with climate risks)
- Areas of future research in urban sustainability identified by the [EU FP6 URBAN-Net project](#).

3.2. Maximising our investment through collaboration with others

The active **co-operation of a number of key stakeholders** will be required to meet the immediate targets and the overall objectives of the STRIVE programme. The thematic area will continue to be developed in consultation with the DEHLG, EPA (Licensing, OEE), and the Research Community, General Public, Local Authorities, Teagasc and DAFF. We will maintain contact and liaison with the EU level activities and other relevant international activities (FP7, ERA-Nets, SNIFFER, LIFE+, JRC, ESNB, ESA, etc).

We will establish an **expert group** that will advise the research needs of the programme which will include:

Soils:

- Dr. Jane Brogan (EPA),
- Dr John O'Neill (DEHLG)
- A representative of NPWS
- EPA CCRP soils person
- A representative of DAFF, and
- a representative from the EU JRC Land Management & Natural Hazard Units

Land Use:

- George McHugh (EPA)
- Tadhg O'Mahony (EPA)
- Chris O Grady and/or Bruce McCormack (DEHLG)
- A representative from Comhar
- A representative from Forest Services (DAFF)
- A representative from NPWS

Our approach will be to consult with the stakeholders on a bi-lateral basis in the first half of 2009 with a view to hold a **one-day workshop** with stakeholders in late 2009.

We will disseminate the findings of the individual research projects and the overall programme to the widest possible audience in a coherent and timely manner (see separate paper on VFM & Research to Policy).

4. Outputs and Medium-Term Outcomes

The key outputs from this Thematic Area include:

- Reports
- Tools & Methods
- Briefing Papers
- Theses
- Publications
- Scientific Papers
- Databases including Soil Information System
- Guidance Notes
- Soil Physical Archive
- Workshops
- Conferences
- STRIVE Staff Papers

The medium-term outputs from this thematic area up to 2013 aims at achieving the following targets:

- Translate the improved soil knowledge into developing and implementing:
 - soil management strategies to sustainably use and protect soil functions;
 - strategies to support the implementation of the Soil Framework Directive
 - strategies to contribute to halt biodiversity loss by 2010;
 - strategies to contribute to climate change mitigation/adaptation
- Develop and establish a related, adequate soil monitoring system for Ireland
- Update the National Landcover Inventory
- Feed into the discussions in the international arena (UNCCD, CBD and Kyoto)
- Significant support for emerging international, EU and national environmental and research plans, policies and legislation
- Input to Future DEHLG Strategy Documents and other policy initiatives
- Effective partnership with the key stakeholders in this area
- STRIVE Researchers leverage funding from international funding programmes (e.g. FP7, LIFE+)
- Increased research capacity and capability in Ireland
- Established specific and targeted knowledge brokering and dissemination mechanisms that facilitate the production of policy-relevant knowledge in a timely and effective manner
- Managed the programme to the highest standards with respect to project/programme evaluation and ensuring optimal value for money for stakeholders

5. Conclusion – Overall Vision 2020

The Soils & Land Use research programme will help to protect and ensure a sustainable use of soil by getting a better understanding of soil and its functions and by preventing the threats to soil and mitigating their effects. Research activities in this thematic area will aim at supporting sustainable urban and land-use policies.

Research activities in this thematic area will actively support the work required towards the preparation & implementation of the proposed Soil Framework Directive, the preparation of a National Soil Strategy and the update of the National Landcover Inventory. One major objective of the research programme will be to built research capacity & capability in the land use & soils area among

the Irish research community. The findings of the individual research projects and the overall programme will be disseminated to the widest possible audience in a coherent and timely manner.

6. Relevant Links

- Climate Change Research Strategy
- Environmental Technologies Research Strategy
- Environment & Health Research Strategy
- Waste, Resource Management & Chemicals Strategy
- EPA Environmental Research Centre

Appendix-1: Different EU policies contributing to soil protection

Conventions and protocols

- 1972 Council of Europe's Soil Charter, revised in 2003
- World Soil Charter (FAO 1982)
- World Soils Policy (UNEP 1982)
- 1992 UN Framework Convention on Climate Change (UNFCCC)
- 1997 Kyoto Protocol
- 1992 Convention on Biological Diversity (CBD)
- 1994 UN Convention to Combat Desertification (UNCCD)
- 1999, Creation of the European Soil Forum (ESF)
- 2001 Stockholm Convention on persistent organic pollutants (POPs)
- Alpine Convention (Protocol on Soil Protection)

Links to objectives from other environmental legislation

- Liability Directive
- IPPC Directive
- Water Framework Directive
- Nitrates Directive
- Groundwater Directive
- Floods Directive

- Air legislation
- Waste Framework Directive
- Sewage Sludge Directive
- Directive on the management of waste from extractive industries
- Thematic Strategy on prevention and recycling of waste
- Directives on Authorisation of Plant Protection Products and on Biocidal products
- Proposal for a Thematic Strategy on the sustainable use of pesticides
- REACH Regulations
- Communities Sustainable Development Strategy
- Habitats Directive
- Thematic Strategy on the urban environment
- Thematic Strategy on the sustainable use of natural resources

Links to other Community policies

- 2003 Common Agriculture Policy reform (cross compliance).
- Structural fund programmes

Appendix 2 – Current On-going ERTDI & STRIVE Projects¹ in the Land Use & Soils area

Projects	Lead Organisation	Completion Year	Expected Outputs
CréBeo	UCD	2009	<ul style="list-style-type: none"> ○ Recommendations for soil protection strategies that will sustain Ireland's soil biodiversity ○ Inform technical and practical guidance document on the Landspreading of Industrial Organic Wastes ○ CréBeo baseline data on earthworms as a Pilot Area dataset used by ENVASSO (ENVironmental ASsessemnt of SOil for Monitoring) is FP6 SSP (Scientific Support to Policy) project ○ Research Seminar: recommendations for soil biological monitoring ○ End-of-project Workshop
Soil Organic Carbon	UCC	2008	<ul style="list-style-type: none"> ○ National quantitative baseline understanding of soil organic carbon (SOC) concentrations and soil carbon stocks in Ireland to a depth of 50 cm. This will directly assist in understanding many facets of terrestrial carbon management and carbon changes over time. ○ DOC component of this project is the first such national dataset for the Republic of Ireland. ○ Research has created the first Irish dataset of bulk density for Irish soils and land uses to a depth of 50 cm.

¹ Not including Scholarships & Fellowships

Projects	Lead Organisation	Completion Year	Expected Outputs
Soil H	UCC	2011	<ul style="list-style-type: none"> ○ Archive of soil samples ○ Database of soil hydraulic properties ○ Hydraulic classification of Irish soils ○ GIS risk assessment model ○ GIS maps soil types/hydraulic properties/risks
IRLSoil	Teagasc	2013	<ul style="list-style-type: none"> ○ Determination of national physiographic Soilscape units, output in a documented map format. ○ Incorporate a new national legend into digital soil map process ○ Final version of digital 1:250,000 soils map ○ Published final soil map in high quality cartographic version ○ Operational soils information system
NSDB Archive	EPA / Teagasc / NUI Galway	On-going	<ul style="list-style-type: none"> ○ Physical Archive of Soil samples and Archive of DNA extracts ○ Interactive GIS map interface, available (Map Viewer) ○ Search & request for physical soil samples
BogLand	UCD	2009	<ul style="list-style-type: none"> ○ Protocol for Sustainable Peatlands Management ○ Models, papers, project reports, workshops etc ○ Demonstration of integrated Sustainable Development approach ○ Improved Knowledge base on Peatlands ○ Strengthened Research Capacity
MOLAND	UCD	2010	<ul style="list-style-type: none"> ○ Digital Atlas, ○ Manual and a decision-making tool that will assist decision-makers to assess the implications of 'business as usual' and different policy interventions, ○ Mechanisms for engagement with the public on biodiversity awareness and related issues, ○ Template for making both small area specific and macro analyses

Appendix 3: Research Gaps in Soils Research Area

Research Priorities from EU Soil Thematic Strategy

The Thematic Strategy for Soil Protection (2006) outlined that further research is necessary to close the gaps in knowledge about soil and strengthen the foundation for policies. Key priority areas identified are:

- **processes** underlying soil functions (e.g. soil's role in global CO₂ accounting and in the protection of biodiversity),
- spatial and temporal **variability** in soil processes,
- ecological, economic and social **drivers** of soil threats,
- **factors** influencing soil eco-services, and
- **strategies and technologies** for soil protection and restoration.

These priorities will be part of the 7th Research Framework Programme (2007-2013) in the areas "Environment" and "Food, Agriculture and biotechnology".

Soils Workshop 2006:

The EPA organised in May 2006 a Soils Workshop (*A Showcase of recent progress in Soils Research and Identification of future requirements and challenges for the EPA Soils Research Strategy 2007-2013*) involving major stakeholders to re-focus the future research needs of the EPA, as well as the discussion of the progress made within the last few years.

- Research projects towards meeting the implementation requirements of the future Soil Framework Directive
- Research on identification and assessment of pressures on the extent of soil resource (erosion, sealing, salinisation, floods and landslides)
- Pressures on soil diversity (loss of biodiversity, decline in soil organic matter, contamination, sealing, compaction, salinisation, floods and landslides)
- Pressures on soil quality (loss of biodiversity, decline in soil organic matter, contamination, sealing, compaction, salinisation)
- Soil Research Platform

Other areas requiring research include:

- the impacts on soil biodiversity of:
 - the various soil management and land use practices
 - the effects of climate change (and vice versa),
 - the presence of contaminants; Interaction between soil biodiversity, soil use and soil pollution (risk assessment)
- development of:
 - Comparable, standardized methods for the
 - characterisation of soil biodiversity

- Definition of biological indicator of soil quality/health and subsequent development of a monitoring system
- Biodiversity based soil management strategies
- Targeted research activities:
 - better understanding of the role of soil in GHG cycles (Link with CCRP)
 - measurable methods and techniques for soils as carbon sinks (Link with CCRP)
 - measures to prevent soil degradation processes
 - measures to prevent soil contamination
 - building techniques to limit sealing and favour brownfield redevelopment
 - modelling for the identification of risk areas
 - methodologies for the establishment of risk acceptability criteria
 - methodologies for the identification of contaminated sites
 - cheap and reliable techniques for soil remediation (Link with ET)