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DRAFT NATIONAL BIORESOURCES STRATEGY

SEA Environmental Report

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1 INTRODUCTION

This Strategic Environmental Assessment (SEA) Environmental Report has been prepared by RPS TetraTech with the support of Egis on behalf of Uisce Éireann (UÉ) as part of the SEA of the updated National Wastewater Sludge Management Plan (NWSMP) published in 2016.

Following the scoping stage of the SEA process underway, UÉ renamed the draft revision to the NWSMP as the draft National Bioresources Strategy (hereafter referred to as the 'draft Strategy' or 'draft NBioS' throughout this report), to ensure alignment with the principles of the circular economy, zero waste and sustainability.

Uisce Éireann prepared the National Wastewater Sludge Management Plan in 2016 outlining a strategy for managing wastewater sludge over a 25-year period. The proposed draft Strategy is a review and update to the existing plan and will cover the period from 2026 to 2050, the next 25-year horizon. It provides a progress update on the objectives identified in the original NWSMP in 2016 and to what extent they have been achieved. It also includes detail on wastewater sludge management activities and how these activities impact climate change, sustainability and circular economy initiatives and address changes in legislation and good practice which has evolved since 2016. The recommendations of the draft Strategy will be used to inform future capital and operational activities in relation to wastewater sludge management.

The purpose of this SEA Environmental Report is to:

- Inform the development of the draft Strategy.
- Identify describe and evaluate the likely significant effects of the draft Strategy and its reasonable alternatives; and
- Provide an early opportunity for the statutory authorities and the public to offer views on any aspect of this environmental report and accompanying draft Strategy documentation, through consultation.

2 BACKGROUND AND CONTENTS OF THE DRAFT STRATEGY

This chapter provides an overview, contents and main objectives of the draft National Bioresources Strategy (NBioS) which have been subject to the SEA process as documented in this report.

2.1 Overview and Purpose

The draft NBioS is Uisce Éireann's (UÉ) updated 25-year plan to standardise and sustainably manage wastewater sludge and associated bioresources across Ireland. It replaces and builds on the 2016 National Wastewater Sludge Management Plan (NWSMP), aligning wastewater sludge management with circular economy principles, net-zero ambitions and recent regulatory changes. The document sets a vision to treat sludge as a recoverable bioresource (biosolids, biogas, biomethane, and related products), maximise recovery of energy and nutrients (notably phosphorus), protect the environment and support the bioeconomy, while ensuring resilient and efficient operations.

The draft NBioS identifies several interlinked challenges to wastewater sludge management which need to be addressed through the strategy, notably (i) rising sludge volumes driven by population growth, economic activity and more stringent treatment standards and (ii) an over-reliance on a single outlet—agricultural land spreading—which leaves the system vulnerable to regulatory shifts, policy change or acceptance exacerbated by the presence of emerging contaminants of concern (such as PFAS, microplastics and pharmaceuticals) and logistical and storage pressures, exacerbated by shorter land-spreading windows as wetter winters and seasonal conditions reduce the times when application to land is feasible.

2.2 Structure and Contents

The NBioS is structured to cover: background and purpose; the national picture of sludge generation and management; drivers and challenges; strategic objectives and detailed actions; treatment processes and technology options (including Advanced Thermal Conversion — ATC); transport, storage and infrastructure planning (Bioresource Centres and Satellite Dewatering Centres); monitoring, quality assurance and reporting; research & innovation priorities; implementation, performance measurement and review. Appendices provide regulatory context, technology descriptions, county estimates, and existing treatment sites. Key sections include:

- Executive summary and 25-year vision (Future Vision 2050).
- Chapter on what wastewater sludge and bioresources are, current quantities and outlets (currently all applied to agricultural land). The chapter includes an illustration outlining the wastewater and bioresource services provided by UÉ. The current process involves collection of wastewater from homes and businesses and transportation to a wastewater pumping station. It is then treated at a wastewater treatment plant (WWTP) as per strict environmental standards, The resulting wastewater sludge and bioresources are further treated at a Bioresource Centre to meet environmental standards prior to land spreading on agricultural lands.
- Strategic objectives and actions addressing sustainable management, environmental protection, community and bioeconomy support, and efficient operations.
- Treatment technologies and process descriptions (Anaerobic Digestion (AD) Advanced Anaerobic Digestion (AAD), thermal drying, composting, lime stabilisation, Sludge Reed Beds).
- Advanced Thermal Conversion (ATC) technology review (pyrolysis, gasification, hydrothermal carbonisation, etc.) and plans for trials and demonstration plants.
- Transport strategy and Decision Support Tool (DST) to optimise logistics, carbon, and costs.
- Infrastructure planning: prioritised regional Bioresource Centres, and prioritised Satellite Dewatering Centres.
- Monitoring, reporting and a proposed Biosolids Assurance Scheme (BAS) for independent quality assurance.
- Research and Innovation programme listing national and international collaborations and trial projects.

- Implementation approach, governance, review cycle (at least every five years), and integration into regulatory funding cycles.

2.3 Main Objectives

Cross-cutting aims of the NBioS include meeting sustainability goals (net zero carbon target by 2040 for UÉ), increasing circularity, reducing greenhouse gas emissions, and improving resilience against policy, market or public-perception surrounding agricultural reuse route through diversification of outlets. Other main objectives of the NBioS are summarised as:

1. Sustainable management of wastewater sludge and bioresources — reduce volumes, stabilise biosolids to accepted standards, optimise treatment and transport, and maximise resource recovery.
2. Protect and restore the environment — ensure biosolids reuse is safe for soils, biodiversity, and water; monitor and respond to emerging contaminants (poly-fluoroalkylated substances - PFAS), microplastics, Persistent Organic Pollutants -POP).
3. Support communities, growth, and the bioeconomy — facilitate beneficial reuse in agriculture where appropriate, develop alternative outlets and value recovery and support regional economic opportunities while maintaining community acceptance.
4. Efficient operation of treatment and Bioresource Centres — consolidate operations into regional BCs and SDCs where appropriate, reduce transport emissions and cost through strategic dewatering/storage, and optimise energy use.

The draft NBioS repositions sludge management from disposal-focused practice to a resource-centric, adaptive, and evidence-led strategy. It balances immediate operational realities (current reliance on agricultural reuse, existing assets, and transport dynamics) with medium- to long-term shifts toward ATC trials, regional consolidation, strengthened monitoring, and circular bioeconomy outcomes — all within the evolving EU regulatory framework and national sustainability commitments.

3 STRATEGIC ENVIRONMENTAL ASSESSMENT METHODOLOGY

3.1 The SEA Process

The SEA Directive requires that certain plans and programmes, which are likely to have a significant impact on the environment, be subject to the SEA process. The SEA process is broadly comprised of the following stages outlined in **Table 3-1**.

Table 3-1: Stages in the SEA Process

SEA Step/Stage	Purpose	Status
Screening	The purpose of this stage of the process was to reach a decision, on whether or not an SEA of the draft Strategy is required.	As a national scale plan, required by legislation, which will be adopted by Uisce Éireann for the management of wastewater sludge and biosolids, the draft Strategy meets the requirements of Article 2(3) and paragraph (a) of Article 9(1) of the European Communities (Environmental Assessment of Certain Plans and programmes) Regulations 2004, as amended. As such, the draft Strategy has been screened in for SEA.[1]
Scoping and statutory consultation	The purpose of this stage of the process was to clarify the scope and level of detail to be considered in the environmental assessment. This was undertaken in consultation with the defined statutory bodies for SEA in Ireland and other stakeholders. Transboundary consultation was undertaken with the relevant authorities in Northern Ireland.	This stage was completed in August 2024.
Environmental assessment and consultation	The purpose of this stage of the process is to assess the likely significant impacts on the environment as a result of implementation of the draft Strategy and consideration of reasonable alternatives. The output from this stage of the process is an SEA ER which records this assessment. Consultation on the draft Strategy contained therein and Environmental Report are also part of this stage.	This document is the statutory reporting associated with this stage of the process.
SEA Statement	The purpose of this stage of the process is to identify how environmental considerations and consultations have been integrated into the finalisation of the draft Strategy, as well as consideration of alternatives and inclusion of an SEA	To be published following the publication of finalised Strategy.

[1] A screening applicability check was undertaken in line with EPA SEA Screening Guidance (2021). This concluded that the revision to the 2016 NWSMP by UÉ was to update their management approach for wastewater sludge in response to changes in EU legislation governing sludge treatment and reuse. The strategy is relevant to the water and the waste management sectors listed in the SEA Directive and furthermore will contribute to the framework for future development consent of projects listed in the EIA Directive. It was also found to have potential for likely significant effects on a European site under the EU Habitats Directive and required preparation of a Natura Impact Statement. For these reasons the strategy was considered to require a mandatory SEA.

monitoring programme, culminating in the production of an SEA Statement.

Integration of the SEA and draft Strategy was achieved through involvement of relevant team members in discussions across the stages of scoping including review of the existing situation, alternatives development, iterative assessment of actions, and suggested mitigations.

Consultation as part of SEA Scoping was carried out with the statutory environmental authorities for SEA in Ireland and contact was also initiated with the environmental authority in Northern Ireland (Department of Agriculture, Environment and Rural Affairs). The scoping stage also included the preparation of a Scoping Report, and a SEA Scoping workshop was held on 14th August 2024.

3.2 Work Completed to Date

3.2.1 Screening

Screening for SEA was undertaken in 2024. This screening determined that SEA was required for the draft Strategy for the following reasons:

- The draft Strategy will be prepared by Uisce Éireann to update the management approach for wastewater sludge in response to changes in EU legislation governing sludge treatment and disposal.
- The draft Strategy will contribute to the framework for future development consent of projects listed in the EIA Directive.
- The draft Strategy is relevant to the water and the waste management sectors listed in the SEA directive, and therefore mandatory SEA is required.

With reference to the above, it has therefore been concluded that SEA is required for the draft Strategy under S.I. No. 435/2004, as amended.

3.2.2 Scoping

Scoping was carried out and a Scoping Report was prepared in May 2024 to help inform statutory SEA scoping. The Scoping Report outlined the geographical and temporal scope of the draft Strategy and identified the scope and level of detail of the proposed environmental assessment. The scoping report confirmed the following:

- **Geographical Scope**: The draft Strategy is a modification to a national plan designed to manage wastewater sludge. As such the assessment of the proposed revision will be primarily focussed on activities occurring at the national scale.
- **Temporal Scope**: In line with the SEA Directive, short, medium and long-term impacts (including reference to secondary, cumulative, synergistic, permanent and temporary, positive and negative effects) will be considered during the assessment. The recommendations put forward in the draft Strategy span a 25-year horizon and may take a number of years / cycles to be realised / take full effect. As a result, the timelines proposed for assessment of long-term impacts extends beyond the timeframe of this revision. For the purpose of the SEA, a short-term horizon of 2030 covering this cycle of the plan, a medium-term horizon up to 2050 and a long-term horizon of beyond 2050 will be considered. The NBioS will be reviewed at least every five years.
- **Environmental Scope**: The environmental topics in the SEA Directive that were scoped in for the assessment of the draft Strategy following SEA scoping in consultation with the statutory consultees for the SEA were: Biodiversity, Flora and Fauna; Population and Human Health; Soils, Geology and Hydrogeology; Water; Air Quality; Climatic Factors; Material Assets; Cultural Heritage including Architectural and Archaeological Heritage; Landscape; and the interrelationship between the above factors.

Scoping Consultation: In line with the SEA Directive, specific environmental authorities (statutory consultees) were consulted on the scope and level of detail of the information to be included in the Environmental Report. The relevant statutory consultees that were consulted as part of the SEA Scoping phase for the draft Strategy were:

- Environmental Protection Agency (EPA);

- Department of the Environment, Climate and Communications (DECC);
- Department of Agriculture, Food and the Marine (DAFM);
- Department of Housing, Planning and Local Government and Heritage (DHLGH); and
- Department of Agriculture, Environment and Rural Affairs (Northern Ireland).

The scoping report was supported by a scoping consultation workshop on the 14th of August 2024 during the consultation period to facilitate engagement between the consultees, Uisce Éireann and the SEA/AA team. A summary of issues raised by statutory consultees relevant to the SEA and AA processes are included in **Table 3-2**. Issues raised relevant to the content of the draft Strategy have been addressed by Uisce Éireann in the draft Strategy. A copy of the submissions received are provided in **Appendix A**.

Table 3-2: Statutory Consultees Scoping Responses Relevant to the SEA and AA Processes

Summary of Issues Raised	How this was addressed…
Environmental Protection Agency	
• **Integration of the SEA and the Plan:** – The integration of the SEA process into the Plan should reflect the overall objective of the SEA Directive. – SEA ER and the draft Plan should include a chapter outlining how the recommendations and mitigation measures from the SEA have been incorporated into the draft Plan. – Both should include summary tables outlining the key findings of the SEA and linking the significant environmental effects identified to the proposed mitigation measures, monitoring programme and, where relevant, draft Strategy policies/measures. • **Wastewater treatment sludge - design capacity and future loading:** The Plan and the SEA should consider the location and capacity aspects to ensure the necessary sludge management infrastructure is provided to cater for the current and future loadings expected. • **Sludge Quantity Data:** The Plan and SEA should consider the potential increase in wastewater sludge production likely from ongoing and planned sludge handling improvements at several WWTPs. • **Context of the Plan:** The Plan and SEA should consider including a commitment to review/assess the status of sludge handling facilities at WWTPs. • **State of the Environment Report:** The EPA State of the Environment Report 2024 should be considered and integrated as appropriate in the SEA ER and in implementing the plan over its lifetime. • **SEA Statement:** Uisce Eireann is required to publish a SEA Statement alongside the adopted Plan. • **Integration with other key Plans and Programmes:** A schematic showing the links and key inter-relationships between the Plan and other key relevant national, regional, sectoral and environmental plans can be included in the Plan and SEA ER. • **Environmental Authorities:** Under the SEA regulations, Environmental Protection Agency; Minister for Housing, Local Government and Heritage; Minister for Environment, Climate and Communications; and Minister for Agriculture, Food and the Marine should be consulted.	• **Integration of SEA and the Plan:** – Appropriate consideration has been given to the overall objective of the SEA Directive throughout the development of the draft Strategy and the associated SEA process. – Chapter 9 of the SEA Environmental Report presents the mitigation required for the significant effects identified. The SEA Statement will outline how the recommendations and mitigation measures from the SEA were incorporated into the draft Strategy. – Chapter 9 of the SEA Environmental Report sets out the draft monitoring table for discussion. The SEA will set out a draft SEA monitoring programme which will be updated post-consultation on the draft Strategy and environmental reports. Thereafter it will be the responsibility of UÉ to take forward the SEA monitoring programme and to report on its implementation. • **Wastewater treatment sludge - design capacity and future loading:** The location and capacity aspects have been taken into account in SEA assessment in **Chapter 8** of the SEA ER. • **Sludge Quantity Data:** The potential increase in wastewater sludge production at several WWTPs has been taken into account in SEA assessment in **Chapter 8** of the SEA ER. • **Context of the Plan:** Any review/ assessment commitment for the sludge handling facilities has been taken into account in the SEA assessment in **Chapter 8** of the SEA ER. • **State of the Environment Report:** Ireland's State of the Environment Report 2024 has been reviewed and considered during the preparation of **Chapter 5** of the SEA ER. • SEA Statement: Noted. • **Integration with other key Plans and Programmes:** Section 3 of the draft Plan includes a figure outlining other integrated plans and programmes and this is included in **Chapter 4** of the SEA. The same Chapter sets out other relevant plans and programmes in the context of environmental protection objectives in narrative form. • **Environmental Authorities:** SEA consultees were and will be consulted throughout the SEA process.

SEA Environmental Report

Summary of Issues Raised	How this was addressed…
• **Relevant Plans and Programmes:** Nature Restoration Law may be useful to include under relevant plans and programmes. • **Environmental Scope** There is merit in including a matrix in the SEA ER showing the interrelationships between the various topic considered with relevant explanatory text. • **Data gaps:** References to latest water quality report from 2023 and circular economy and waste statistics highlights report from 2021 should be updated. • **Potential Impacts:** Recommend considering competing land uses, such as forestry, land use zoning/development etc, that may possibly limit the existing (or any additional) lands used for land spreading purposes. • **Approach to SEA Assessment:** The SEA Environmental Report (SEA ER) should refer to the full range of effects and of the area likely to be affected including duration and frequency of effects. • **Monitoring, Implementation & Reporting:** – SEA ER should include a description of the measures envisaged concerning monitoring. Table 1 of EPA's guidance on SEA Statements and Monitoring may be useful for high-level monitoring indicators. – SEA monitoring should address positive, negative and cumulative effects as relevant and should include provision for ongoing review to facilitate an early response to any arising environmental issues. SEA ER should specify the monitoring frequency and responsibilities and include provisions for reporting on the monitoring. • **Available Guidance & Resources:** EPA's SEA Resources and Guidance should be utilised for the ER.	• **Relevant Plans and Programmes:** Nature Restoration Law has been considered in **Chapter 4** of the SEA ER. • **Environmental Scope:** An interrelationship matrix is provided in **Section 5.3.9** of this SEA ER. • **Data Gaps:** References to the latest EPA reports have been updated throughout the SEA ER. • **Potential Impacts:** The limitations of competing land uses in the context of land spreading are considered in **Chapter 5 (baseline), 7 (alternatives) and 8 (assessment)** • **Approach to SEA Assessment: Chapter 8** of this SEA ER includes an assessment of the draft Plan's actions, which considers potential for various effects such as short to long-term, cumulative, direct and indirect. • Monitoring, Implementation & Reporting: – Table 9-1 in Chapter 9 of the SEA ER presents draft SEA monitoring programme which will be updated post-consultation on the draft Strategy and environmental reports. Thereafter it will be the responsibility of UÉ to take forward the SEA monitoring programme and to report on its implementation. – Positive, negative, and cumulative effects that are likely to occur are considered under **Chapter 9** of this SEA ER along with monitoring and provisions for reporting. • **Available Guidance & Resources:** Recommended guidance, data sources and tools have been utilised during the preparation of **Chapter 5** of this SEA ER and to inform the assessments as appropriate.
Department of the Environment, Climate and Communications (DECC)	
Comments for the SEA • The submission contains a list of possible additional relevant legislations and plans/programmes that should be considered, as relevant and where appropriate to the SEA. • The submission contains a list of datasets and map viewers that could be utilised in the SEA ER.	• Relevant plans and programmes have been considered in **Chapter 4** of this SEA ER. • Recommended datasets and map viewers relevant to the draft Strategy have been utilised during the preparation of **Chapter 5** of this SEA ER and to inform the assessments as appropriate.

3.3 Environmental Assessment

3.3.1 Assessment Approach

Strategic Environmental Assessment is, as its name suggests, set at a strategic level, therefore it is not possible for the baseline environment to be described (and assessed) in as much detail as could be done for a project-level environmental impact assessment. SEA instead uses a system of objectives to rationalise information for the purposes of assessment. The environmental assessment is also focussed on the level of detail contained within the policy, plan or programme.

In order to streamline the assessment process, this report has used broad themes, based on the environmental topics listed in the SEA Directive, to group large environmental datasets, e.g., human health, air quality, land and soils, etc. Assigned to each of these themes is at least one high-level Strategic Environmental Objective (SEO) that specifies a desired direction for change (e.g., protect, restore and enhance water quality) against which the future impacts of the draft Strategy can be measured. These high-level SEOs are then paired with specific assessment criteria.

The environmental assessment includes a combination of qualitative and quantitative assessment and expert judgement. It also uses GIS to support the assessment including the use of sensitivity mapping and constraints, and opportunities mapping. It is noted that the draft Strategy does not include specific spatial policies and this has influenced the nature of the assessment which can be undertaken.

3.3.2 SEA Environmental Report

This Environmental Report complies with the requirements of the Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive) as implemented in Ireland through the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. No. 435/2004), as amended. Based on the legislation and guidance, the Environmental Report must include the information outlined in **Table 3-3**.

Table 3-3: Requirements of the SEA Directive and Relevant Section in the Environmental Report

Requirement of SEA Directive (Article 5(1) Annex I)	Chapter of Environmental Report
An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes.	Chapter 2: Background and Content of the draft Strategy Chapter 4: Review of Relevant Plans, Policies and Programmes
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme.	Chapter 5: Relevant Aspects of the Current State of the Environment (Baseline)
The environmental characteristics of areas likely to be significantly affected.	Chapter 5: Relevant Aspects of the Current State of the Environment (Baseline)
Any existing environmental problems which are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to the Birds Directive or the Habitats Directive.	Chapter 5: Relevant Aspects of the Current State of the Environment (Baseline)
The environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation.	Chapter 4: Review of Relevant Plans, Policies and Programmes
The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Chapter 8: Assessment of Preferred Scenario
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme, or modification to a plan or programme.	Chapter 9: Mitigation and Monitoring
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Chapter 7: Consideration of Alternatives
A description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme.	Chapter 9: Mitigation and Monitoring
A non-technical summary of the information provided under the above headings.	Non-technical Summary

3.3.3 Links between the SEA and AA Process

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) obliges member states to designate Special Areas of Conservation (SACs) to protect and conserve habitats and species of importance in a European Union context. Article 6 is one of the most important articles of the Habitats Directive in determining the relationship between conservation and site use.

Article 6(3) requires that 'any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to Appropriate Assessment (AA) of its implications for the site in view of the site's conservation objectives.'

The Habitats Directive has been transposed into Irish law by the Planning and Development Act 2000, as amended and the European Communities (Birds and Natural Habitats) Regulations 2011, as amended. In the context of the draft Strategy, the governing legislation is principally Regulation 27 of the Birds and Natural Habitats Regulations 2011, which sets out the general duties of public authorities in relation to the nature directive and nature conservation. Public authorities are obliged, when exercising their functions, to take appropriate steps to avoid the deterioration of natural habitats and the habitats of species in European Sites, as well as disturbance of species for which a site has been designated insofar as this disturbance could be significant in relation to the objectives of the Habitats Directive.

The draft Strategy is not directly connected with or necessary to the management of a European site for nature conservation. As a modification to a plan of national scale, it has the potential for likely significant effects on Special Areas of Conservation (SAC) and Special Protection Areas (SPA). In acknowledgement of this, early consideration has been given to the need for AA and a report in support of AA screening has been prepared. It concluded that, given the strategic nature of the draft National Bioresources Strategy and in light of a number of uncertainties relating to the implementation of the draft Strategy going forward, there is potential for likely significant effects on one or more European sites, in view of the site's conservation objectives in the absence of mitigation. As such full AA is required for the draft Strategy and a Natura Impact Statement (NIS) has been prepared. An NIS has been prepared in parallel with the SEA Environmental Report and draft Strategy and is available under separate cover.

Assessment and analyses in the NIS have been used to guide the development of the alternatives considered as part of the SEA. The NIS has also fed directly into the assessment of biodiversity, flora, and fauna in this SEA Report.

Other aspects of the Habitats Directive, in addition to Art. 6(3) and 6(4), in relation to the conservation, protection and management of (European) sites are also noted including Art. 6(1) and Art. 6(2). The EU considers the role of these supporting sub-articles in Art. 6 as: *Article 6(1) makes provision for the establishment of the necessary conservation measures and is focused on positive and proactive interventions. Article 6(2) makes provision for avoidance of habitat deterioration and significant species disturbance. Its emphasis is therefore preventive.*[2]

Article 10 of the Habitats Directive refers to features of the landscape outside designated sites which are of major importance for wild flora and fauna. It is noted that the requirements of Article 10 of the Habitats Directive are not specifically considered under the AA (except in so far as they support a qualifying feature) but it is noted such features have been considered in the SEA under the broader heading of Biodiversity, Flora and Fauna.

Article 12 of the Habitats Directive refers to protection of species listed in Annex IV. This requires measures to establish a system of strict protection in their natural range. The requirements of Article 12 are not specifically considered under the AA (except in so far as they support a qualifying feature) but it is noted such features have been considered in the SEA under the broader heading of Biodiversity, Flora and Fauna. In addition, there are objectives under other related directives, such as the Water Framework Directive, which are of relevance.

3.3.4 Difficulties Encountered

The following difficulties were encountered during the preparation of the assessment:

- Lack of scientific evidence on the effects of emerging pollutants available for the Irish context;
- Lack of available evidence in support of effectiveness of measures to date as limited monitoring was completed during the previous cycle;
- Lack of publicly available mapped resource for landspreading locations/sites;

[2] European Commission (2019) Managing Natura 2000 Sites: the provisions of Article 6 of the Habitats Directive 92/43/EC.

- Oversight and regulation of landspreading by third parties is outside the remit of UÉ. It is addressed through nutrient management planning which is overseen by Local authorities and DAFM in an agricultural context.
- As several of the commitments are not specific, measurable or timebound they are difficult to assess and will be challenging to review for further cycles.;
- Limited quantitative assessment was possible due to the very strategic level of the measures proposed; and
- Not all of the proposed monitoring measures are currently being gathered and reported on at a national level. They may therefore require additional resources from UÉ if they are to be implemented.

3.3.5 SEA Statement

The main purpose of the SEA Statement is to provide information on the decision-making process and to document how environmental considerations, i.e. the views of consultees and the recommendations of the Environmental Report, have been taken into account in the draft Strategy. The SEA Statement illustrates how decisions were taken, making the process more transparent. The SEA Statement for the final Strategy will be compiled after the statutory consultation on the draft Strategy and Environmental Report has been completed.

4 RELEVANT PLANS AND PROGRAMMES

4.1 Introduction

As documented in the SEA Directive, the purpose of SEA is 'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations in the preparation and adoption of plans and programmes with a view to promoting sustainable development'. Therefore, it is imperative that environmental considerations are documented and taken into account in the development of the draft Strategy. In order to do this, the environmental protection objectives from key plans, programmes and policy must be first identified and then explored in relation to the draft Strategy. The emphasis in this section is on relevant plans and policies relating to the draft Strategy including agriculture, water quality, air emissions, biodiversity, land use and climate. Plans and policies from other keys sectors and topics are also discussed.

The SEA Directive also states in Article 5(1) of Annex 1, that the environmental assessment must identify 'the environmental protection objectives, established at International, European Union or national level, which are relevant to the plan or programme, or modification to the plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation'. Since the draft Strategy is a review of the current National Wastewater Sludge Management Plan, all the plans and programmes that are related to the draft Strategy will be considered in this section.

This chapter follows on from the overview of the draft Strategy provided in **Chapter 2**. The purpose of this chapter is to set out how the draft Strategy, as a modification to the current Draft National Bioresources Plan interacts with other key relevant plans and programmes and their environmental protection objectives. This chapter is not intended to represent a comprehensive list of all legislation of plans/programmes/policies, but rather a collation of the most relevant agriculture related plans and programmes as well as key environmental references.

4.2 Methodology

During the SEA scoping stage, key plans and programmes were identified and this chapter seeks to consider the objectives/measures within such plans/ programmes which will directly drive and influence or be influenced by the draft Strategy during its development. As the draft Strategy is a modification to a national strategic plan, this review has focused on relevant regional, national, European and international plans and frameworks. Such plans and programmes have been explored under specific topic headings addressing sectors such as agriculture, climate change, air quality, water, waste and nature conservation.

In order to set a framework for exploring the relationship between the draft Strategy and key plans/programmes the following two questions were borne in mind:

- Does the draft Strategy contribute to the fulfilment of environmental protection objectives set in other key plans/programmes? and
- To what degree are the environmental protection objectives/measures set in these other key plans/programmes impacted by the draft Strategy?

In addition, this chapter seeks to take on board comments made on plans/programmes during the SEA scoping stage.

4.3 Sustainable Development

Since 2015, Ireland has been a signatory to the **United Nations Sustainable Development Goals (SDGs)**, which frame national agendas and policies to 2030 (see **Figure 4-1**)**.** The SDGs build on the UN Millennium Development Goals and have a broader agenda that applies to all counties. These goals are mirrored through EU strategies such as Europe 2020 and the **European Regional Development Fund (ERDF)** which emphasise smart, sustainable and inclusive growth. The **EC LIFE Programme (2021-2027)** will succeed **Horizon 2020,** and the European Commission (EC) has indicated it will be the only European funding programme exclusively aimed at the areas of environment, energy and climate. The key priorities will be to halt biodiversity loss, protection and improvement of the environment and enabling the transition to a circular economy.

Sustainability is at the heart of long-term agriculture and river basin management therefore it is important that the SDGs are integrated into Irish policy. To this end there is alignment between the UN SDGs and the

goals of the strategy and the draft Strategy, such as resilient and sustainable agricultural practices, clean water and water management, climate action, responsible consumption and production, as well as education and health.

Figure 4-1:United Nations Sustainable Development Goals (Source: United Nations)

The 2030 Agenda for Sustainable Development encourages countries to develop national responses to the Sustainable Development Goals (SDGs) and incorporate them into planning and policy. Of particular relevance to the draft Strategy are Goal 3, Goal 6, Goal 9, Goal 12, Goal 13 and Goal 15:

Goal 3, Good Health and Well-Being states: *Ensure healthy lives and promote well-being for all at all ages:*

- *3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination*

Goal 6, Clean Water and Sanitation states: *Ensure availability and sustainable management of water and sanitation for all*:

- *6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally*

Goal 9, Industry, Innovation and Infrastructure states: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation:*

- *9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.*

Goal 12, Responsible Consumption and Production states: *Ensure sustainable consumption and production patterns:*

- *12.2 By 2030, achieve the sustainable management and efficient use of natural resources*
- *12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment*
- *12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse*

Goal 13, Climate Action states: *Take urgent action to combat climate change and its impacts:*

- *13.2 Integrate climate change measures into national policies, strategies and planning.*

Goal 15, Life on Land states: *Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss:*

- *15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.*

In October 2022, DECC published the second **SDG National Implementation Plan 2022-2024** which sets out the objectives, actions, and measures required to increase Ireland's ambition and strengthen implementation structures to achieve the Sustainable Development Goals. The SDG plan includes five strategic objectives which are directly relevant to the draft Strategy:

- Strategic Objective 1: To embed the SDG framework into the work of Government Departments to achieve greater Policy Coherence for Sustainable Development;
- Strategic Objective 2: To integrate the SDGs into Local Authority work to better support the localisation of the SDGs;
- Strategic Objective 3: Greater partnerships for the Goals;
- Strategic Objective 4: To further incorporate the principle of Leave No One Behind into Ireland's Agenda 2030 implementation and reporting mechanisms;
- Strategic Objective 5: Strong reporting mechanisms.

The **European Green Deal** is the EC strategy to make the EU more sustainable by 2050, recognising the cross-cutting nature of climate change and the need to align policies across key areas such as renewable energy, agriculture, industry, infrastructure and finance[3] if the required gains are to be realised by 2050. It has an action plan, and operates across nine policy areas, and the key areas of relevance to the draft Strategy being: clean energy supply, industry, production and consumption, large-scale infrastructure, and agriculture. Various actions have been assigned including the development of the **EU Biodiversity Strategy for 2030** and development of a **Zero Pollution Action Plan for Air, Water and Soil**. (further details in **Section 4.7.3**).

The **8th Environmental Action Programme to 2030** entered into force in 2022 to reiterate the EU's long-term vision to 2050 of living well, within planetary boundaries. It sets out priority objectives for 2030, and the conditions needed to achieve these. Building on the European Green Deal, the action programme aims to speed up the transition to a climate-neutral, resource-efficient economy, recognising that human wellbeing and prosperity depend on healthy ecosystems. It has six priority objectives:

- Achieving the 2030 greenhouse gas emission reduction target and climate neutrality by 2050;
- Enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change;
- Advancing towards a regenerative growth model, decoupling economic growth from resource use and environmental degradation, and accelerating the transition to a circular economy;
- Pursuing a zero-pollution ambition, including for air, water and soil and protecting the health and well-being of Europeans;
- Protecting, preserving and restoring biodiversity, and enhancing natural capital;

Reducing environmental and climate pressures related to production and consumption (particularly in the areas of energy, industry, buildings and infrastructure, mobility, tourism, international trade and the food system).The draft Strategy should continue to contribute to the national effort of achieving the SDGs and the priorities of the EAP in its efforts to implement a zero-pollution environment by protecting water quality from pollution by agricultural sources and to promote the use of good farming practice as well as contributing to the protection of the health and wellbeing of all Europeans.

[3] The European Green Deal and its Implications for Ireland, Oireachtas Library & Research Service 2020

4.4 Wastewater Treatment

A **Capital Investment Programme (CIP) 2020-2024** was published by Uisce Éireann. €5.35 billion was approved to invest in public water and wastewater infrastructure. Investment priorities are set out for where improvements are needed urgently, and cover drinking water quality, leakage reduction, water availability, wastewater compliance and customer service. Uisce Éireann sets out three types of priorities in the plan as follows:

- Strategic: Funding mandated to deliver commitments arising from WSSP (Water Services Strategic Plan 2015-2040) including those related to leakage; to support Government initiatives and IW connection policy and to address risk of growth constraints in GDA and Eastern Midlands.
- Tactical: Funding allocated to deliver quality and capacity investments and to deliver organisational and IT transformation.
- Operational: Funding allocated to address asset and service risk to customer; to support asset and operational priorities and to address unknown needs arising in Revenue Control 3 (RC3).

An updated **CIP 2025-2029** has since been prepared setting out Uisce Éireann's budgetary plan for capital investment in the water services network for the next 5-year period. It seeks to optimise investment decisions by prioritising the best possible outcomes, while balancing risk and compliance, deliverability and maximising value for money within the funding allocation for the 5-year period This in turn has underpinned UÉ Strategic Funding Plan 2025-2029 which was approved by Government in November 2024 and sets out an ambitious capital investment plan to make necessary improvements to water and wastewater infrastructure including new capacity to facilitate growth.

The **Water Services Strategic Plan 2050 (WSSP 2050)** is the overarching Plan in the implementation on any future strategies in line with the Water Services No. 2 Act 2013. The plan replaces the previous WSSP from 2015. This plan sets out the objectives to face the challenges being faced over the next 25 years. The four strategic objectives are as follows:

- Safe & reliable drinking water - Water quality is protected at the source and treated to a high standard before it is distributed. A key part of this is water conservation and leakage reduction to manage water resources sustainably.
- Support our customers communities & the economy – Customers' needs met through the provision of high quality, reliable water and wastewater services. This is done by prioritising customers' needs and working with all relevant bodies to safeguard water sources.
- Protect & restore our environment – work with other stakeholders to meet the environmental objectives of the Water Framework Directive. Also work with stakeholders to achieve climate resilient drainage for cities and towns.
- Sustainable services fit for the future – Transforming water services to be fit for the future will involve becoming a Net Zero Carbon water utility and maximising recovery in line with circular economy.

The draft Strategy aims to contribute towards net zero carbon and adopt circularity and therefore aligns with the WSSP 2050's strategic objective for Sustainable Services fit for the Future.

The **Recast Urban Wastewater Treatment Directive (2024/3019)** - The primary objective of this Directive is to further strengthen the treatment regulations to protect the environment from the adverse effects of discharges of urban wastewater. The Directive also covers smaller agglomerations starting at 1,000 inhabitants and provides for removal of more nutrients and new standards will be applied to micropollutants including microplastics and PFAS etc. In accordance with the 'polluter pays' principle, the new legislation will ensure that the costs of advanced treatment are predominantly borne by the responsible industry. The new Directive also aims to propel the sector towards energy and climate neutrality, enhancement of stormwater management. The relevant objective of the Directive to the draft Strategy is of increased circularity by introduction of new requirements to recover valuable components from wastewater and sewage sludge, like phosphorus for reuse in agriculture and increased reuse of treated water.

The **Sewage Sludge Directive (SSD) (Directive 86/278/EEC)** focuses on the safe management of sewage sludge to protect the environment and human health. It establishes quality standards for the treatment and use of sludge, particularly in agriculture, to prevent soil and water contamination. This directive is essential for wastewater management as it promotes the recycling of treated sludge, supporting nutrient recovery and reducing reliance on chemical fertilizers. Compliance with these standards helps mitigate the environmental impact of wastewater treatment practices. The European Commission recognised as part of the **Circular Economy Action Plan** from 2020 that the SSD had not be substantially amended since its introduction more

than 40 years previously. An evaluation of the directive was undertaken in 2023, and it was found to have continued relevance, and it is supported by stakeholders albeit it also noting that the list of contaminants which it regulates would need review, notably considering organic compounds, pathogens, pharmaceuticals, and microplastics which are present in sewage sludge. The risks which they pose when sludge is used on farmland needs to be assessed and addressed through risk management measures.

The **Water Framework Directive (2000/60/EC)** is the key instrument for the main law for water protection in Europe protecting and improving the aquatic environment. It applies to inland, transitional and coastal surface waters as well as groundwaters. As articulated by the EC, the WFD "ensures an integrated approach to water management, respecting the integrity of whole ecosystems, including by regulating individual pollutants and setting corresponding regulatory standards." Member states are required to achieve at least good status in all waters and must ensure that status does not deteriorate. Managing and treating wastewater is part of the overall objectives for protection of waters as it aims to protect and enhance water quality through effective wastewater collection, treatment, and discharge practices. The directive emphasizes the importance of integrated management of water resources, ensuring that wastewater transport systems are efficient and minimize environmental impact. By setting standards for treatment processes and encouraging sustainable practices, the directive plays a critical role in safeguarding aquatic ecosystems and public health.

The **Nitrates Directive (Directive 91/676/EEC)** aims to protect water quality in Europe by reducing nitrate pollution from agricultural sources. While it primarily focuses on agricultural practices, it also indirectly impacts wastewater sludge management. Effective treatment of wastewater sludge which is being land spread can help prevent contaminant runoff into water bodies, aligning with the directive's goals to minimize water pollution. By ensuring that wastewater sludge management activities comply with nitrates regulations, it can contribute to the overall water quality improvement in Ireland.

Ensuring consistent policy integration between the draft Strategy and the implementation of these measures which will avoid conflicts in relation to biosolids reuse. Water Quality and Services

Water Services Act 2007, as amended is pivotal in regulating and managing water services in Ireland. It establishes a framework for oversight and compliance with national and EU standards, ensuring safe and reliable water supply and wastewater treatment. The Act aims to protect water resources and the environment by setting quality standards and addressing wastewater discharge. It also safeguards public health by ensuring water services meet health requirements and supports the development and maintenance of water infrastructure to meet current and future demands.

As noted above, the **Water Services Strategic Plan 2050 (WSSP 2050)** is the overarching Plan in the implementation on any future strategies in line with the Water Services No. 2 Act 2013. The plan replaces the previous WSSP from 2015. This plan sets out the objectives to address the challenges being faced over the next 25 years. The four strategic objectives are as follows:

- Safe & reliable drinking water - Water quality is protected at the source and treated to a high standard before it is distributed. A key part of this is water conservation and leakage reduction to manage water resources sustainably.
- Support our customers communities & the economy – Customers' needs met through the provision of high quality, reliable water and wastewater services. This is done by prioritising customers' needs and working with all relevant bodies to safeguard water sources.
- Protect & restore our environment – work with other stakeholders to meet the environmental objectives of the Water Framework Directive. Also work with stakeholders to achieve climate resilient drainage for cities and towns.
- Sustainable services fit for the future – Transforming water services to be fit for the future will involve becoming a Net Zero Carbon water utility and maximising recovery in line with circular economy.

The draft Strategy aims to contribute towards net zero carbon and adopt circularity and therefore aligns with the WSSP 2050's strategic objective for Sustainable Services fit for the Future. Section 3 of the draft Strategy presents the following **Figure 4-2** showing range of Tier 2 and 3 plans/programmes and strategies and where draft Strategy sits in the hierarchy.

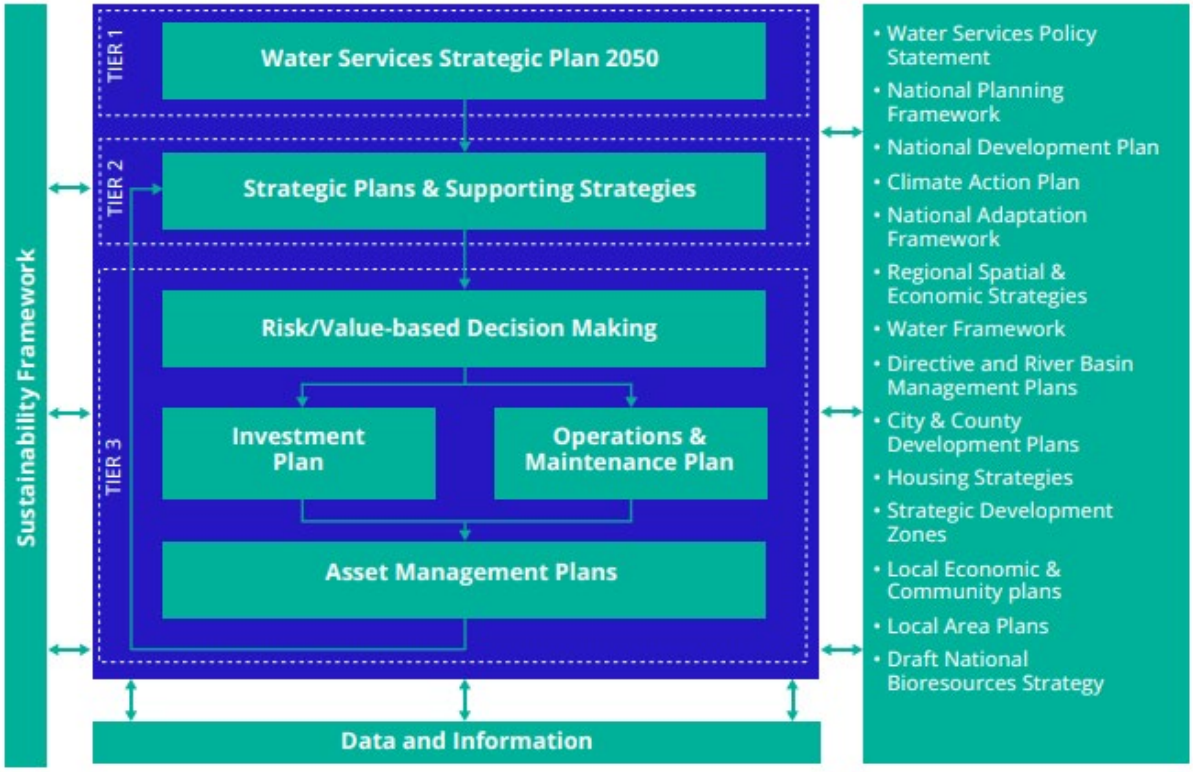


Figure 4-2: Relationship between Tier 1 WSSP and Tier 2 Plans and Strategies *(Source: Draft NBioS)*

The **Water Services Policy Statement 2024-2030** sets out the Irish government's vision for the delivery of water and wastewater services. In relation to wastewater, it focuses on ensuring proper wastewater treatment infrastructure, supporting compliance with environmental standards, and managing resources efficiently to protect public health and the environment. The draft Strategy aligns with the objective of this policy statement as it outlines various methods/technologies for wastewater treatment and associated feasibility to help produce environmentally safe biosolids along with increasing circularity and efficiency within the WWTPs across Ireland.

The **Water Framework Directive** (see also Section 4.4 above) objectives are achieved through the adoption and implementation of River Basin Management Plans (RBMP) and Programmes of Measures (PoM) as outlined under Article 13 of the WFD. Member States are required to achieve at least good status in all waters and must ensure that status does not deteriorate, with a requirement for water quality management to be centred on river basin districts (RBDs). Ireland's 3rd cycle **River Basin Management Plan** (3rd RBMP), **Water Action Plan 2024** was published in September 2024[4] covering the period of 2022-2027. This RBMP, amongst other requirements, set out the environmental improvements to be delivered during a river basin planning cycle with a focus on 'the right measure, in the right place'. The plan also contains actions in relation to urban wastewater treatment and infrastructure development that are important to consider during the preparation of the draft Strategy to avoid any conflicts and ensure stronger alignment for improved wastewater treatment across various WWTPs and maintaining healthy aquatic ecosystems.

The Department of Agriculture, Environment and Rural Affairs (DAERA) is responsible in Northern Ireland for producing the **Nutrients Action Programme Regulations** and the River Basin Management Plan in that jurisdiction. Northern Ireland currently has a **Nutrients Action Programme** for the period 2019-2022. The regulations replaced the **Nutrients Action Plan and Phosphorus Regulations 2015-2018**. The NAP Regulations and the Phosphorus Regulations apply to all agriculture land in Northern Ireland.

There are three international river basin districts - Neagh Bann, Northeastern and Northwestern - for which plans have been developed (the portions in Northern Ireland only). The **Neagh Bann River Management Plan** and the **Northwestern River Management Plan** have international borders with the Republic of Ireland. It is outlined that in the plans that the responsible bodies in Northern Ireland and Republic of Ireland

[4] DHLGH (2024). Water Action Plan 2024: A River Basin Management Plan for Ireland. Available at: https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/

are coordinating their water management actions through a North-South Working Group on Water Quality. In Northern Ireland, the **Water (Amendment) (Northern Ireland) (EU Exit) Regulations 2019** ensures that the Water Framework Directive (as transposed) and the various supporting pieces of water legislation continue to operate after 1 January 2021. The draft Strategy should consider any potential for transboundary effects in shared waters of Lough Foyle and Lough Carlingford from agricultural practices, including the agricultural reuse of biosolids

The **EU Groundwater Directive (2006/118/EC)** seeks to maintain and enhance the quality of all groundwaters in the EU. The **Environmental Objectives (Groundwater) Regulations 2010** (S.I. No. 9/2010), as amended gives effect to the directive. These establish environmental objectives to be achieved in groundwater bodies and include groundwater quality standards and threshold values for the classification of groundwater and the protection of groundwater against pollution and deterioration in groundwater quality. The draft Strategy recognises the challenge regarding increasing concerns and associated uncertainties for contaminants in biosolids. The protection of potable groundwater resources requires continued attention as there is a potential for leaching followed by vertical migration of such contaminants and nutrients from lands where biosolids are applied over time.

Similarly, for marine waters, the **Marine Strategy Framework Directive (MSFD, 2008/56/EC)** has adopted an ecosystem-based approach to protect and manage the marine environment. Ireland developed an MSFD Programme of Measures that aims to meet the targets set in order to achieve or maintain Good Environmental Status (GES). Following this, in line with the **Maritime Spatial Planning Directive (2014/89/EU)**, Ireland published a **National Marine Planning Framework (NMPF)** in May 2021 that aims to support the achievement of GES by setting out a framework for the sustainable development of sectoral activities within Irish waters. One of the issues highlighted in the framework was related to introduction of marine microplastic, particularly in the form of microbeads that enter the marine environment via wastewater discharges or land spreading of sludge/biosolids. This could be of concern, particularly in the southeastern region which has a large number of surface waterbodies draining into the marine ecosystem. Therefore, the draft Strategy should consider any potential of marine pollution from agricultural practices, including the agricultural reuse of biosolids. Ensuring consistent policy integration between the draft Strategy and the implementation of these measures will avoid conflicts in relation to biosolids reuse. .

The **Drinking Water Directive** (Directive 98/83/EC, revised in 2020) ensures the provision of clean, safe drinking water across the EU by setting strict quality standards. Its relevance to draft Strategy lies in the protection of water resources from contamination, which can be significantly affected by the handling and disposal of sludge, if done improperly. Effective sludge management practices are essential for minimising the risk of pollutants entering water bodies, thus ensuring available safe drinking water. Furthermore, the relevance to sludge management is underpinned by the requirements set out in the Drinking Water Directive, which outlines and highlights the need for effective practices to prevent the contamination of water sources. The directive also encourages integrated water management, linking the management of wastewater systems to the safeguarding of drinking water sources, which UÉ addresses through the source protection element of the Drinking Water Safety Plan.

This directive relates to the draft Strategy be ensuring the sustainable management of water resources, which are critical for supporting biodiversity and human health. More specifically, effective sludge management practices are essential to prevent contamination of groundwater pollutants that may leach from improperly managed sludge. Through the process of safeguarding groundwater quality, the directive supports the ecosystems that provide essential services for agriculture, renewable energy production and water quality. As a result, this directive has two functions: it protects groundwater resources but also has capacity to align with the Draft Strategy to promote sustainable resources use and recovery.

The draft Strategy should consider any potential for pollution from agricultural practices, including the agricultural reuse of biosolids. Ensuring consistent policy integration between the draft Strategy and the implementation of these measures will avoid conflicts in relation to biosolids reuse.

4.5 Agri Sector

Internationally, the argi-food policy is set by the **Food and Agriculture Organization** (FAO) of the United Nations who published a **Strategic Framework 2022-2031** in July 2021. This Strategic Framework seeks to support the 2030 Agenda through the transformation to more efficient, inclusive, resilient and sustainable agri-food systems based on the following:

- Better production - Ensure sustainable consumption and production patterns, through efficient and inclusive food and agriculture supply chains at local, regional and global level, ensuring resilient and sustainable agri-food systems in a changing climate and environment.

- Better nutrition - End hunger, achieve food security and improved nutrition in all its forms, including promoting nutritious food and increasing access to healthy diets.
- Better environment - Protect, restore and promote sustainable use of terrestrial and marine ecosystems and combat climate change (reduce, reuse, recycle, residual management) through more efficient, inclusive, resilient and sustainable agri-food systems.
- Better life - Promote inclusive economic growth by reducing inequalities (urban/rural areas, rich/poor countries, men/women).

The four betters represent an organising principle for how FAO intends to contribute directly to SDG 1 (no poverty), SDG 2 (zero hunger), and SDG 10 (reduced inequalities) as well as to supporting achievement of the broader SDG agenda, which is crucial for attaining FAO's overall vision. Effective sludge management ensures that these materials do not impact the environment negatively. Sludge management supports the achievement of climate resilience in agri – food systems in line with the 2030 agenda.

Within the EU, the **Common Agricultural Policy** (CAP) was first launched in 1962 as a partnership between agriculture and society. and the CAP aims to:

- Support farmers and improve agricultural productivity, ensuring a stable supply of affordable food;
- Safeguard European Union farmers to make a reasonable living;
- Help tackle climate change and the sustainable management of natural resources;
- Maintain rural areas and landscapes across the EU; and
- Keep the rural economy alive by promoting jobs in farming, agri-food industries and associated sectors.

By encouraging the use of organic fertilisers, such as treated sludge, the CAP supports nutrient cycling and soil regeneration, which are essential for sustainable farming. This integration of a circular economy in agriculture, fosters an understanding of the overarching goals of the CAP to achieve resilience in the sector.

In 2021, the EC launched the post-2020 reform for the CAP 2023-2027 to incorporate the sustainable ambitions of the European Green Deal, particularly the Farm to Fork strategy and biodiversity strategies into the CAP. The CAP 2023-2027 entered into force in January 2023 that follows a performance- and results-based approach and focuses on ten objectives (see **Figure 4-3**) setting out what the policy is intended to achieve for farmers, citizens and climate. This reform is key in aligning ambitions under the draft Strategy with Ireland's agriculture policy. It is noted that three out of ten specific objectives directly concern the environment and climate – covering climate change, management of natural resources and biodiversity. Under CAP, Member States are required to draft a national strategic plan describing the use of CAP instruments based on the country's current conditions and needs.

Figure 4-3: Nine Objectives of CAP 2023-2027 (source: European Commission)

Ireland's CAP Strategic Plan (CSP) 2023-2027 was first published in September 2020. It was then amended in response to EC's observations and resubmitted to the EC in 2022. The CSP 2023-2027 has three key objectives:

- Protect farm family incomes;
- Recognise the hard work of the farm families as food producers regardless of where they are in the country; and
- Play a meaningful role in supporting our climate ambitions.

The sector is under growing pressure to enhance its environmental sustainability to comply with national and EU obligations, as well as to meet market and consumer demands.

Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (the **Nitrates Directive, 91/676/EEC**) was adopted on 12 December 1991. It aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. The Nitrates Directive forms an integral part of the Water Framework Directive and is one of the key instruments in the protection of waters against agricultural pressures.

Under the Nitrates Directive, Ireland is obliged to prepare national cyclical **Nitrates Action Programmes (NAP)** to protect water quality from pollution by agricultural sources and to promote good farming practice. The latest cycle relates to the 6th NAP which builds on the suite of measures introduced in the 5th Programme, as well as introducing a mix of new regulatory and non-regulatory measures. Ireland's Nitrates Action Programme is given effect by the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2026. The regulations contain specific measures to protect surface waters and groundwater from nutrient pollution arising from agricultural sources. The NAP is applied on a country-wide basis in Ireland, thus ensuring 100% territorial coverage compared to an EU average of 45% territorial coverage. In addition, the programme also provides for the control of phosphorus used in agriculture.

The **Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998** (S.I. No. 148/1998) established the rules for the safe and regulated use of treated sewage sludge in agriculture in Ireland, in line with **EU Directive 86/278/EEC**. These regulations aim to protect human health, the environment, and soil quality by managing risks associated with heavy metals, pathogens, and improper application.

The key provisions of these regulations are as follows:

- Treatment Requirements: Sewage sludge must be treated to reduce health risks before use. Untreated sludge is allowed only if directly incorporated into the soil.
- Prohibited Applications: Sludge cannot be applied to:
  - Grasslands or forage crops within three weeks of grazing or harvest.
  - Fruit and vegetable crops during growth, except fruit trees.
  - Soils used for root crops eaten raw for at least ten months before harvest.
- Heavy Metal Limits: The regulations set maximum permissible concentrations of heavy metals in both sludge and soil, along with annual loading limits to prevent soil contamination.
- Monitoring and Record-Keeping: Producers and users of sludge must test and monitor sludge and soil regularly. Local authorities must maintain detailed records of sludge quantities, properties, and application sites.

These regulations promote the beneficial use of sewage sludge in agriculture while ensuring environmental and public safety.

The **Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations, 2001** (S.I. No. 267/2001) introduced specific amendments to the original 1998 regulations (S.I. No. 148/1998) governing the use of sewage sludge in agriculture in Ireland. The key differences were as follows:

- Introduction of Nutrient Management Plans: The 2001 amendment mandates that the application of sewage sludge in agriculture must be conducted in accordance with a nutrient management plan. This plan is designed to ensure that nutrient inputs from sludge are balanced with crop requirements, thereby preventing nutrient overloading and potential environmental harm;
- Modification of Sludge Application Limits: The original 1998 regulations imposed a general limit of two tonnes of dry matter per hectare per year for sludge application. The 2001 amendment replaces this with specific limits based on the absolute quantities of certain heavy metals that can be introduced into the soil per hectare annually. This change aims to provide a more precise control over potential soil contamination by focusing on the actual amounts of heavy metals added; and
- Enhanced Record-Keeping Requirements: The amendment expands the technical parameters that must be recorded in the sludge register. This includes detailed information on the characteristics of the sludge, treatment processes, application rates, and monitoring data. These enhanced record-keeping requirements are intended to improve traceability and oversight of sludge use in agriculture.

In summary, the 2001 amendment refines the original 1998 regulations by implementing nutrient management plans, adjusting application limits to focus on heavy metal inputs, and strengthening record-keeping protocols to ensure safer and more environmentally sound practices in the use of sewage sludge in agriculture.

In accordance with the European Communities (Good Agricultural Practice for Protection of Waters) Regulations and the Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations the Code of Practice for the Use of Biosolids in Agriculture was developed.

The **Code of Good Practice for the Use of Biosolids in Agriculture** provides guidelines for the safe and effective application of treated sewage sludge (biosolids) to farmland. It aims to protect soil, water, and public health by ensuring that biosolids meet specific quality standards. This code is directly related to the draft Strategy as it supports the sustainable recycling of organic waste, aligning with national policies on waste management and nutrient recovery.

Ensuring consistent policy integration between the draft Strategy and the implementation of these measures will avoid conflicts with population and human health in relation to biosolids reuse.

4.6 Other Relevant Policy Areas

4.6.1 Land Use Planning

Project Ireland 2040 is the government's long-term strategy for sustainable development in Ireland to 2040. It is comprised of the **National Planning Framework (NPF)** and the **National Development Plan (NDP) 2018-2027**. It sets out a high-level vision to shape the future growth and development of Ireland to 2040 and

expressed as ten National Strategic Outcomes (NSOs) a shared set of national goals and benefits that the plan can deliver if implemented according to the identified National Policy Objectives (NPOs). The First Revision to the NPF, published in 2025 sets the tone for alignment of planned growth and development of water services infrastructure.

The NDP outlines the investment priorities which underpin the NPF, which includes for investment in rural economies and communities. The NPF, together with the NDP, sets the context for each of Ireland's three regional assemblies to develop the three **Regional Spatial and Economic Strategies** for the Eastern & Midlands Region, Southern Region, and Northern & Western Region, taking account of and co-ordinating local authority City and County Development Plans in a manner that will ensure national, regional and local plans align.

Ensuring consistent policy integration between the draft Strategy process and national, regional and local planning is of relevance for the draft Strategy to avoid conflicts in relation to land use in particular.

4.6.2 Population and Human Health

The latest **2024 analysis** of Understanding Life in Ireland: The Well-being Framework 2024[5] showed that of the four sustainability indicators, Ireland performed negatively for three indicators: water quality, waste and environmental pollution while performed slightly positively for greenhouse gas emissions.

Specifically in relation to nitrates, health research has determined that nitrate levels in drinking water exceeding 100mg/l have been demonstrated to cause meta-haemoglobin, (blue blood syndrome) in very young children (around one-year-old). To add a safety factor similar to the previous Directive (98/83/EC), the recast **Drinking Water Directive (2020/2184)** set that nitrate levels in drinking water at half of the above observed levels (i.e. 50mg/l nitrate).

The EPA has also adopted the World Health Organisation (WHO) approach to **Drinking Water Safety Plans (DWSP),** which is a risk management system designed to identify potential risks to a water supply, as well as those areas in need of remedial action. The responsibility to devising DWSP lies with the national water supplier, i.e. Uisce Éireann, and the technical work is now underway to develop the risk assessments. This will lower the risks to drinking water sources from pollutants and microbial contaminants in both public and private water sources. DAFM and the National Federation of Group Water Schemes (NFGWS) are also developing a source protection strategy to help protect water quality, biodiversity enhancement and climate action.

Ensuring consistent policy integration between the draft Strategy and the implementation of these measures which support Ireland's commitments for the protection of human health and the environment will avoid conflicts with population and human health in relation to biosolids reuse.

4.6.3 Biodiversity and Nature Conservation

Ireland is a party to the **UN Convention on Biological Diversity** and is therefore committed to measures to conserve biodiversity. The measures include conservation of ecosystems, habitats and species in their natural surroundings both inside and outside protected areas, conservation of the components of biological diversity outside their natural habitats and impact assessment.

The **EU Biodiversity Strategy to 2020** aimed to halt the loss of biodiversity and the degradation of ecosystems in the European Union (EU) by 2020. The new **Biodiversity Strategy to 2030** aims to put Europe's biodiversity on the path to recovery by 2030 for the benefit of people, climate and the planet. In the context of the post-COVID-19 pandemic, it aims to build resilience to future threats, including climate change, security of food supplies, forest fires, outbreaks of disease and combating the illegal trade in wildlife and also increase the Natura 2000 network. EC also launched the EU Nature Restoration Law in August 2024[6] that sets binding targets to restore degraded ecosystems across EU's land and sea regions.

[5] Department of the Taoiseach (2024). Understanding Life in Ireland: The Well-being Framework 2024 Analysis. Available at: https://www.gov.ie/en/publication/ce1ff-understanding-life-in-ireland-2024-analysis/ Accessed: February 2026

[6] European Commission, Official Journal of the European Union: EU Nature Restoration Law (2024). Available at: https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en Accessed: February 2026

The **EU Habitats Directive (92/43/EC)** and the **EU Birds Directive (2009/147/EC)** are transposed into Irish law principally through the **Birds and Natural Habitats Regulations 2011, as amended**. Article 6 of the Habitats Directive requires that any plan or project, be screened for Appropriate Assessment to determine if it, alone or in combination with other plans and projects, is likely to have a significant effect on a European Site. A screening for Appropriate Assessment has been undertaken in parallel to development of the draft Strategy and it was concluded that a Stage 2 Appropriate Assessment was required due to the potential for impacts arising from the draft Strategy. Further detail can be found in the Natura Impact Statement (NIS) which accompanies this SEA Environmental Report and the draft Strategy.

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. At a national level, protection and conservation is outlined in the **National Biodiversity Plan**. Ireland's fourth **National Biodiversity Action Plan 2023-2030** aims to address issues and halt the loss of biodiversity, in line with international commitments under the UN Convention on Biological Diversity (CBD), which Ireland ratified. The overall aim for Ireland's BAP is "to deliver the transformative changes required to the ways in which we value and protect nature".

The **EU Nature Restoration Law** that entered into force in August 2024, aims to address the severe decline in biodiversity across the EU and to return ecosystems to good conservation condition. The rules set a binding target at EU-level where member states will have to enact restoration measures that cover at least 20% of land and sea areas of the EU by 2030. For those ecosystems that require restoration, measures must be put in place by 2050. This law was recently adopted at EU level and will require Member States to prepare plans over the next 2 years. The National Restoration Plan will identify the restoration measures that are necessary to meet the targets and obligations of the law.

The main objective of **EC Zero Pollution Action Plan for Water, Air and Soil** from 2021 is to provide a compass for including pollution prevention in all relevant EU policies, maximising synergies in an effective and proportionate way, stepping up implementation and identifying possible gaps or trade-offs. To steer the EU towards the 2050 vision of a "Healthy Planet for All", this action plan sets key 2030 targets to speed up pollution reduction. It also sets out key actions for 2021-2024 to complement the many relevant actions in other European Green Deal initiatives, including the **Chemicals Strategy for Sustainability**. This action plan therefore sets out a broad sustainability and environmental action agenda for Europe across key areas, which recognises the 'triple planetary threat' of climate change, pollution and biodiversity loss. This is directly relevant to the draft National Bioresources Strategy.

The draft Strategy should continue to contribute to the protection of biodiversity and the wider environment by continuing to tackle resource efficiency through policies that focus on circularity of nutrients and resource management. It is to be acknowledged that the draft Strategy commits to comply with the obligations under the Birds and Natural Habitats Regulations 2011, as amended whilst carrying out bioresources management activities. Ensuring consistent policy integration between the draft Strategy and the implementation of these measures which support Ireland's commitments for the protection of biodiversity will avoid conflicts with biodiversity in relation to biosolids reuse.

4.6.4 Land and Soils

Under the EU biodiversity strategy for 2030, the EU Commission have developed a soil strategy with the aim of having all EU soil ecosystems in a healthy condition by 2050 (currently the Commission estimate 60% of soils are in an unhealthy state). The **EU Soil Strategy for 2030** sets out a framework and concrete measures to protect and restore soils and ensure that they are used sustainably. It sets a vision and objectives to achieve healthy soils by 2050, with concrete actions by 2030. To achieve this objective, the Commission has published the **Soil Monitoring and Resilience Directive (2025/2360)**, laying down measures for monitoring and assessing soil health. One of the aims of the EU's **Soil Strategy for 2030** is to 'close the nutrient and carbon circle'. It is recognised in this strategy and the **Pathway to a Healthy Planet for All, EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' (2021)** that recycling organic matter including sewage sludge should be carried out safely and sustainably to prevent any soil pollution. This will also be supported by the revaluation of **Sewage Sludge Directive** and adoption of an Integrated Nutrient Management Action by the Commission to allow for a safer use of nutrients on soil.

Peatlands play an important role in helping to protect and restore the natural environment including specifically water quality and biodiversity. The **National Peatlands Strategy 2015-2025** is the key national plan responsible for the management and conservation of peatlands. It seeks to protect peatland habitat in designated sites, restore where feasible active raised bog and establish the national approach to peatland conservation and exploitation while avoiding further losses of high conservation value peatlands. Water

quality objectives and requirements under the WFD and the protection of fauna and flora under the Habitats directive and the Wildlife Acts are also addressed.

A mid–term review and implementation plan has been published on the National Peatlands Strategy[7] that assessed which actions could be closed, which actions needed only be monitored, and which actions required a combination of both. The Implementation Plan focuses on refining outstanding actions and prioritising measurable, achievable objectives.

In addition to this strategy, NPWS have published the **National Raised Bog Special Areas of Conservation (SAC) Management Plan 2017-2022** which includes the objective to conserve and manage the 53 raised bog SAC sites in Ireland. The overall objective is: *To restore the favourable conservation status of active raised bogs in Ireland*.

Bord na Móna launched its first **Biodiversity Action Plan** in 2010 to frame its policy objectives in the context of biodiversity management of peatlands, bog restoration as well as conservation. Bord na Móna's **Peatland Restoration Plan** involves an investment of €115 million to harness the natural power of peatlands. The plan intends to secure a store of over 100m tonnes of carbon and capture millions of tonnes more in the coming years. Bord na Móna has now ceased harvesting of peat commercially and has completed its Brown **to Green Strategy** to shift from non-renewable energy to renewable energy and resource recovery. The strategy, driven by climate change and decarbonisation initiatives, has resulted in a cessation of peat harvesting in 2020 and a shift toward bog rehabilitation in the medium to long term. While decarbonation is at the centre of the strategy it will have implications for water quality in the longer term. Bord na Móna's **Biodiversity Action Plan 2023-2030** builds on the foundations of the 2010-2015 and 2016-2021 objectives and actions and reframes the current landscape of peatland management, restoration and conservation for the optimisation of biodiversity.

These plans and programmes are an important consideration in the context of the draft Strategy as the protection and restoration of soils is a key consideration as to date, there has never been a specific legal framework for their protection either at European or at national level, aside from project-level considerations in EIA and similar assessments. The draft Strategy shall have regards to the objectives of these plans throughout its evolution in order to avoid conflicts for use of land and soils in relation to biosolids reuse.

4.6.5 Air Quality

There are a number of EU Directives on air quality in place that set standards for a wide variety of pollutants. Additionally, Ireland is a Party to the **Convention on Long Range Transboundary Air Pollution (CLRTAP)** under which certain transboundary air pollutants (including ammonia) are controlled. For EU Member States, implementation of the **Gothenburg Protocol** (a daughter protocol of the CLRTAP) is achieved through limits set out in the **National Emissions Ceilings Directive 2016/2284 (NECD)**. A key component of the NECD is more ambitious and protective national emission ceilings for key pollutants. The NEC Directive sets new national targets for 2020 and 2030 for five air pollutants – particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3) and volatile organic compounds (VOCs). The aim of the Directive is to cut the negative impacts of air pollution on human health by almost half by 2030. Reducing levels of illness, including respiratory and cardiovascular diseases and premature death is the main priority.

In 2021, DAFM published a **Code of Good Agricultural Practice for reducing Ammonia Emissions from Agriculture**[8], with a view to increasing the awareness of the options open to farmers. In September 2020 Teagasc published an Ammonia Marginal Abatement Cost Curve which sets out 13 measures for potential implementation at farm level to address compliance of agriculture with the NECD ceilings. While each of the measures deliver a contribution to the reduction of NH_3 emissions from Irish agriculture, increasing the proportion of slurry applied using low emission spreading systems (LESS) can reduce ammonia emissions by up to 60% over current application methods (splash plate). The use of LESS for applying 90% of all slurry from Irish bovines can deliver a potential abatement in 2030 of 11.69 Kt of NH_3 emissions. The uptake of these technologies is currently being supported through DAFM's **Targeted Agricultural Modernisation Schemes (TAMS)** and **Agri-Climate Rural Environment Scheme (ACRES)**.

[7] DHLGH (2023). National Peatlands Strategy Mid–Term Review and Implementation Plan. Available at: https://www.npws.ie/peatlands-and-turf-cutting/peatlands-council/national-peatlands-strategy

[8] Department of Agriculture, Food and the Marine (2021) Code of Good Agricultural Practice for reducing Ammonia Emissions from Agriculture https://www.gov.ie/en/publication/9a6c6-code-of-good-agricultural-practice-for-reducing-ammonia-emissions-from-agriculture/ Accessed: February 2026

In terms of local air quality, the **Ambient Air Quality and Cleaner Air for Europe (CAFÉ) Directive (2008/50/EC)** sets out the requirements for ambient air quality to protect human health and the environment as a whole; it replaced the Air Framework Directive and the First, Second and Third Daughter Directives. The CAFE Directive has been implemented in Ireland through the **Air Quality Standards Regulations 2011 (**S.I. No. 180/2011), as amended, and the Fourth Daughter Directive **(2004/107/EC)** (covering polyaromatic hydrocarbons, arsenic, nickel, cadmium and mercury in ambient air) has been transposed into Irish law via **Ambient Air Regulations 2009** (S.I. No. 58/2009), as amended. These regulations set ambient air quality limits and target values for air pollutants. The World Health Organisation (WHO) also publish **Global Air Quality Guidelines** for PM, ozone, nitrogen dioxide (NO_2) and sulphur dioxide (SO_2), with the latest revision published in 2020. The WHO guidelines contain stricter air quality limits than the EU directives.

Ireland also has a **National Ambient Air Quality Monitoring Programme 2017-2022**. Air quality in Ireland is regulated both at the local level through ambient air quality limits and at the national level through emission ceilings. Ireland's reporting under the NECD is part of the **National Air Pollution Control Programme (NAPCP)**. In April 2023, Ireland published the **Clean Air Strategy** that aims to Ireland's Clean Air Strategy focuses on continuous air quality improvement, integrating clean air considerations into all government policies, and using evidence-based actions to understand and address pollution sources. It also aims to enhance regulations and enforcement while promoting awareness and education about the importance of clean air for health and the environment.

The **Industrial Emissions Directive 2024/1785** came into effect in August 2024, amending **the Directive 2010/75/EU of the European Parliament and of the Council on Industrial Emissions** (integrated pollution prevention and control) and **Council Directive 1999/31/EC on the landfill of waste.** The Directive introduces stricter emission limits and enhances the permit system to ensure that industrial activities are carried out in an environmentally sustainable manner.

The draft Strategy should therefore ensure the implementation of resilient waste management practices continue to support Ireland's commitments in relation to national and international air quality targets.

4.6.6 Climate

A key-interdependency for the draft Strategy is how climate action may be impacted by wastewater management activities, as well as its contribution to climate action measures including recovery and resource/energy use, which includes consideration of moving to climate neutrality.

The **United Nations Intergovernmental Panel on Climate Change (IPCC)** published the sixth Assessment Report (AR6[9]) which states that:

> *It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred.*

The report shows that emissions of greenhouse gases from human activities are responsible for approximately 1.1°C of warming since 1850-1900, and finds that averaged over the next 20 years, global temperature is expected to reach or exceed 1.5°C of warming. Since 2011 (measurements reported in the fifth Assessment Report, AR5), concentrations have continued to increase in the atmosphere, reaching annual averages of 410 ppm for carbon dioxide (CO_2), 1866 ppb for methane (CH_4), and 332 ppb for nitrous oxide (N_2O) in 2019.

As a member state Ireland will have to adhere to the goals and targets set by the EU in relation to climate and energy. In line with global efforts to meet the **Paris Agreement** objective of reducing global warming with the goal of reaching net-zero emissions by 2050.

In 2011, the EC developed long-term goals through the *Roadmap for moving to a competitive low carbon economy in 2050*, which states the EU's target of reducing greenhouse gas emissions by 80-95% below 1990 levels by 2050. The **EU 20-20-20 Agreement** set the following three key targets: a 20% cut in EU GHG emissions on 1990 levels; 20% of EU energy from renewable energy sources; and a 20% improvement in energy efficiency. The **2030 EU Climate and Energy Package** continues on from the base set out in the 20-20-20 Agreement and sets new targets and measures to make the EU's economy and energy system more competitive, secure and sustainable. It outlined three key targets for the year 2030 of at least: 40% cut in GHG emissions on 1990 levels; 27% share of renewable energy; and 27% improvement in energy efficiency. A review clause by 2023 allows for a potential upward revision of the EU level target. The agreement on the

[9] IPCC AR6 Climate Change 2021: The Physical Science Basis, Link: https://www.ipcc.ch/assessment-report/ar6/

2030 framework, specifically the EU domestic GHG reduction target of at least 40%, forms the basis of the EU's contribution to global climate change.

The EC has further developed long term goals through the roadmap for moving to a competitive low carbon economy in 2050 which states the EU's goal of reducing greenhouse gas emissions by 80-95% below 1990 levels by 2050.

At national level, Ireland has committed to meeting ambitious targets for reducing greenhouse gas emissions in the short (2020), medium (2030) and longer term (2050), and the State is at a critical juncture in relation to rolling out policies and actions to achieve these ambitions. The **National Policy Position on Climate Action** sets a fundamental national objective to achieve the transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050.

The **Climate Action and Low Carbon Development Act 2015** facilitates the approval of plans for Ireland in relation to climate change to aid the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of 2050. The **Climate Action and Low Carbon Development (Amendment) Act 2021** further strengthens the governance framework on climate action, and through this Act, Ireland has:

- Set economy-wide carbon budgets and sectoral emission ceilings (SECs) for the periods 2021-25 and 2026-30;
- Established pathways to deliver the SECs, incorporating 26 $MtCO_2eq.$ in unallocated emissions savings for the second carbon budget period; and
- Defined a delivery approach through specific measures and actions to meet emissions ceilings, which are estimated to require €119 bn in capital investment between 2022-2030.

The 2021 Act places the national climate objective of achieving, by no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy, on a statutory footing. The 2021 Amendment Act also replaced the 2015 Act's requirement for a National Mitigation Plan with a requirement for the preparation of an annual update to the Climate Action Plan and to prepare, not less frequently than once every five years, a national long term climate action strategy.

CAP23 enforces the carbon budgets and sectoral emissions limits, outlining a clear path to decisively reduce Ireland's emissions by 50% by 2030 and achieve net zero by 2050, in line with the commitments made in the Programme for Government. The DECC is required to publish an update to the CAP annually. The **CAP24** building upon the measures and actions of CAP23, outlines the actions required to 2035 and beyond to achieve the ambition of halving Ireland's GHG emissions by the end of the decade and aiming for carbon neutrality by 2050.

CAP24 included 26 actions for agriculture sector focusing on measures related to:

- Reduction of chemical N use and use of low emission chemical fertiliser;
- Reduction of GHG emissions from the bovine herd; and
- Expansion of the indigenous biomethane sector through anaerobic digestion, increasing the area under tillage and increasing the level of Organic Farming.

Similarly, CAP 25 that was published in April 2025, builds upon existing strategies and continues to recognise the need for accelerated reductions in GHG emissions needed across all sectors to meet the 2030 targets.

Direct relevance is maintained between this plan and the draft Strategy as the sustainable management of sludge and promotion of circular economy initiatives in agriculture will result in reduced GHG emissions.

Ireland's integrated **National Energy and Climate Plan (NECP) – (2021 – 2030)**, published in July 2024, outlines Ireland's approach to achieving its energy and climate objectives, such as reducing greenhouse gas emissions and enhancing the use of renewable energy sources. It emphasizes improving energy efficiency in wastewater treatment and supports the recovery of energy from waste processes. By integrating wastewater management into energy strategies, the NECP fosters sustainable practices that contribute to climate action.

The draft Strategy recognises the impacts of climate change on land spreading availability and aims to demonstrate increased resilience for the wastewater sludge treatment sector and align with energy and climate neutrality policies and targets of 20% by 2030 & 70% by 2040.

The **Water Quality and Water Services Infrastructure Climate Change Sectoral Adaptation Plan (2025)**, aims to build resilience to the effects of climate change and weather-related events in the water quality and

water services sector, reduce any negative impacts where possible and take advantage of any opportunities. The plan recognises the potential impacts of projected changes in climate including those related to precipitation, temperature etc. on water/wastewater assets and environmental pollution. The draft Strategy aims to increase resilience in relation to sludge treatment processes and explore alternative outlets to agricultural lands recognising the changes in land availability due to climate change impacts such as flooding and increased storminess etc.

Ensuring consistent policy integration between the draft Strategy and the implementation of these measures which support Ireland's commitments climate action will avoid conflicts in relation to biosolids reuse.

The **Ag-Climatise** roadmap was published in December 2020 by the Department of Agriculture, Food and the Marine. It is presented as a living document which can be updated to reflect developments with regard to the Climate Action (Amendment) Act 2021 and the Climate Action Plan and future iterations of these legislative/policy documents. The document sets out a series of 29 actions to deliver a 10-15% reduction in GHG emissions by 2030. These actions are primarily based on the Teagasc Marginal Abatement Cost Curves (MACC) regarding GHG and ammonia emissions.

The roadmap focuses both on the immediate actions that the sector must take alongside the more medium to long term actions. The approach to ensuring the sector achieves its climate ambitions is three pronged and includes

- Reducing emissions;
- Enhancing the development of sustainable land management; and
- Contributing to sustainable energy.

Significant progress will be needed in all three areas if the sector is to achieve its overall objective of becoming climate neutral. The main focus of the roadmap will be on nitrogen management and reducing fertiliser nitrogen use to a maximum of 325,000 tonnes by 2030.

The **Bioeconomy Action Plan 2023-2025** sets out an approach to using the wastes and side-streams from various sectors, such as agriculture, forestry, fisheries and aquaculture. The aims are to support a circular and regenerative bioeconomy. Such a system has the potential to reduce GHG emissions and create new opportunities and diversification activities and the potential to replace fossil-fuel based resources with bio-based ones, such as the creation of bioenergy, biofertilisers, bio-packaging etc.

Similar to Climate Action Plans, policies such as **Ag-Climatise and Bioeconomy Action Plan** are of relevance to the draft Strategy in a way that draft Strategy continues to ensure that the GHG and ammonia emission from the treatment of sludge and application of sludge on land are influenced by an approach that will help achieve climate neutrality and circular bioeconomy within the sector.

Ireland's **National Biomethane Strategy** was published in January 2024 and was co-developed by the Department of Agriculture, Food and the Marine in partnership with the Department of the Environment, Climate and Communications. This strategy was developed on foot of the inclusion of a Key Performance Indicator (KPI) included in the Climate Action Plan 2023 which is to achieve 5.7 terawatt hours (TWh) of biomethane production by 2030. It outlines how it will be agri-led with a strong emphasis placed on suitable feedstocks of agricultural origins, such as slurry and grass silage. The strategy recognises the potential of biomethane to displace fossil fuel usage in hard-to-decarbonise sectors, such as those requiring high-temperature heat. The overriding ambition of this strategy is set out to:

- *"Provide an alternative energy vector and decarbonisation pathway for a variety of Ireland's most difficult to decarbonise sectors;*
- *Present a credible and sustainable diversification option for Ireland's rural economy;*
- *Harness currently underutilised land resources, in line with the Land Use Review, to enhance domestic energy production and reduce dependence on imported fossil fuels;*
- *Optimise the use of primary bioresources and valorise waste streams and by-products with the aim to optimise socio-economic and environmental value and promote the circular economy and bioeconomy."*

The draft Strategy provides an overview of the current use of Anaerobic Digestion (AD) processes for the treatment of wastewater sludge and subsequent recovery of energy from it. The draft Strategy also discusses about ongoing investment from UÉ in renewable energy generation and biogas optimisation. In this regard, the draft Strategy can contribute towards the achievement of national climate targets for biomethane production through conversion of any surplus biogas into biomethane.

4.6.7 Noise

Regulation of noise comes under the remit of the **Environmental Noise Directive (2002/49/EC)**, with the requirement for member states to produce noise maps and compile noise action plans based on those maps. It was amended by **Directive (EU) 2015/996** establishing common noise assessment methods and replacing Annex II of the 2002 END. END is transposed in Ireland through the **Environmental Noise Regulations 2018** (S.I. No. 549/2018) and its amendment S.I. No. 663/2021 - **European Communities (Environmental Noise) (Amendment) Regulations 2021**. Local authorities publish Noise Action Plans on a regular basis. Environmental noise is unwanted or harmful outdoor sound created by human activities, including noise emitted from sites of industrial activity including the categories of activities specified in Annex I to the IED. Nuisance noise is dealt with under the **Environmental Protection Agency Act 1992, as amended**.

The draft Strategy discusses UÉ's Standard Operating Procedures (SOPs) that are followed at all UÉ facilities. These SOPs should have regard to these legislative instruments for protection from noise emitted from wastewater treatments plants as a result of deploying treatment technologies on site. Traffic noise emitted during transportation of sludge have the potential to impact sensitive receptors and require adequate management to reduce any impacts.

4.6.8 Waste and Resources

The EU Waste Framework Directive sets out the approach for the sustainable management of waste in the Member States. This has been transposed into Irish law by the **Waste Management Act 1996, as amended**, and the **Waste Directive Regulations 2011** (S.I. No. 126/2011), as amended. This legislation requires the preparation of a national hazardous waste management plan and regional waste management plans for the State.

The Waste Framework Directive was amended in 2018 by **Amending Directive (EU) 2018/851** and transposed into Irish legislation under the **Waste Directive Regulations 2020** (S.I. No. 323/2020). The revised directive places responsibility on EU member states to improve their waste management systems, to improve the efficiency of resource use, and to ensure that waste is valued as a resource.

In 2020, the Department of Environment, Climate and Communications (DECC) launched a new national waste policy, **A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020-2025**. It builds on Ireland's previous national waste policy, *A Resource Opportunity – waste management policy in Ireland*. The new action plan puts the focus on waste management further up the waste hierarchy, using less raw materials and shifting away from disposal and treatment of waste towards circular product design. The plan has over 200 measures across various sectors including the circular economy transition, protection of consumers, green procurement, plastics and packaging, municipal waste, etc.

The **National Waste Prevention Programme (NWPP)** is a government initiative which is led by the EPA. It supports national programmes and aims to encourage sustainability and circularity, and targets funding at programmes that support these aspects.

In 2021, the EPA published **Ireland's Circular Economy Programme 2021-2027**. This programme will replace the National Waste Prevention Programme and will be a driving force for Ireland's move to a circular economy by business, citizens & the public sector, characterised by behaviours and business models that design-out waste; ensure resource recycling; and deliver sustainable economic growth. While continuing to prioritise prevention, the remit of the programme will expand further down the waste hierarchy to encompass recycling, as well as reuse and repair.

The **National Waste Management Plan for a Circular Economy 2024-2030** has been prepared to replace the previous three Regional Waste Management Plans 2015-2021. It sets out a framework for the prevention and management of waste in Ireland for the period up to 2030. The plan aims to support and supplement the wider policy base while also including specific targets, policies and actions to enable the waste and resource sector to meet the circular challenge.

This suite of circular economy plans and programmes are directly relevant to the draft Strategy, which recognises the importance of improving on circular economy principles and acknowledges that a circular economy can have positive environmental, economic and social impacts, such as circularity of nutrients and resource management, new employment opportunities, better quality and longer-lasting consumer products, and reduced demand for consumption of resources.

4.6.9 Landscape and Cultural Heritage

The **National Landscape Strategy for Ireland (NLSI)** (2015-2025) aims to promote the sustainable management of Ireland's landscapes, emphasizing their cultural heritage, biodiversity, and ecosystem services. This framework outlines objectives for protecting and enhancing landscapes while integrating landscape considerations into planning and decision-making processes. Collaboration among stakeholders, including government, local communities, and the agricultural sector, is vital for maintaining resilient and vibrant landscapes. Agricultural activities and wastewater sludge management can affect the NLSI's goals. Practices such as fertilizer and pesticide use can lead to nutrient runoff and water pollution, harming aquatic ecosystems and landscape integrity. Effective wastewater sludge management is essential for mitigating these impacts, ensuring that effluents meet legislative and Code of Good Practice requirements. Ensuring consistent policy integration between the draft Strategy and the implementation of these measures will avoid conflicts in relation to biosolids reuse.

5 RELEVANT ASPECTS OF THE CURRENT STATE OF THE ENVIRONMENT

5.1 Introduction

This section of the Environmental Report examines the relevant significant issues of the current state of the environment in relation to Biodiversity, Flora and Fauna, Population and Human Health, Water, Land and Soils, Air Quality and Climatic Factors, Material Assets, Cultural Heritage, Landscape, and the interrelationship between these factors. The baseline has been compiled using available datasets and indicators developed through scoping and this environmental assessment. It is noted that the draft Strategy is national in its focus, and this is reflected in the level of detail presented for the baseline description which follows. It is also focused in the first instance on the Republic of Ireland, however given the boundary with Northern Ireland and shared water bodies and adjacent marine space, there is potential for environmental impact on e.g., air and water quality in other jurisdictions. As such the description below includes reference, where relevant, to conditions outside the Republic of Ireland. The characteristics of areas likely to be significantly affected and existing environmental problems are summarised for each topic heading in the following sections.

5.2 State of Environment Overview- Republic of Ireland

Ireland's natural environment represents one of the country's most essential national assets (EPA, 2012, 2016, 2020 and 2024[10][11][12]). However, it is acknowledged that under increasing pressure, the quality of the environment is not considered to be good. In the most recent, state of the environment review *Ireland's State of the Environment Report 2024 (SOER, 2024)*[13], the EPA outlines a summary scorecard for the progress being made across key environmental policy areas as well as the general trend/outlook. The score card shows that the improvements being made are not of appropriate scale and are therefore insufficient to meet the national long-term environment protection objectives and targets. **Table 5-1** presents the scorecard from the EPA SOER 2024 report and highlights the relevance to the draft Strategy.

Table 5-1: Summary Assessment and Future Outlook for Selected Environmental Policy Areas and Relevance to the draft Strategy

Policy Area	Summary Assessment & Outlook Scorecard taken from EPA SOER, 2024	Relationship to the measures outlined in the draft Strategy
Climate	***"Assessment:* Poor – environmental and/or compliance challenges to address** ***Outlook:* Largely not on track to meet policy objectives and targets. Significant challenges to achieving full compliance remain. Systemic and transformative change needed**	The agriculture sector overall is the largest contributor to Ireland's GHG emissions. Research has indicated that reducing nitrogen (N) fertiliser inputs for agriculture and/or using efficient application mechanisms (such as LESS), has resultant co-benefits for reduction in N losses to water and reduction in N_2O generation (a greenhouse gas, 93.0% of which is derived from use of synthetic fertilisers and animal manure). N_2O accounted for 8.8% of Ireland's GHG emissions in 2023, so is a significant source of emissions for action. The draft Strategy contains actions related to nutrient circularity and use of biosolids in agriculture to improve soil quality leading to reduction in synthetic
	While there has been progress in terms of beginning to reduce greenhouse gas emissions and in strengthening adaptation governance structures and support services, overall current assessment for climate is 'poor' (a slight improvement from 'very poor' in 2020). Full implementation of actions set out in the Climate Action Plan and additional	

[10] Ireland's Environment 2012 - An Assessment | Environmental Protection Agency

[11] Ireland's Environment 2016 - An Assessment | Environmental Protection Agency

[12] Ireland's Environment 2020 - An Assessment - Report | Environmental Protection Agency

[13] EPA (2024) Ireland's State of the Environment Report 2024. Available at: https://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/irelands-state-of-the-environment-report-2024.php

Policy Area	Summary Assessment & Outlook Scorecard taken from EPA SOER, 2024	Relationship to the measures outlined in the draft Strategy
	actions are needed if Ireland is to meet its 2030 and 2050 climate targets."	fertiliser use and can therefore, play a role in contributing towards the reduction of GHG emissions from agriculture sector.
Air Quality & Emissions	***"Assessment:* Moderate – on track generally/local or occasional challenges** ***Outlook:* Partially on track to achieving full compliance or measures in place or planned that will improve the situation. Outlook is dependent on existing and planned actions, measures and plans being fully implemented and effective**	The draft Strategy has limited impact on local and ambient air quality. Biosolids applied to soils accounts for 0.2% of the total agriculture emissions.[14] The draft Strategy will contribute positively towards national air quality by utilising alternative outlets to land spreading with efficient use of decision support tool with regard to the transport of biosolids. Transport related emissions are addressed through a National Bioresources Strategic Decision Support Tool (DST) which optimises transport strategies and ensure lower carbon transport.
	The overall current assessment for air is 'moderate' (the same as in 2020). Ireland is compliant with current air quality standards for many air pollutants. However, Ireland is not meeting the guidelines set by WHO for multiple pollutants, including PM2.5, and Ireland is non-compliant with the EU reduction target for ammonia. Achieving the ambitions of the Clean Air Strategy and complying with the limit values of the proposed EU Air Quality Directive from 2030 onwards will be challenging but will have a significant and positive impact on health."	
Water	***"Assessment:* Poor – environmental and/or compliance challenges to address** ***Outlook:* Partially on track to achieving full compliance or measures in place or planned that will improve the situation. Outlook is dependent on existing and planned actions, measures and plans being fully implemented and effective**	Building on the existing NWSMP, the primary purpose of the draft Strategy is to ensure that bioresouce management occurs sustainably as a part of wastewater treatment processes. This in turn also ensures protection of surface water and groundwater quality. Whilst the overall assessment in the SOER, 2024 scorecard provides a national outlook and is focused on wastewater discharges as a significant pressure, it should be noted that the report also states that there is a decrease in the number of waterbodies impacted by wastewater as a result of increasing investment and upgrades to wastewater treatment plants. It also highlights that agriculture is the most significant pressure on waterbodies due to nutrient loss. Furthermore, recent EPA data indicates that nearly half (44%) of our rivers had mean nitrate concentrations above 8 mg/l NO_3 in 2024 and 20% of estuarine and coastal water bodies were too high for dissolvedinorganic
	Overall current assessment for water is 'poor' (the same as in 2020). Trends remain mixed, with no net improvement in river or lake water quality in recent years, a sharp decline in the number of monitored estuaries in satisfactory ecological condition and continued direct discharges of raw or inadequately treated sewage to water from 19 agglomerations. Significant challenges remain for achieving full compliance with relevant EU obligations and national policy objectives."	

[14] EPA (2024). Ireland's UNECE Submissions 2024. Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-unece-submissions-2024

Policy Area	Summary Assessment & Outlook Scorecard taken from EPA SOER, 2024	Relationship to the measures outlined in the draft Strategy
		nitrogen (EPA, 2025[15]). Majority of the river sites with higher nitrate concentrations are located in the south and south-east of the country. It has been reported that one of the main causes impacting water quality is the run-off of nutrients, sediments and pesticide from agricultural lands and farmyards. While sludge accounts for a small fraction of total amount of fertilisers spread, there is scope for greater action and water protection within the draft Strategy to support reversal of this trend in line with the WFD and WSSP objectives.
Nature	***"Assessment: Very poor / significant environmental and/or compliance challenges to address*** ***Outlook: Largely not on track to meet policy objectives and targets. Significant challenges to achieving full compliance remain. Systemic and transformative change needed***	One of the aims of the draft Strategy is to incorporate nature based solutions into wastewater treatment sites to reap benefits for biodiversity. It also commits to carry out the bioresource management processes in compliance with the obligations under the Birds and Natural Habitats Regulations 201, as amended in recognition of wider biodiversity issues.
	The overall current assessment for nature is 'very poor' (the same as in 2020). Deteriorating trends dominate, especially for protected habitats and bird populations, and Ireland is not on track to achieve policy objectives for nature. While the recent expansion of marine protected areas is welcome, additional far-reaching measures are needed to address the declines in nature and biodiversity."	
Waste & Circular Economy	***"Assessment: Poor – environmental and/or compliance challenges to address*** ***Outlook: Partially on track to achieving full compliance or measures in place or planned that will improve the situation. Outlook is dependent on existing and planned actions, measures and plans being fully implemented and effective***	The draft Strategy provides for improvement in the circularity of scarce nutrients such as phosphorus and in this regard, the draft Strategy aims to contribute towards circular economy and achievement of net zero carbon in the wastewater treatment sector.
	The overall current assessment for the circular economy and waste is poor (the same as in 2020) but progress is being made in a number of areas to improve performance. Waste generation continues to grow, in absolute and per capita terms, and Ireland remains overly reliant on export markets for recycling and for treating municipal residual waste. Recycling rates for municipal and plastic packaging waste streams are at risk and need to increase urgently to achieve 2025 targets. Recent interventions, such as the Deposit Return Scheme, statutory roll-out	

[15] EPA, 2025. Water Quality in 2029-2024. Environmental Protection Agency. https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/EPA-Water-Quality-in-Ireland-Report.pdf

Policy Area	Summary Assessment & Outlook Scorecard taken from EPA SOER, 2024	Relationship to the measures outlined in the draft Strategy
	of the organic waste collection service, recovery levy and national end-of waste and by-product decisions, are positive developments but the effects of these remain to be seen. The circular material use rates remains very low by comparison to the European average and Ireland needs to address specific sectoral challenges to accelerate moving from a linear to a circular economy."	

Five key State of the Environment (SOE) priorities are outlined by the EPA for Ireland in order to protect the environment, health, and wellbeing. These comprise of the following:

- **Delivering a national policy position on the environment**: There is an urgent need to have a national policy position on the environment to address the complex interactions, synergies and trade-offs across environmental policy areas and to deal with its interactions with other policy domains.
- **Driving policy implementation**: Ireland must rigorously implement existing environmental plans and programmes to achieve the benefits that they were developed to deliver.
- **Transforming our systems:** Transformation of energy, transport, food and industrial sectors is critical to achieving a sustainable future.
- **Scaling up investment in infrastructure:** Investment in water, energy, transport and waste management infrastructure is essential to protect the environment now and into the future.
- **Protecting the environment to protect our health**: Protecting the environment is key to protecting human health and Ireland must act to reduce the modifiable risks to human health from environmental exposures.

More detail and up to date information is discussed throughout **Section 5.3**.

5.3 Environmental Characteristics

The following baseline information is prefaced for each environmental discipline by clarification on the nature and extent of effects considered for that discipline in relation to the draft Strategy. The baseline information is then summarised in relation to the identified scope, having referenced key data sources e.g. EPA Geoportal, ESM Tool.

5.3.1 Population and Human Health

Population and human health are broad topic areas within the assessment framework which encompass consideration of the presence of people, their activities, their use of the receiving environment and their wellbeing. Population distribution and growth forecasts are important indicators of both pressure on infrastructure and resources, and potential exposure to pollution and risk. Given the strategic nature of the draft Strategy, the focus of the baseline for population and human health is predominantly at the national level. The baseline relevant to the draft Strategy in relation to Population and Human Health is as follows:

- Population trends and their impact on wastewater services and disposal; and.
- Potential for impacts on human health from pollutants / emerging contaminates in biosolids.

5.3.1.1 Population Trends

National and Regional Population Trends

The State's population has grown strongly in the most recent intercensal period: on Census Night (3 April 2022) the Central Statistics Office (CSO) recorded a resident population of 5,149,139, an increase of 387,274 people (8.1%) since Census 2016, and the first time since 1851 that the population of the State exceeded five million. Growth has been driven by both natural increase and positive net migration, an ageing of the population (median/average age rising to 38.8 years) and an increase in occupied households (to

approximately 1.85 million), with the largest absolute housing-stock and population increases concentrated in and around the Eastern and Midland region — notably the Greater Dublin area — while other regions have recorded more modest increases and continued variation between counties. (cso.ie)

The First Revision to the National Planning Framework (NPF), progressed by Government from June 2023 and approved by the Oireachtas in April 2025, explicitly responds to these changing population patterns by recalibrating regional development objectives, infrastructure priorities and housing targets to reflect both continued population growth and the need for a more balanced regional outcome. The revision highlights regional ambition, climate transition and infrastructure alignment as core drivers and positions the revised framework to guide investment decisions by public bodies, developers and infrastructure agencies so that spatial planning responds to the scale and distribution of the 2022 census population and projected future change.

Table 5-2: National and Regional Population (Census 2022)

Population Figures	Population Numbers (CSO 2022)
National Total	• Republic of Ireland resident population): 5,149,139.
Regional and county population totals	• Border Region: 419,473. ➢ Cavan: 81,704; Donegal: 167,084; Leitrim: 35,199; Monaghan: 65,288; Sligo: 70,198.
	• Dublin Region: 1,458,154. ➢ Dublin City: 592,713; Dún Laoghaire–Rathdown: 233,860; Fingal: 330,506; South Dublin: 301,705.
	• Mid-East Region: 764,154. ➢ Kildare: 247,774; Louth: 139,703; Meath: 220,826; Wicklow: 155,851.
	• Mid-West Region: 505,369. ➢ Clare: 127,938; Limerick: 209,536; North/Tipperary: 167,895.
	• South-East Region: 457,410. ➢ Carlow: 61,968; Kilkenny: 104,160; Waterford: 127,363; Wexford: 163,919.
	• South-West Region: 740,614. ➢ Cork City: 224,004; Cork County: 360,152; Kerry: 156,458.
	• West Region: 483,941. ➢ Galway City: 85,910; Galway County: 190,541; Mayo: 137,231; Roscommon: 70,259.

5.3.1.2 Human Health

Sludge from WWTPs is primarily the organic by-product of the biological treatment of wastewater, and comprises the solids removed during the treatment processes. WWTPs operate biologically active processes, and sludge is the natural product of this process. It can be particularly beneficial as a soil conditioner and source of nutrient enrichment (fertiliser) as part of land spreading. The Urban Wastewater Treatment Directive (UWWTD) is a principal legislative mechanism that aims to protect human health and the environment through obligations for collection and treatment of urban wastewater.

In recent years that has been a growing awareness of the potential for pollutants and contaminants to enter the wastewater system from several sources e.g. excretion of pharma by-products after use, unlicensed disposal of medicines etc. In response the UWWTD has been recast and the rUWWTD was adopted in late 2024. Some key obligations relating to wastewater sludge and bioresource management include energy and climate neutrality targets of 20% by 2030 & 70% by 2040 and increasing monitoring to include microplastics and GHG emissions. Increased circularity is also an important element, with new requirements introduced to recover valuable components from wastewater sludge, like phosphorus, a critical raw material in the EU[16]. The rUWWTD also sets out requirements for quaternary treatment for the removal of emerging contaminants and micropollutants at the larger sites, and other sites on a risk basis. The new Directive introduces the 'polluter pays principle' whereby producers of pharmaceuticals and cosmetics must cover at least 80% of additional costs for treating wastewater through an extended producer responsibility (EPR) scheme[17]. Other supports include Ireland's Surface Water (Amendment) Regulations (S.I. No. 77/2019) (as amended) which incorporates the EU 'watch list of substances for Union-wide monitoring as set out in Article 8b of Directive 2008/105/EC' comprising certain antibiotics, hormonal birth control substances as well as neonicotinoids (a class of insecticide). Initiatives such as the Disposal of Unused Medicines Properly (DUMP) developed by the Health Service Executive (HSE) in 2002 also encourages the proper disposal of unused/expired pharmaceuticals. However, research conducted in 2020 on behalf of the Irish Pharmacy Union showed that one-third of all unused medicines in Ireland are disposed of incorrectly, with 6% flushed down sinks or toilets.

Contaminated drinking water can pose a risk to public health if it is contaminated by pathogens or certain chemicals. EPA SOER 2024 states that sewage sludge can act as a sink for varied levels of persistent contaminants arising from wastewater.

Microplastics have been observed in the soil around the world and wastewater and biosolids from WWTPs are one of the sources[18]. These can enter the food system and waterways causing contamination.

The EPA SOER 2024 states that the requirements of the EU Sewage Sludge Directive (86/278/EEC) do not address the current needs in relation to current and emerging chemicals and contaminants of concern in the wastewater sludge. It is highlighted that there is a potential for these contaminants to enter the food chain affecting human health and a build-up of these in the soil microbial communities can contribute towards the risk of increasing anti-microbial resistance in the environment. Currently, there are no limits for Persistent Organic Pollutants (POPs) in the wastewater sludge for Ireland whilst some Member States have ceased the use of directly applying treated sewage sludge on agricultural lands and diverted its utilisation for energy generation and nutrient recovery (See **Section 5.3.6**). It is recommended in the SOER 2024 that a national assessment of sewage sludge in agriculture is required to collect data to enhance Ireland's future management and tracking systems for these materials.

Environmental factors such as, soil, water quality and air quality in Ireland that will indirectly affect human health are discussed in **Sections 5.3.3, 5.3.4** and **5.3.5**, respectively.

5.3.1.3 Existing Environmental Pressures/ Problems: Population and Human Health

The key issues in relation to wastewater sludge and bioresource management for population and human health include:

- Impacts arising from emerging contaminants including pharmaceuticals, PFAS and microplastics in wastewater sludge; and
- Potential negative impacts from increase in the volume of sewage sludge because of growing population.

These potential impacts are considered in the assessment of the measures presented within **Chapter 8** of this report.

[16] New rules for urban wastewater management set to enter into force - European Commission

[17] https://www.consilium.europa.eu/en/press/press-releases/2024/01/29/urban-wastewater-council-and-parliament-reach-a-deal-on-new-rules-for-more-efficient-treatment-and-monitoring/

[18] Nash, R., et al., 2023. Sources, Pathways and Environmental Fate of Microplastics. Environmental Protection Agency. www.epa.ie/publications/research/environment--health/Research_Report-430.pdf (Accessed February 2026).

5.3.2 Biodiversity, Flora and Fauna

Biodiversity is the variety and variability of plants (flora) and animals (fauna) in an area and their associated habitats. The importance of preserving biodiversity in its own right and its value in terms of quality of life and amenity is recognised from an international to a local level. The natural environment is also critical in delivering ecosystem services such as providing clean air and water, food and raw materials and cultural benefits. The EU Nature Restoration Law aims to address the severe decline in biodiversity across the EU and to return ecosystems to good conservation condition. The rules set a binding target at EU-level where Member States will have to enact restoration measures that cover at least 20% of land and sea areas of the EU by 2030. For those ecosystems that require restoration, measures must be put in place by 2050. This law was recently adopted in August 2024 at EU level and requires Member States to prepare national restoration plans within a two- year period.

Ireland has obligations under EU law to protect and conserve biodiversity including habitats and species both within and outside designated sites. At national level, the vision for biodiversity in 2050 as stated in the fourth National Biodiversity Action Plan (NBAP) 2023-2030 is one where “Biodiversity in Ireland is valued, conserved, restored and sustainably used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people”. It aims to address issues and halt the loss of biodiversity, in line with international commitments. One of the key objectives and associated outcomes of relevance for the draft Strategy in Ireland’s Fourth NBAP are:

Objective 2: Meet Urgent Conservation and Restoration Needs

- *Outcome 2D: Biodiversity and ecosystem services in the marine and freshwater environment are conserved and restored*

The preparation of the draft Strategy has had regard to the Habitats Directive (EU Council (Directive 92/43/EEC)) on the Conservation of Natural Habitats and of Wild Fauna and Flora, as amended (commonly referred to as the Habitats Directive), and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds (commonly referred to as the Birds Directive). These are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, and requires that any plan or project not directly connected with or necessary to the management of a European Site but likely to have a significant effect on such a site must undergo an appropriate assessment in view of best scientific knowledge and in view of the conservation objectives of the site.

The draft Strategy falls under the remit of these regulations, and an Appropriate Assessment is being undertaken pursuant to these regulations, and the Natura Impact Statement is available under separate cover. The draft Strategy must have regard for these commitments and associated legal obligations.

5.3.2.1 Designated Sites

Ireland has designated sites and species of conservation value and/ or concern in an effort to protect its biodiversity resource. **Table 5-3** outlines the various types of designation at a national level and are illustrated on **Figure 5-1.**

Table 5-3: Nature Designations in Ireland

Designation Type	Description	Number
UNESCO Biosphere Reserve	Biosphere Reserves are areas of terrestrial and coastal/marine ecosystems, designated to reconcile the conservation of biodiversity with the quest for economic and social development and the maintenance of cultural values. They are internationally recognised within the framework of UNESCO’s Programme on Man and the Biosphere. In Ireland these sites comprise Dublin Bay and Killarney National Park.	2
OSPAR Marine Protected Area (MPA)	MPAs have no single definition. They are generally understood to be geographically distinct zones for which conservation objectives can be set and are often established in an attempt to strike a balance between ecological constraints and economic activity, so that the seas may continue to allow for goods and services to be delivered. They may include existing SACs and SPAs, as well as other areas established under international or regional agreements (e.g. OSPAR, Helsinki Commission [HELCOM] etc.). The MSFD (2008/56/EC) requires Member States to use spatial protection measures, such as these MPAs, in their MSFD Programme of Measures, helping to contribute to a coherent network.	19

Designation Type	Description	Number
Ramsar	Ramsar sites are wetlands of international importance designated under the Ramsar Convention on Wetlands 1971, which Ireland joined in 1984. This intergovernmental treaty provides for national action and international cooperation for the conservation and wise use of wetlands and their resources with a particular focus on birds. Ramsar designations often overlap with SPAs.	45
Important Bird Area	The Important Bird Areas (IBA) Programme is a BirdLife International initiative aimed at identifying and protecting a network of critical sites for the conservation of the world's birds. BirdWatch Ireland is the BirdLife partner and is responsible for promoting and updating the status of Ireland's birds and their key sites.	73
Special Areas of Conservation (SAC)	Special Areas of Conservation (SAC) are designated under the EU Habitats Directive (92/43/EEC) and Special Protection Areas are designated under the Birds Directive (2009/147/EC). Together these sites form the backbone of the Natura 2000 network. Further details on these sites can be found in the NIS for the draft Policy Document.	441* including 8 offshore SACs
Special Protection Area (SPA)	Ireland is required under the terms of the EU Birds Directive (2009/147/EC) to designate Special Protection Areas (SPAs) for the protection of[19]: Listed rare and vulnerable species. Regularly occurring migratory species Wetlands especially those of international importance	167* including 2 marine SPAs
Natural Heritage Area (NHA)	Natural Heritage Areas (NHAs) are protected under the Wildlife Amendment Act 2000. NHAs are areas considered important for the habitats present, or which hold species of plants and/ or animals whose habitat needs protection.	155*
Proposed Natural Heritage Area (pNHA)	Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats.	1,085*
National Nature Reserve	A National Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order. Most are owned by the State, but some are owned by organisations or private landowners. The NPWS provides an online spatial viewer displaying the National Parks and Nature Reserves.	80
Marine Nature Reserve	Lough Hyne, Co. Cork is the one Marine Nature Reserve designated under the Wildlife Acts. The directives require that habitats and species listed in them are maintained, or if necessary restored, to favourable conservation status.	1
National Park	National parks are areas that exist to conserve natural plant and animal communities and scenic landscapes, and which facilitate public access. They exist in accordance with international criteria established by the world conservation union (IUCN). To note the establishment of Boyne Valley as a National Park was announced in September 2023[20].	8**
Refuge for Fauna	Refuges for Fauna are designated by ministerial order under Section 17 of the Wildlife Act 1976 as amended by Section 28 of the Wildlife (Amendment) Act 2000.	7
Wildfowl Sanctuary	A Wildfowl Sanctuary is an area that has been excluded from the 'Open Season Order' so that game birds can rest and feed undisturbed.	68*

**Numbers retrieved from the NPWS website (www.npws.ie) Accessed February 2026.*

*** https://www.nationalparks.ie/*

In Northern Ireland there are 58 SACs, 16 SPAs, 20 Ramsar and 394 Areas of Special Scientific Interest (ASSIs). ASSIs are areas of land with national conservation value. Some designations in the Republic of Ireland, such as Carlingford Lough SPA and Carlingford Shore SAC, extend into Northern Ireland and as such present potential for transboundary effects.

[19] Special Protection Areas (SPA) | National Parks & Wildlife Service

[20] Press Release. New National Park established in Boyne Valley

5.3.2.2 Natural Habitats and Protected Species

The latest report Article 17 report published by the National Parks and Wildlife Service (NPWS) in 2025 provides details regarding the conservation status in Ireland of habitats and species listed in the EU Habitats Directive (92/43/EEC).[21] Under the Habitats Directive, each Member State is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive.

For the 2025 submission, Ireland's Article 17 Report recorded 10% of habitats as '*favourable'*, 42% as '*inadequate*' and 48% as '*bad*'[22]. Among the key findings are:

- Many Irish habitats are in unfavourable status. Many are still declining albeit with some positive actions underway while almost half are demonstrating ongoing declines.
- The main pressures to habitats are from grazing; pollution of watercourses (freshwater and marine); drainage / cutting of peatlands and wetlands; invasive species; recreation; urbanisation; fertiliser application; and road building, among others.
- Grasslands, such as and hay meadows, are beginning to increase in both range and area by 9.3% and 14%). Some improvements have been associated with the Burren Programme, the All-Ireland Pollinator Plan and Aran LIFE. However, some grasslands such as orchid-rich calcareous grasslands are experiencing a deteriorating trend.
- Many freshwater habitats are considered unfavourable due to nutrient loading within the catchment. The Cycle RBMP (2018-2021) aimed for improved targeting of mitigation measures. The 3rd RBMP has now been published and covers the period of 2021 – 2027, continuing efforts to address nutrient loading and enhance the health of freshwater ecosystems through targeted interventions and updated strategies.

From the 2025 report, 58% of species were assessed as 'favourable', 12% as 'inadequate', 20% as 'bad' and 10% as 'unkn*own*' or considered to be vagrant species. Among the key findings are:

- Otter, pine marten and many bat species have also been assessed as '*favourable*' with evidence of an expanding range.
- The Natterjack toad has a bad overall status but has a stable trend. The range and population show historical losses, leading to small isolated meta-populations
- Salmon (*Salmo salar*) is now categorised as having a 'bad' overall status along with other fish (namely Pollan (*Coregonus pollan*), Sea Lamprey (*Petromyzon marinus*) and Twaite Shad (*Alosa fallax*)) that remain at '*bad*' status. Killarney shad (*Alosa killarnensis*) and the Brook Lamprey (*Lampetra planeri*) are assessed as '*favourable.*'
- Freshwater pearl mussel is '*bad*' and declining.

Similarly, the requirements for reporting under Article 12 of the Birds Directive (2009/147/EC) are every six years. Ireland's Article 12 submission to the EU Commission on the *Status and trends of bird species (2013-2018)*[23] covers over 460 species which includes breeding, wintering and passage species.

The report details that some species have had significant increases in population over the long term, including raven (*Corvus corax*), collared dove (*Streptopelia decaocto*), buzzard (*Buteo buteo*) and blackcap (*Sylvia atricapilla*). However, other species have undergone significant declines in their long-term breeding population trend: corncrake (*Crex crex*) (85%), curlew (*Numenius arquata*) (98%), lapwing (*Vanellus vanellus*) (88%) and redshank (*Tringa totanus*) (88%). The hen harrier (*Circus cyaneus*) shows a long-term population trend decrease of 27%. The results confirm that there is a need for measures to halt the declines noted above, most of which are due largely to changes in farming practices, and an increase of activity in extensively farmed uplands through forestry activity and wind farm construction.

Ireland's Article 12 submission for 2019-2024 with updated data is yet to be published.

[21] The Status of EU Protected Habitats and Species in Ireland, NPWS 2007 (Vol 1-3), 2013 (Vol 1 -3) and 2019 (Vol 1-3).

[22] NPWS, 2025. The Status of EU Protected Habitats and Species in Ireland 2025. Available at: https://www.npws.ie/publications/article-17-reports/article-17-reports-2025. Accessed: February 2026.

[23] http://ec.europa.eu/environment/nature/knowledge/rep_birds/index_en.htm (Accessed February 2026)

Freshwater Pearl Mussel

The freshwater pearl mussel (FPM) is a filter feeder (filtering up to 50 litres of water per day) and is associated with salmonid waters but requiring a higher water quality than salmonids. The species *Margaritifera margaritifera* is more common than *Margaritifera durrovensis*, with the latter recorded only in the Nore catchment.[24] There are 27 populations that have been protected within 19 SACs.[25] The FPM is protected under Annex II and IV of the Habitats Directive and is legally protected in Ireland under Schedule 1 of the Wildlife Act. There has been a considerable decline in species distribution and numbers of FPM in Ireland and across the EU.

As noted above, the conservation status for FPM remains at '*bad*' status and continues to decline, with few locations with recruiting populations showing near-adequate replenishment. FPM are particularly sensitive to changes in water quality, such as increased nutrient inputs and changes in suspended solids/ sediment loads. This can cause severe damage as the FPM closes its shells in response to the sediment pressure, impacting feeding behaviour or causing suffocation. In 2009, legislation was enacted to support the achievement of favourable conservation status for FPMs (S.I. 291 of 2009), and the NPWS developed 27 FPM Sub-Basin Management Plans as designated under the regulations to address measures to halt the decline in the species. They would be sensitive to land spreading activities associated with the draft NBioS alone and in combination with wider agricultural activities.

Salmonid Rivers

Inland Fisheries Ireland (IFI) is the primary body responsible for management of the fish habitat, which is a national resource that needs to be protected. In Ireland, there are eight fish species listed under Annex II and/or Annex V of the Habitats Directive, including: three species of lamprey (*Petromyzon* sp. and *Lampetra* spp.), two species of shad (*Alosa* spp.), Atlantic salmon (*Salmo salar*) and Pollan (*Coregonus autumnalis*). Annex V species are protected such that the exploitation of the fish resource and their taking in the wild is compatible with maintaining the species at favourable conservation status. Their conservation status, noted above, is due to a variety of pressures which include physical barriers such as weirs which limit migration to breeding sites, nutrient enrichment and general habitat quality. They would be sensitive to land spreading activities alone and in combination with wider agricultural activities as salmonid waters must have good water quality, allow upstream movement and provide suitable habitat for spawning. The protected areas for Salmonid species are comprised of the 34 Salmonid rivers, tributaries and lakes listed in the Salmonid Regulations (S.I. 293 / 1988). It is noted that European and national legislation does not cover all watercourses and as such there is a significant portion of watercourses that are not under formal European designation but may hold species that are designated under the European Habitats Directive, for example salmon and lamprey (sea, river and brook) which are listed as Annex II Species.

Plant Species under Flora Protection Orders

The current list of plant species protected by Section 21 of the Wildlife Act, 1976 is set out in the Flora Protection Order (S.I. No. 356 of 2015). It is illegal to cut, uproot or damage the listed species in any way. In addition, it is illegal to alter, damage, or interfere in any way with their habitats. This protection applies wherever the plants are found and is not confined to sites designated for nature conservation. The list includes vascular plants, mosses, lichens and stoneworts.

Ecological Corridors

Stepping stones and ecological corridors can include nature conservation sites (other than European sites), habitat areas and species' locations covered by the wider obligations of the Habitats Directive. It is also recognised that non-designated receptors, such as landscape features, can function as ecological stepping stones or corridors, which are of importance to wildlife. There is a diversity of habitats (e.g. woodlands, hedgerows, field boundaries, sand dunes, saltmarshes, rivers, streams and associated riparian zones, canals, marine habitats and wetlands) that are subject to limited legislative protection[26][27][28] although they are of high biodiversity and conservation value and contribute to the concept of 'green infrastructure'. Soil itself is

[24] NPWS, 2019. Article 17 Species Conservation Assessments 2019 Volume 3 (Available at *https://www.npws.ie/publications/article-17-reports/article-17-reports-2019*

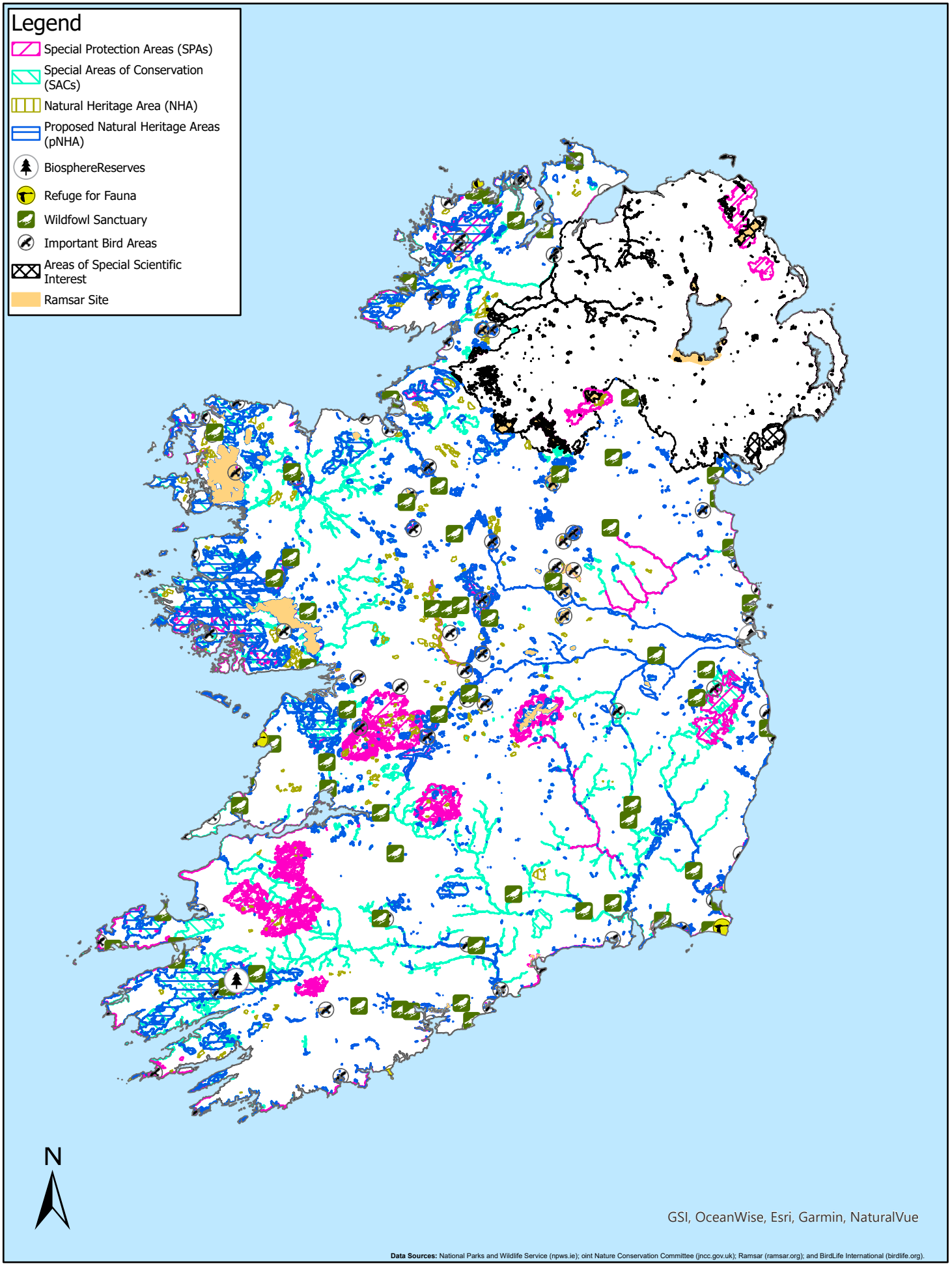
[25] NPWS, 2020. Monitoring Populations of the Freshwater Pearl Mussel Stage 3 and Stage 4 Survey. Available at: https://www.npws.ie/sites/default/files/publications/pdf/IWM122.pdf

[26] GAEC - Teagasc | Agriculture and Food Development Authority

[27] SMRs - Teagasc | Agriculture and Food Development Authority

[28] gov.ie - Environmental Impact Assessment (Agriculture) Regulations

a finite natural resource that underpins much of terrestrial biodiversity and contributes to aquatic biodiversity also (e.g. as riparian zones and buffer strips around watercourses). Where the quality of these corridors deteriorates, this can impact negatively on biodiversity.



Data Sources: National Parks and Wildlife Service (npws.ie); oint Nature Conservation Committee (jncc.gov.uk); Ramsar (ramsar.org); and BirdLife International (birdlife.org).

Figure 5-1

Designated Sites

Project
National Bioresources Strategy

Client
Uisce Éireann
Irish Water

RPS
A TETRA TECH COMPANY
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.

Tel: +353 (0) 1 488 2900
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

Issue Details

Drawn By: AK/RO'B	**Project No.** IE000883
Checked By: RA	**Date:** 08/05/2026
Approved By: CW/AG	**File Ref:** IE000833-RPS-AP-XX-R-EN-0002
Scale: 1:2,200,000 @ A4	

5.3.2.3 Existing Environmental Pressures/ Problems: Biodiversity, Flora and Fauna

The main drivers and pressures on nature noted by the EPA in their most recent assessment of Ireland's SOER (2024)[Error! Bookmark not defined.] include the rapid loss and degradation of habitats, water and air pollution, climate change and development (particularly residential, agricultural and commercial). In Ireland, 42% of habitats are assessed as 'inadequate' and 48% are 'bad'; of the species assessed, 20% are assessed as 'bad' and 10% as 'unknown'. The outlook for nature in Ireland is very poor, with climate change adding to challenges and cumulative impacts. According to National Biodiversity Data Centre, a key biodiversity indicator of particular note is[29] that two of our iconic freshwater fish, the Atlantic salmon and the European eel, have suffered catastrophic population declines, and the freshwater pearl mussel, Ireland's longest-living animal, is facing extinction. This has direct relevance to the draft NBioS as landspreading remains a key outlet for wastewater sludge and this poses risks to biodiversity if not adequately treated and managed along the entire supply chain. Discharge of poorly treated wastewater is one of the major causes of water pollution in Ireland behind with nutrient loading from agricultural activities, hydromorphological changes and forestry. Treated wastewater sludge or biosolids act as fertiliser and soil improver when applied to agricultural lands but as stated in **Section 5.3.1.4**, contaminants which may be present within these biosolids including pathogens, metals, chemicals such as pesticide, PFAS, pharmaceutical residues, and microplastics can affect soil health and biodiversity and subsequently water quality. It is essential to preserve and restore biodiversity in agricultural landscapes to ensure ecosystem resilience and long-term sustainability.

The key pressures and threats for biodiversity in relation to wastewater sludge and bioresource management include:

- Changes to soil nutrient status from diffuse pollution;
- Changes to water quality resulting from contaminants entering water bodies (overland flow or leaching) following land spreading;
- Vegetation or community changes (e.g. from land use change as well as direct changes to the environment, e.g. through land spreading etc.);
- Habitat loss and fragmentation from sludge infrastructure;
- Disturbance or damage to breeding, roosting, feeding areas; and
- Changes to distribution of species as result of changes to soil/water quality;

These impacts may result in adverse impacts on the following sensitive receptors:

- Protected areas: European (e.g. SACs, SPAs, Ramsar sites) and National (e.g. (p)NHAs);
- Water dependent habitats and species;
- Flora and fauna, (including migratory bird species, invertebrates etc.) and habitats including marine habitats;
- Potential for habitat loss and fragmentation;
- Freshwater Pearl Mussel, salmonids, other protected fish and shellfish species;
- Sensitive habitats, e.g. peatlands, limestone habitats;
- Invasive species management;
- Potential for interaction with Habitats Directive, i.e. Articles 6, 10,12; and
- High status sites and protection of status sites.

These potential impacts will be considered in the assessment of the measures presented within **Section 8** of this report.

[29] NBDC (2023). IPBES & Ireland's biodiversity crisis. Available at: https://biodiversityireland.ie/ipbes-irelands-biodiversity-crisis/ (accessed February 2026).

5.3.3 Land and Soils

Given the strategic nature of the draft Strategy, the focus of the baseline for land and soils is at a national level. It is focused on existing overall soil quality, baseline geology and hydrogeology, presence of agricultural land and contaminated land, and known issues which have the potential to impact on soil and land quality.

5.3.3.1 Soils

Soils are a valuable resource that performs many ecosystem services: production of food; production of biomass; storage, filtration and transformation of nutrients and water; carbon storage and cycling; and contribution to the landscape and cultural environment. Such functions are worthy of protection because of their socio-economic as well as environmental importance. Soils in any area are the result of the interaction of various factors, such as parent material, climate, vegetation and human action, land cover and land use.

The Intergovernmental Panel on Climate Change (IPCC) deals with mitigation of climate change through Working Group III,[30] which has concluded that land use, including agriculture and forestry, as well as soil management play a central role for food security and sustainable development.

The predominant soil types have been mapped nationally at a scale of 1:50,000 by Teagasc in collaboration with the EPA, DAFM's Forestry Division and the Geological Survey of Ireland (GSI), completed in 2006; these soil types are shown on **Figure 5-2**.

The European Commission (EC)'s 8th Environmental Action Program (EAP) to 2030 has acknowledged that degradation of soil is a serious problem[31]. The 7th EAP proposed that by 2020 all land in the EU should be managed sustainably and soils afforded protection, with remediation of contaminated sites laid out as a priority[32]. During development soils may be disturbed, moved, sealed-in, compacted (e.g. from heavy machinery operations), eroded or lost to water as a result of the agricultural activities or infrastructure, such as road development. The EC also recognises that degraded soils have less resilience to changing environmental conditions and can provide less ecosystem services (such as food production, water retention/flood management, soil carbon retention, timber production etc.).

In December 2020, the EC published the Roadmap for a New Soil Strategy - Healthy Soil for a Healthy Life, in order to address soil and land degradation and to achieve land degradation neutrality by 2030. A special report from EU Court of Auditors was published in 2023 providing an overview of EU efforts for sustainable soil management[33] concluded that due to the often-unambitious definition and requirements of the standards and limited national targeting, the available tools were not used sufficiently and that there remains considerable scope to improve soil health. In July 2023, the EC adopted a proposal for a Soil Monitoring Law which entered into force in December 2025, creating the first EU-level legal framework to monitor soil health and support efforts to achieve healthy soils by 2050.

The quality of soils in Ireland is considered generally good and there are pressures impacting on the long-term protection and maintenance of soil and soil quality, particularly from soil sealing, compaction, erosion, loss of soil biodiversity and organic carbon, soil contamination, salination and landslides. McNamara et al., 2022 found that the current soil research in Ireland has gaps and it is not well aligned to EU or national priorities. In Ireland, some soil protection legislation has been enacted including the 2011 EIA Regulations for On Farm Development which includes a requirement for EIA of soil operations such as soil drainage.

In 2024, Teagasc analysed a total of 69,471 soil samples comprising of soils from dairy farms, dry stock farms and tillage farms and the following is a summary of the findings:

- There is an increase of soils with optimum fertility to 17% from 2023 (+2%)

[30] IPCC (2022) Agriculture, Forestry and Other Landuse (AFOLU), Working Group III, Assessment Report 6, Chapter 7. Available at: https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter07.pdf

[31] Environment action programme to 2030 - European Commission

[32] Implementation of the 7th Environment Action Programme - Publications Office of the EU

[33] Special report 19/2023: EU efforts for sustainable soil management – Unambitious standards and limited targeting (europa.eu)

- Soil pH is improving with 47% of soils with a pH > 6.2 (2%)
- Soil P levels at Index 1 and 2 have decreased to 49% (-1%)
- Soil K levels at Index 1 and 2 have slightly decreased (-1%)

Land use change is the major pressure impacting soils across Europe; urban land-take and intensification continue, with about a third of Europe's landscape already considered to be highly fragmented.[34] The current target is for there to be no net land-take in Europe by 2050. As stated in **Section 5.3.1.4**, the EPA SOER 2024 points out that a build-up of the contaminants in the soil microbial communities can contribute towards the risk of increasing anti-microbial resistance in the environment. Currently, there are no limits for organic pollutants in the wastewater sludge for Ireland whilst some Member States have ceased the use of sewage sludge in agriculture and diverted its utilisation for energy generation and nutrient recovery. Nash et al., 2023 found that wastewater and biosolids from WWTPs are sources of microplastics in the soil, that can impact the soil chemistry, soil fauna including earthworms and plant growth.

5.3.3.2 Land

Land Cover Classification

The main source of national-scale information on land cover in Ireland is the CORINE land cover data series, which is an EU-wide inventory of land cover in 44 classes categorised from satellite photography. It should be noted that the smallest amount of land analysed under the study is 25 hectares, therefore features smaller than this are not currently discernible at the resolution of CORINE. The EPA does however undertake some adjustments to better reflect Ireland's land cover and there are plans to increase the resolution to 0.1 ha from 2021. The first CORINE dataset was produced in 1990, thereafter updated by the EEA every 6 years. More recently, a new National Land Cover (NLC) Map has been produced for Ireland that maps out land cover classes in much greater detail than CORINE. This was produced by the National Mapping Division (formerly known as the Ordnance Survey Ireland) of Tailte Éireann in partnership with the EPA.[35]

The main land cover type in Ireland is agricultural land, which accounts for approximately two-thirds (67%) of the national landmass (**Figure 5-3)**. Most of this is permanent grassland pastures. Peatlands and wetlands are the second most widespread land cover type, covering almost one-Fifth (about 17%) of the country, while forested areas cover about 11.6% of the country (as per Ireland's National Forest Inventory 2022). The classes for artificial surfaces and built ground encompass features such as urban fabric, ports, road/rail networks and extraction sites etc. Overall, this class covers just 2.4% of the country (CORINE, 2018). Wetlands and forestry also represent a high proportion of land use cover, at 14.9% and 9.5%, respectively (EPA, 2023)[36].

The EPA developed a national land use map[37] in March 2023, which will be used to inform Ireland's reporting obligations under the Land Use, Land Use Change & Forestry [LULUCF] Regulation (EU) 841/2018, as well as the National Inventory Report that covers the reporting on climate emissions. However, it should be noted that the new National Land Cover Map, when compared to the CORINE 2018 data highlights the coarser CORINE data overestimated the land area of some land cover classes (e.g. Grasslands and Peatlands) and underestimated other classes (Forest Areas, Cultivated Land, Heath and Bracken, and Artificial Surfaces), mainly as a result of the greater mapping resolution available with the NLC Map (**Figure 5-4)**.

[34] The European environment — state and outlook 2020 — European Environment Agency

[35] National Land Cover Map for Ireland. https://www.epa.ie/our-services/monitoring--assessment/assessment/mapping/national-land-cover-map/

[36] EPA (2023). EPA Land use and land cover. Current trends: Land and soil | Environmental Protection Agency (epa.ie)

[37] EPA (2023). EPA Land use and land cover. Current trends: Land and soil | Environmental Protection Agency (epa.ie)

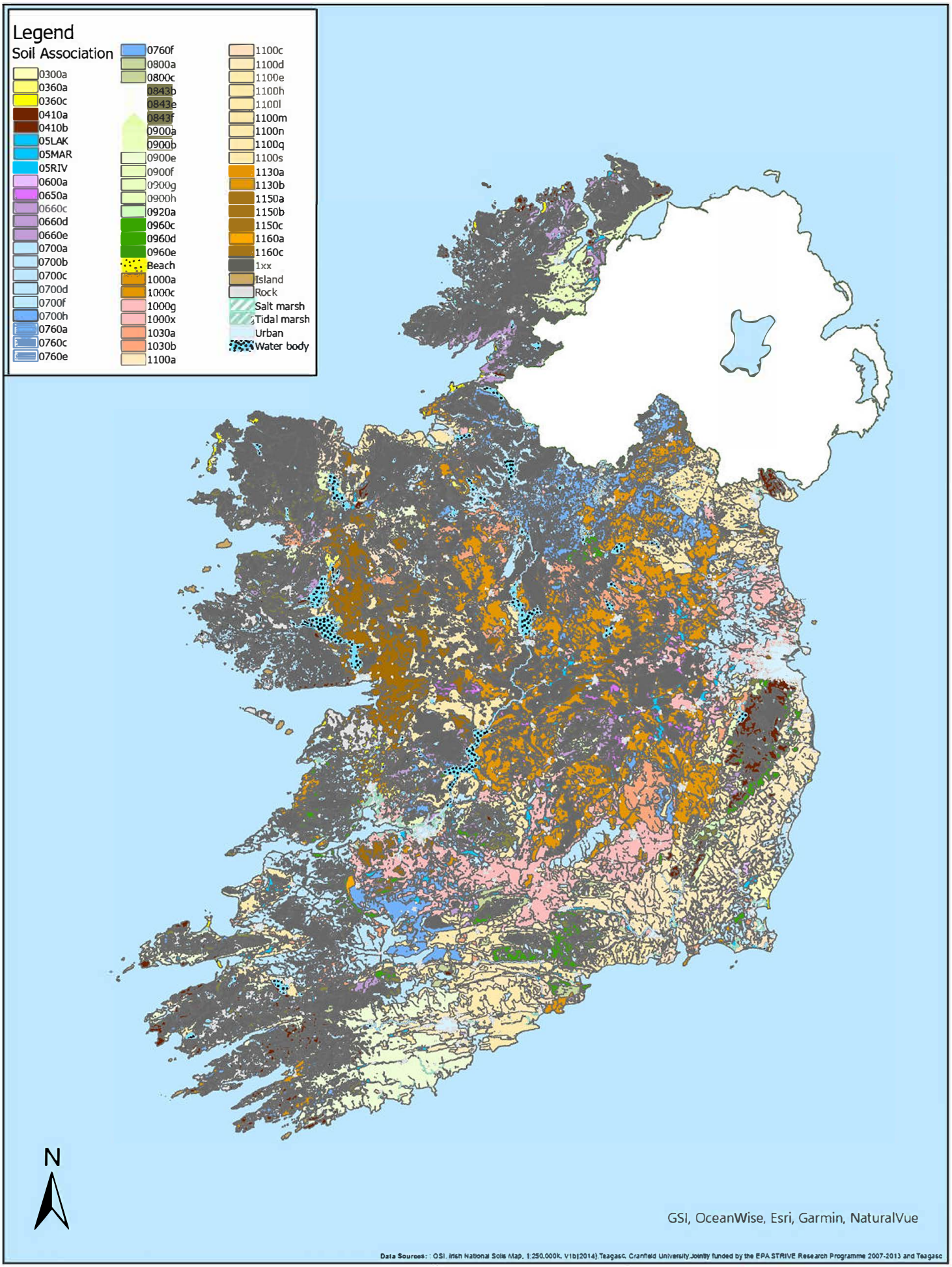


Figure 5-2

Soil in Ireland

Project
National Bioresources Strategy

Client
Uisce Éireann
Irish Water

RPS
A TETRA TECH COMPANY
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.
Tel: +353 (0) 1 488 2900
Email: Ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

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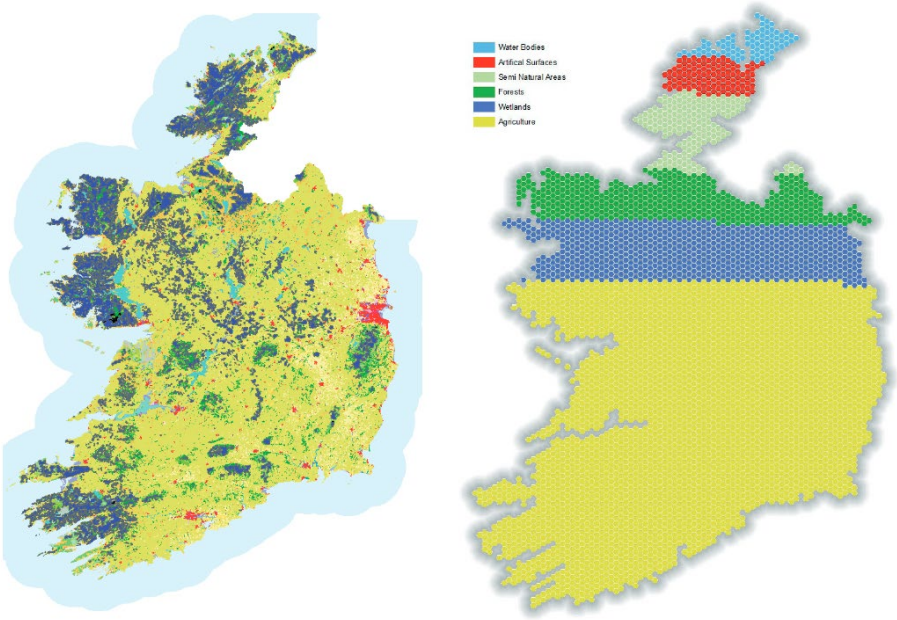
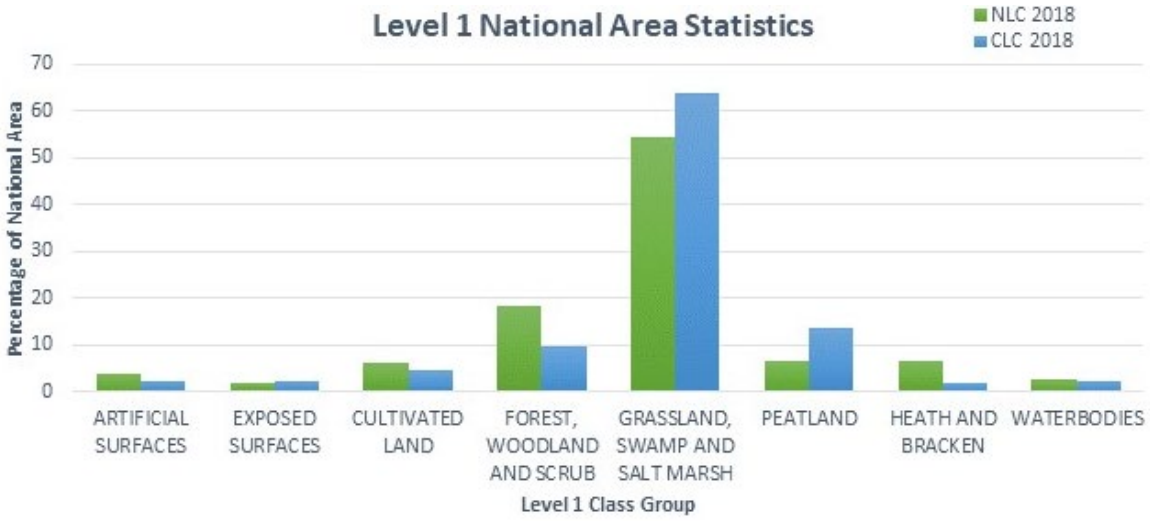


Source: *Figure 2.1, EPA (2023) Land Use Evidence Review Phase 1 Synthesis Report. Available at: https://www.gov.ie/en/publication/f272c-land-use-review-phase-1/*

Figure 5-3: Landcover CORINE 2018 [left] and Proportion of Ireland covered by each Land cover Type [right]



Source: *EPA National Land Cover Map. Available at: https://www.epa.ie/our-services/monitoring--assessment/assessment/mapping/national-land-cover-map/*

Figure 5-4: Comparison of Land Cover Classes CORINE versus the National Land Cover Map

Agriculture

Agriculture constitutes 67.6% of national land cover, with the main agricultural class being pasture (51.1%) (Government of Ireland, 2023)[38]. According to the CORINE Land Cover Classes, agriculture has maintained roughly the same coverage between 1990 and 2018, at 67.48% and 67.35%, respectively (Government of Ireland, 2023)[38].

[38] Government of Ireland (2023). Land Use Evidence Review Phase 1 Synthesis Report. Available at: Land Use Evidence Review Phase 1 Synthesis Report - 989cae78-87c1-49ab-99d7-7e02192de089.pdf (www.gov.ie)

Within Ireland, agriculture contributes significantly to GHG emissions, and an increasing trend has been observed as a result of the size of the national cattle herd and the application rates of nitrogen fertilisers. (EPA, 2024)[39].

The EPA reports that between 2010 and 2017, agriculture accounted for an average of 28.8% of Ireland's GHG emissions, compared to the EU-28 average of 10.3% over the same period (EPA, 2021)[43]. In absolute terms, the current EPA emissions data states that agriculture's contribution to GHG emissions was 38% in 2023, compared to a 33.3% in 2011 (when agricultural emissions were at their lowest point since 1990 (EPA, 2024)[39]. GHG emissions from agriculture are projected to decrease over the period 2021-2030, which will contribute to improved climatic effects through reduced atmospheric pollution and warming of the atmosphere from methane (CH_4), nitrous oxide (N_2O) and CO_2 (EPA, 2023)[39].

There have been increases in N_2O and CH_4 emissions over the past decade which have been driven by intensification of production systems for both organic and inorganic nitrogen fertilisers and increases in national herd numbers. In general, dairy farming is the most intensive in terms of inputs and stocking density, while beef and sheep farming is less intensive, and poultry and farmed fish/shellfish are lower still. In 2021, Ireland had the third highest number of cattle within the EU Member States, with 8.8% of the total population (CSO, 2022)[40]. Ireland's agri-food exports reached a record €19 billion in 2022, an increase of €3.4 billion or 22% on 2021. Agri-food imports were €12.6 billion, an increase of €2.6 billion or 26%, accounting for 9% of Ireland's total merchandising imports. The resulting trade surplus in agrifood trade was €6.4 billion in 2022[41].

In 2022, Ireland exported dairy products to over 130 countries, representing a value of €6.9 billion (top exports of which comprised cheese, butter, food preparations, infant formula, and skim milk powder) (DAFM, 2022)[42]. The recent rapid growth in the dairy sector since 2011 has contributed to the increase in the national cattle herd, with an increase of 40.5% in dairy cows from the years 2011 and 2018 (EPA, 2021)[43]. However, recent data has shown a plateauing of dairy cow numbers in 2021 to 2023[44].

Actions aimed at increased production efficiency and improved grazing land and livestock management also have high emissions reduction potential. Agroforestry and agricultural diversification are applicable, but these options face considerable barriers to uptake by landowners. Afforestation and bioenergy/energy crops have considerable mitigation potential; however, they could have negative impacts on biodiversity and increase land competition if implemented at large scales and / or without due regard to the environment, as well as requiring some degree of land use change. The restoration of peatlands and organic agricultural soils represents a major opportunity to reduce GHG emissions and create carbon sinks, but positive outcomes require major investment.

5.3.3.3 Geology and Hydrogeology

Bedrock Geology

According to the GSI's 1:100,000 scale Bedrock Map Series, the bedrock across a large portion of central Ireland is comprised of Carboniferous limestones, which were deposited in tropical seas 350 million years ago. Sandstone and shale of varying ages from 500 – 300 million years ago are the next most prevalent lithology across the country, some of which are interspersed with basalt and rhyolite, followed by Ordovician to Devonian granite intrusions. The bedrock in the south of Ireland is comprised of Devonian Old Red Sandstones, where thick layers of sediment were laid down in semi-arid and mountain river systems. The northwest is comprised of much older Precambrian quartzites, gneisses, schists and granites, and other igneous intrusive rocks.

[39] EPA (July 2024). Ireland's Provisional Greenhouse Gas Emissions 1990-2023. Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-provisional-greenhouse-gas-emissions-1990-2023.php

[40] CSO (2022). Environmental Indicators Land Use - CSO - Central Statistics Office

[41] www.gov.ie/pdf/?file=https://assets.gov.ie/277211/017e5734-74a3-478e-af25-0adb19ee7ffd.pdf#page=null

[42] DAFM (2022). Annual Review and Outlook for Agriculture, Food and the Marine 2023. Available at: https://assets.gov.ie/277211/017e5734-74a3-478e-af25-0adb19ee7ffd.pdf

[43] EPA (2021). Climate Change and Land Use in Ireland Research_Report_371.pdf (epa.ie)

[44] Ireland: Dairy cow numbers 2023 | Statista

Mineral Potential

There is a mining legacy across some parts of the country and the EPA maintains a register of historical mines. Minerals and metals that were mined include zinc, lead, gypsum, coal, silver, copper and gold. In addition to metals, crushed rock, sand and gravel are also currently quarried at over 500[45] sites in Ireland (Essential Aggregates Providing for Ireland's needs to 2040, Irish Concrete Federation). According to the Extractive Industries Register maintained by the EPA under the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009 (S.I. No. 566 of 2009), there are extractive industries nationally (including quarrying, commercial peat extraction and timber production). The GSI Spatial Resources shows presence of 145 active quarries.[46]

Sand and Gravel Potential

Unlike most other forms of development, minerals can only be worked where they are found. This means that the spatial distribution of mineral resources and thus the potential for workings is dictated by geological considerations and not by the demands of human geography. The GSI Minerals Section began a programme of mapping of 'Aggregate Potential' with data now available nationwide, covering crushed rock aggregate potential as well as granular potential. Spatial data is hosted by the GSI and viewable on a dedicated project viewer.

Slope Stability and Landslide Potential

Ireland is fortunate not to be a high-risk area for landslides, though landslides do occur, however infrequently, with the most occurrences in coastal, upland and peat bog areas. Though the potential for major destructive landslides is slight, there have been instances of severe events in Ireland in the past. The GSI Spatial Resource database has recorded approximately 2,167 landslide events across Ireland to date.

The GSI Irish Landslides Working Group has also compiled a landslide susceptibility database in order to assess the scale of the landslide problem historically and also to assess the susceptibility of areas to landslide hazard in the future. This has direct relevance to the sustainable development of the landscape in terms of infrastructure, siting of licensed facilities, etc. and is therefore an important issue for the planning process. This national landslide susceptibility map shows that the majority of Ireland has low susceptibility while there are regions that fall within high susceptibility category and include the counties of Galway, Kerry, Wicklow, Donegal, Sligo and Mayo.

Geological Heritage

The Irish Geological Heritage Programme is a partnership between the GSI and the NPWS. In Ireland, geological heritage is assessed under a framework of 16 themes which cover different time periods and aspects of geology. Some of these sites have been selected or recommended for eventual designation as Geological NHAs. The remainder are being considered as County Geological Sites (CGS) which have no statutory protection but can be included within County Development Plans. Across Ireland there are currently 1,254 geological heritage sites (includes both audited and unaudited site boundaries). These sites can be viewed online via the GSI's dedicated heritage map viewer.

Hydrogeology

An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. The GSI classifies aquifers, and the classes are divided into three main groups based on their resource potential and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Regionally important (karstified - conduit) aquifers are generally located to the west of the country, in the Burren/East Galway area. Gravel aquifers are much smaller in number and extent, covering only about 1,221 km2 nationally.

Approximately 50% of Ireland is underlain by limestone. Limestone pavement is a priority habitat for conservation under the EU Habitats Directive due to habitats relying on hydrological, hydrogeological and geological conditions. The most extensive limestone pavement occurs in the Burren/East Galway area. The nature of the limestone strongly influences its susceptibility to karstification, and most of the largest springs in Ireland emerge from karst. The GSI borehole database indicates that there are over 33,200 groundwater wells and springs at a national level (those with the highest positional accuracy). Of these, over 850 are at the appropriate abstraction yield to provide for potable water supply. Karst springs, both large and small, are

[45] Essential Aggregates Proving for Ireland's Needs to 2040, Irish Concrete Federation

[46] GSI spatial data viewer. Available at: Data and maps (gsi.ie)

ready sources of drinking water in areas where there are often no other alternatives due to the absence of adequate surface watercourses.

Due to the characteristics of karst, including an irregular bedrock surface, the presence of large voids and rapid underground drainage, it can present problems for infrastructure development as groundwater is most at risk where the subsoils are thin or absent and contaminants can enter the groundwater with little or no filtration or attenuation. Common karst features can include swallow holes, caves, turloughs and enclosed depressions. The GSI maintains a database of such mapped features across the country. The distribution of these features indicates that the majority occur in the midlands of the country and along the west coast of Ireland. As of 2021, there were over 15,400 karst features recorded nationally by the GSI. However, the database is not comprehensive, and new features are added as more information becomes available.

The GSI also classifies the groundwater resource according to vulnerability, i.e. the hydrogeological characteristics intrinsic to a groundwater body which determines how easily that water body may be contaminated through human activities. The topsoil and subsoil, depending on their type, permeability and thickness, play a critical role in preventing groundwater contamination and mitigating the impact of many potential pollutants. Groundwater is most at risk where soil and subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes.

As such, groundwater vulnerability in Ireland exhibits a range of vulnerability ratings and is classified by Low risk up to Moderate, High, Extreme and 'X', where the rock is exposed near the surface or comprised of karst. The groundwater vulnerability classification for Ireland is illustrated in **Figure 5-5**.

5.3.3.4 Existing Environmental Pressures/ Problems: Land and Soils

A review of Irish soil research and data from 2013 to 2021 identified major gaps in our knowledge of Ireland's soils.[47] The EPA's SOER 2024 reiterates that Irish soils are under threat from excess nutrients, compaction, soil sealing and loss of soil biodiversity. The key issues for wastewater sludge and bioresource management in relation to soils, geology and hydrogeology therefore relate to:

- Contamination of soil arising from microplastics in biosolids affecting soil fauna and plant growth;
- Influence on land use practices reliant on soil as a resource;
- Limited availability of land for spreading biosolids due to competing land uses;
- Potential effects of land spreading during periods of limited growth; and
- Impacts to baseline soil characteristics and function.

[47] EPA 2022. Evidence Synthesis Report 1: A Signpost for Soil Policy in Ireland. Available at: www.epa.ie/publications/research/evidence-synthesis-reports/evidencesynthesis-report-1--a-signpost-for-soil-policy-in-ireland.php.

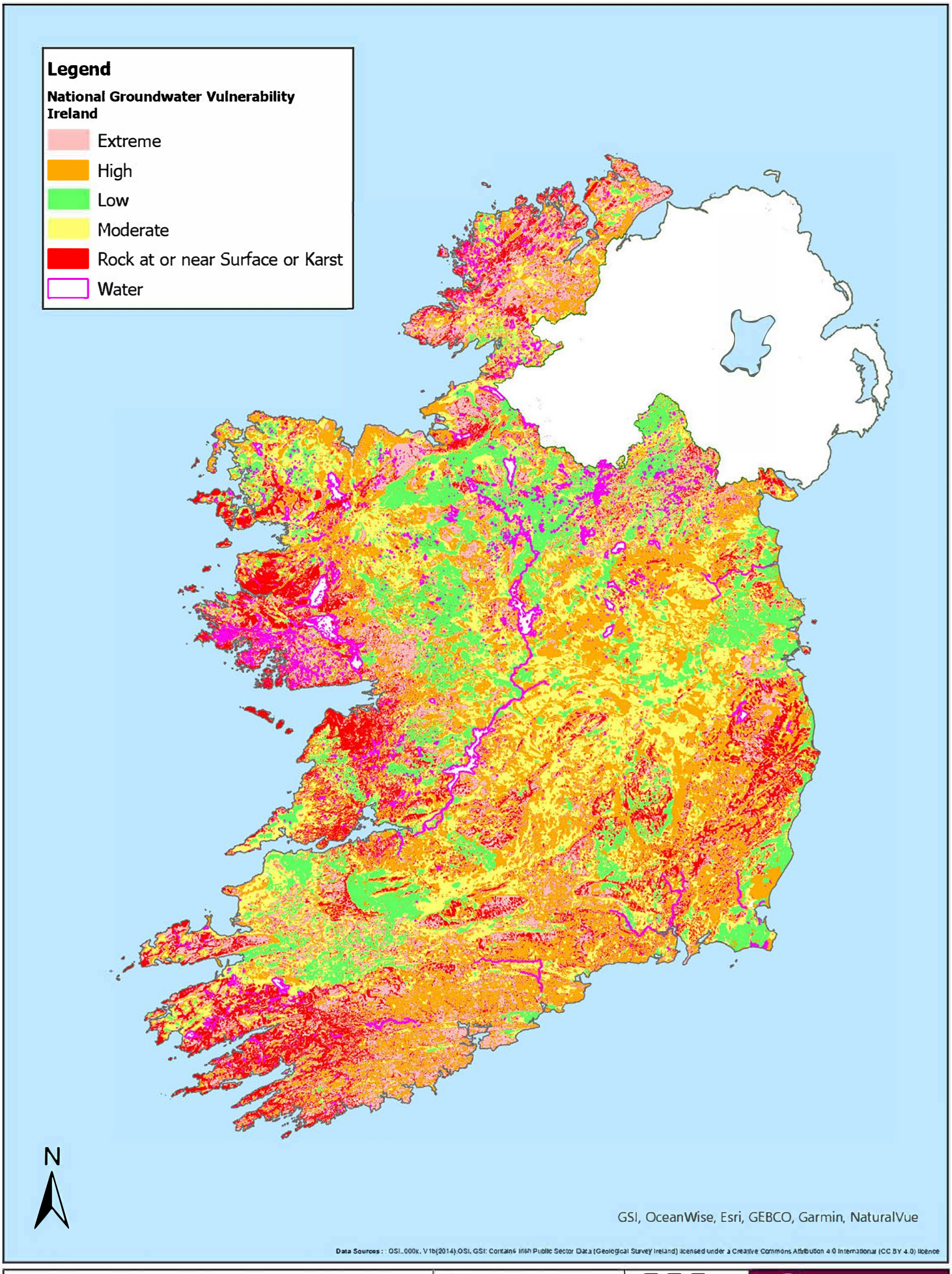


Figure 5-5

Groundwater Vulnerability

Project: National Bioresources Strategy

Client: Uisce Éireann Irish Water

RPS
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.
Tel. +353 (0) 1 488 2900
Email: Ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

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5.3.4 Water Quality

While Ireland's surface and groundwater quality compares favourably with other EU Member States, there are ongoing pressures and problems associated with achieving and maintaining at least good status in line with Water Framework Directive (WFD) (2000/60/EC) objectives, as well as other related directives, such as the Nitrates Directive. Elevated nutrient concentrations from anthropogenic activities and consequent rise in eutrophication are the primary water quality concern in Ireland, namely phosphorus and nitrogen. This causes depleted oxygen levels which can result in the loss of sensitive species and impact the ecological status of the water body. The EPA's latest national assessment, *Water Quality in Ireland 2019–2024*, concludes that 52% of surface waters are in good or high ecological status, meaning 48% are in unsatisfactory condition, while 92% of groundwaters are in good status. Excess nutrients from agriculture, urban wastewater and other human alongside physical habitat degradation are identified as ongoing key challenges.

Water Framework Directive

Article 6 of the Water Framework Directive (WFD) (2000/60/EC) requires each Member State to establish a register of protected areas for water bodies or parts of water bodies that must have extra controls on their quality by virtue of how their waters are used by people and wildlife. This register was split into five categories: Drinking water; Economically significant aquatic species; Recreational and bathing waters; Nutrient sensitive areas; and Protection of habitats and species. **Figure 5-6** shows a map of the register of protected areas nationally.

The key mechanism for addressing water quality and meeting WFD objectives is the National River Basin Management Plan (RBMP) and its associated Programme of Measures. The River Basin Management Plan for Ireland – Water Action Plan 2024 states that agriculture has been identified as a significant pressure in over 1,000 (62%) of the 1,649 water bodies identified as At Risk of not meeting their environmental objective. Of these water bodies, 843 are rivers, 85 are lakes, 7 are coastal waters, 40 are transitional waters, and 48 are groundwater[48].

The WFD requires that all Member States implement the necessary measures to prevent deterioration of the status of all waters (surface, estuarine and coastal and groundwaters) and protect, enhance and restore all waters with the aim of achieving at least good status by 2027 at latest. An 'ecological status' assessment approach was implemented in Ireland as part of WFD implementation. The approach incorporates chemical and biological monitoring into a status grade for each water body, and for surface waters is classified according to a scale of High, Good, Moderate, Poor and Bad. Status on groundwaters is classified as either Good or Poor. In addition to ecological status, a number of water bodies are also monitored for their chemical status. In relation to Northern Ireland,

DAERA issued a consultation document on Significant Water Management Issues to inform the development of the third cycle Basin Management Plan (2022-2027). This identified the most significant pressure on water quality in Northern Ireland is from the release of the phosphorus and nitrogen from agricultural sources.[49]

[48] DHLGH, 2024. River Basin Management Plan for Ireland 2022-2027.

[49] Available at: https://www.daera-ni.gov.uk/consultations/planning-third-cycle-river-basin-management-plan-2021-2027-consultation-significant-water-management

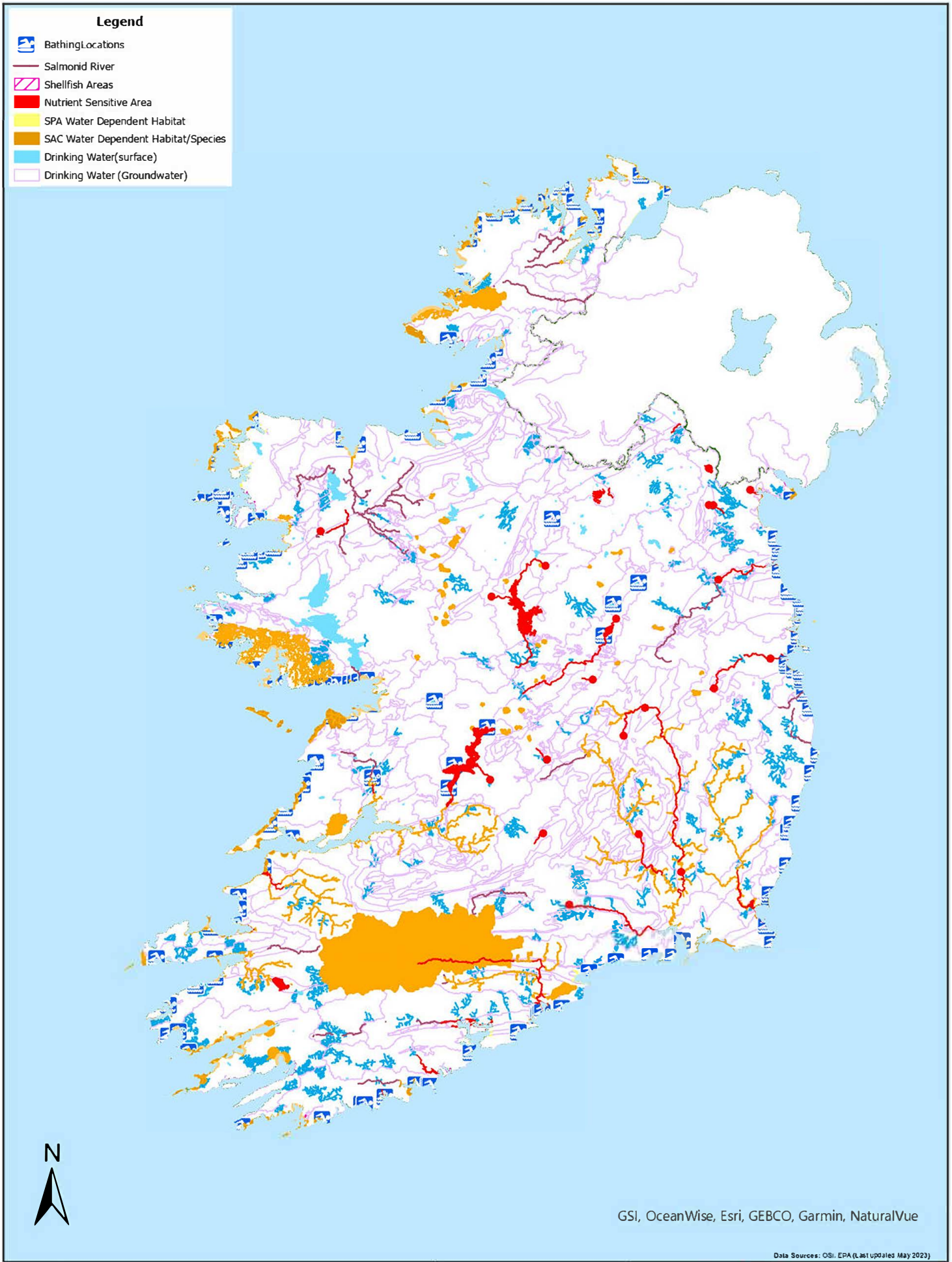

Figure 5-6

WFD Register of Protected Areas in Ireland

Project: National Bioresources Strategy

Client: Uisce Éireann, Irish Water

RPS
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.
Tel: +353 (0) 1 488 2900
Email: Ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

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Surface Waters

The status of surface water in Ireland for the 2019-2024 monitoring period is represented in **Figure 5-7** and **Figure 5-8** presents a map of the ecological status of surface water bodies.

A detailed report on water quality from EPA covering 2019-2024[50] period states that just above half (52%) of Ireland's surface waters are in good or better ecological status and the remaining half (48%) are in unsatisfactory condition. This represents a decline from the previous assessment period. The number of estuaries in satisfactory condition has decreased by almost 5%, however, the number of coastal water bodies in satisfactory condition has increased by 2.4%. Overall, Ireland's water quality continues to decline and the number of monitored water bodies in satisfactory condition has decreased since the last assessment. The main causes reported in the EPA reporting include agricultural runoff (nutrients, sediment, pesticides), forestry runoff, urban runoff from hard surfaces and storm overflows, poorly treated sewage discharges, and physical alterations to waterways (drainage, dredging, dams, weirs, culverts) that disrupt flow and habitat.

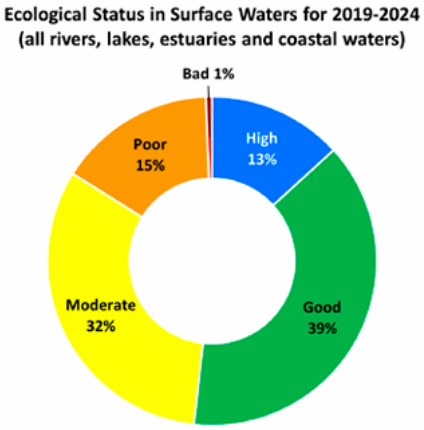

Figure 5-7: Summary of WFD Ecological Status for Surface Waters (2019-2024)

Source: *EPA (2025) Water Quality Status 2019-2024, Accessed February 2026*

Groundwater Status

The majority of groundwater bodies (92%) were reported as having Good chemical and quantitative status for 2019-2024**Error! Bookmark not defined.**. The remaining groundwaters have poor chemical status and six have poor quantitative status, mainly due to historic contamination from industrial and waste sources. The main substances causing failure include nitrate, ammonia, chlorinated solvents, metals and hydrocarbons. Use of herbicides also remains widespread in Ireland, which can be present in groundwaters. The EPA reports that nearly all groundwaters have good quantitative status, i.e. rainfall replenishment can support current abstraction volumes.[51] **Figure 5-9** below presents a map of the ground waterbodies and their associated ecological status.

5.3.4.1 Nutrients and Water Quality

Nutrient enrichment remains one of the principal pressures on water quality in Ireland, with the EPA identifying excess nutrients—particularly nitrogen and phosphorus—as a challenge facing rivers, lakes, estuaries, coastal waters and groundwaters. The key drivers are diffuse losses from agriculture (e.g. fertiliser use, livestock manures, soil run-off and field drainage), urban wastewater discharges, and broader human activities that alter the physical condition of waterbodies, such as land and river drainage, forestry and urban development.

[50] EPA (2025). Water Quality in Ireland 2019-2024Available at: https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/water-quality-in-ireland-2019-2024.php

[51] EPA – Groundwater. Available at: https://www.epa.ie/our-services/monitoring--assessment/freshwater--marine/groundwater/

Key finding reported by the EPA based on the latest reporting[52] include:

> *"Agriculture is the most significant pressure impacting over 1000 waterbodies, followed by hydromorphological pressures (physical changes to habitat conditions), forestry and urban wastewater."*

It is further noted *that "the main issue is nutrient pollution (nitrogen and phosphorus) from agriculture and urban wastewater. Physical changes to the habitat conditions (referred to as morphology) of a waterbody is the second most prevalent issue impacting on water quality. Organic pollution (ammonia and high biological oxygen demand), typically associated with insufficient wastewater treatment and/or farmyard effluents is the third most significant issue."*

The Early Insights Nitrogen Indicator report found that average nitrogen concentrations rose 16% in the first half of 2025 compared with the same period in 2024, and levels—especially in the south and southeast—remain too high to meet water quality objectives[53].

5.3.4.2 Industrial Emissions to Water

Emissions to water from EPA-licensed facilities represents a small proportion of overall emissions to water that are routinely monitored. The EPA SOER 2024 states that in 2022, 41 industrial sites were identified as placing significant pressures on water quality, representing less than 5% of all EPA-licensed industry in Ireland. Of these sites, 14 were exerting significant pressure on surface water quality, 24 on groundwater quality, and three on both surface and groundwater quality. The EPA has formulated site-specific enforcement plans for these locations, which are spread across 20 different counties.

The majority of direct reported releases from licensed industrial sources to water/urban wastewater releases comprise heavy metals. Indirect sources generally comprise chlorinated discharges. Levels of heavy metal releases have been steadily decreasing over the last decade, from a high of 20,000 kg/year in 2007, with a further significant drop from 2015, down to around 4,600 kg/year in 2017. This was achieved through licence reviews conducted by the EPA which ensured greater compliance with the Surface Water Regulations (S.I. No. 272/2009), as amended, and reflects improvements.

[52] EPA Presentation Update on Pressures Impacting Water Quality, May 2024

[53] EPA (2025) Early insights indicator report: Nitrogen concentrations in selected major rivers, January-June 2025. Available at: https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/early-insights-indicator-report-nitrogen-concentrations-in-selected-major-rivers-january-june-2025.php

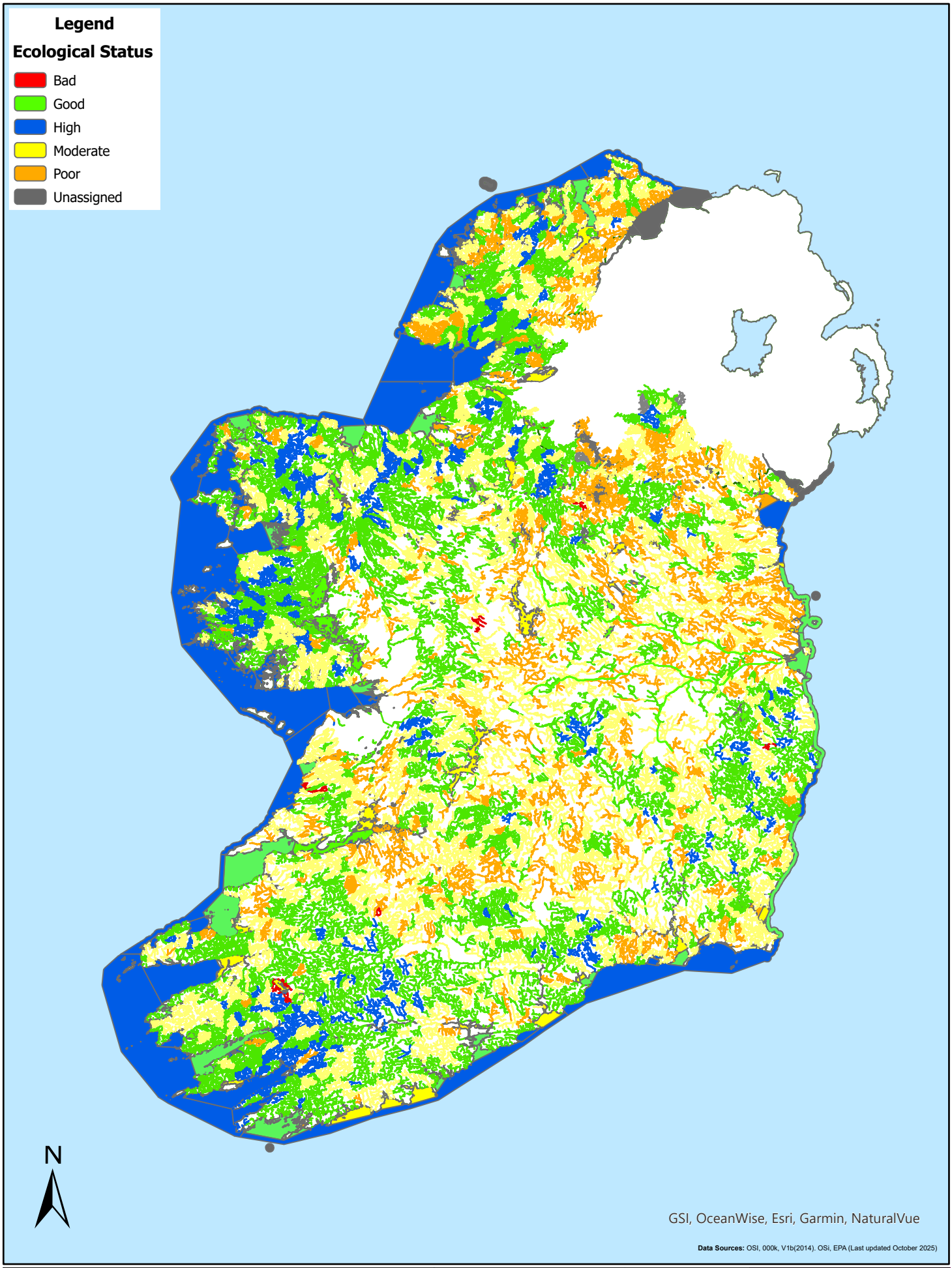

Figure 5-8
WFD Ecological Status (2019-2024) for Surface Water Bodies

Project	National Bioresources Strategy
Client	Uisce Éireann Irish Water

RPS A TETRA TECH COMPANY
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.

Tel: +353 (0) 1 488 2900
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

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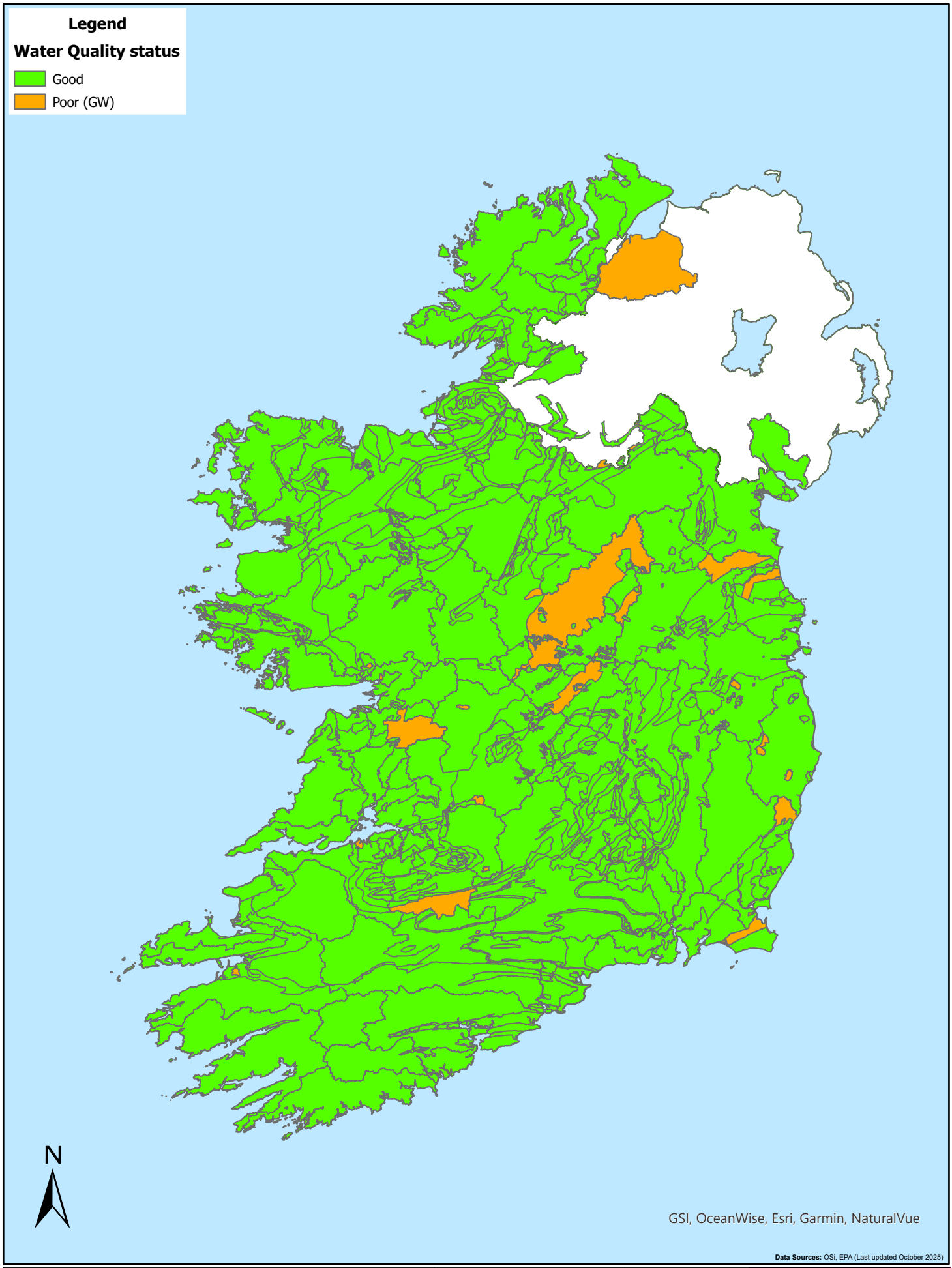

Figure 5-9
WFD Ecological Status (2019-2024) for Ground water bodies

Project
National Bioresources Strategy

Client
Uisce Éireann
Irish Water

RPS
A TETRA TECH COMPANY
West Pier Business Campus,
Dun Laoghaire,
Co Dublin, Ireland.

Tel: +353 (0) 1 488 2900
Email: ireland@rpsgroup.com
Web Page: rpsgroup.com/ireland

Issue Details

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Scale: 1:2,200,000 @ A4	

5.3.4.3 Environmental Incidents

EPA states that discharge of inadequately treated wastewater into the environment is the most common type of environmental incident in Ireland. Uisce Éireann reported 1,080 short duration or once-off incidents during 2024 Additional 263 ongoing or recurring incidents were reported at the end of 2024 resulting from delays in repairs/upgrades, as shown in **Figure 5-10**.

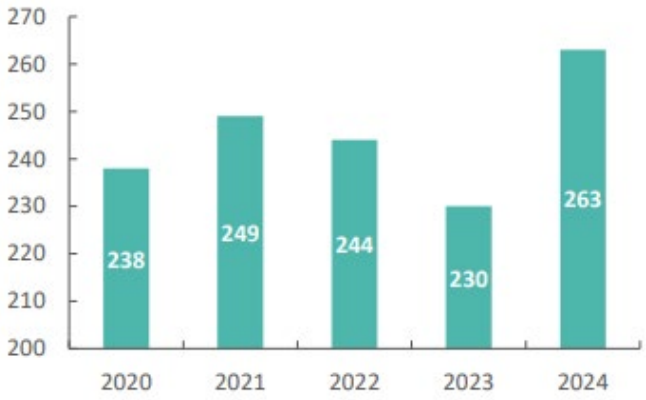


Figure 5-10: Number of Recurring Environmental Incidents at the End of Each Year Flood Risk

(Source: EPA 2025[Error! Bookmark not defined.])

Flood risk presents two issues in relation to sludge and bioresource management activities. Firstly, it can negatively impact on the operation of activities due to flooding of sites/facilities which are used for sludge processing and treatment or farmlands which are used for biosolids application. Secondly, flood waters may contain contaminants in the form of litter, leachate and other chemicals mobilised where flooding has inundated a farm.

Floods are a natural and inevitable part of life that pose a risk to human life and well-being, property and the environment, but climate change is contributing to increased events such as rising sea levels, coastal erosion, storm surges, etc. The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive (2007/60/EC) which is being carried out through the Catchment-based Flood Risk Assessment and Management Studies (CFRAMS). The OPW undertook Preliminary Flood Risk Assessments to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, 29 Flood Risk Management Plans (FRMPs) were developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The FRMPs that were developed were published in early 2018 and flood extent mapping is available on the OPW's dedicated flood map viewer.[54] In addition, in 2009 *The Planning System and Flood Risk Management Guidelines for Planning Authorities* were published (DHLGH, 2009)[55], which ensures that flood risk assessment and management is incorporated within the planning system.

Groundwater flooding can also be a serious issue and occurs when the water table rises above the level of the land, which results from the natural subsurface drainage system being unable to drain away rainfall quickly enough. Following the most significant groundwater flooding event to have occurred in Ireland over the winter of 2015/2016, the GSI in collaboration with Trinity College Dublin and Carlow Institute of Technology undertook the GWFlood Project. The project aims to help fill the data gaps around understanding the issue of groundwater flooding with the outputs being a project report plus a national data viewer showing historic and predictive groundwater flood maps, as well as live groundwater hydrometric data.[56]

[54] OPW Flood Maps Viewer: http://www.floodinfo.ie/map/floodmaps/

[55] *The Planning System and Flood Risk Management Guidelines for Planning Authorities,* November 2009' [DEHLG (renamed as DHLGH) / OPW] and Circular PL02/2014 (August 2014) referred to hereafter as 'The Guidelines'.

[56] GWFlood Data Viewer: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc

5.3.4.4 Existing Environmental Pressures/ Problems: Water

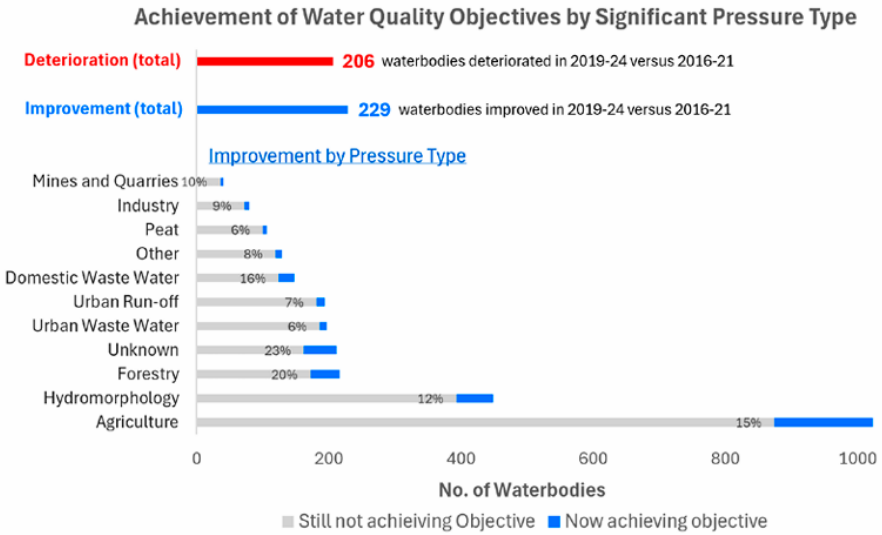
Clean water is important to a population's general health. Ireland has in general good drinking water quality and consequently the health of the population benefits from clean water. There are many potential contaminant sources that pose a risk to Ireland's clean water supply. The main potential risks to human health from water-based contaminants include biological sources (verotoxigenic *E. coli* [VTEC], *Cryptosporidium* etc.) and chemical sources (fertilisers, pesticides, herbicides, trihalomethanes, heavy metals and pharmaceuticals etc.).

The EPA SoER 2024 states that key water quality issue arising from wastewater sludge and bioresource management is the emerging contaminant losses in runoff to waters. Applying biosolids to soil can lead to an accumulation of soil test phosphorus, which may result in persistent phosphorus losses in runoff (EPA 2017, Gerba and Smith 2005)[57]. Additionally, dissolved reactive phosphorus can leach from agricultural systems into shallow groundwater and, if there is connectivity, can impact surface water quality over extended periods (Schulte et al., 2010; Fenton et al., 2011; Galbally et al., 2013)[57]. There is also a potential for transfer of metals into water bodies, soil structures and, consequently, the food chain (Navas et al., 1999) [57].

In Cycle 3 of RBMP, of the 334 monitored high status waterbodies, 260 water bodies did not change ecological status since the last assessment, 44 declined in status and 30 waterbodies have improved status. This represents an overall net decline of fourteen water bodies or 4.2% of the high-status objective river water bodies over 2019-2024 assessment period**Error! Bookmark not defined.**.

The key pressures on water bodies continues to be agriculture (surplus nutrient leaching, run-off and sediment, point pressures such as farmyards), followed by hydromorphological issues (e.g. land drainage, channelisation), urban wastewater discharges and forestry, as well as 'other' pressures. There were 142 fish kills recorded, an average of 24 per year, from 2019 to 2024. The number of fish kills are also reflective of levels of pollution and sensitivity to the effects of climate change; the 21 fish kills recorded in 2022 out of which 2 kills were reported to have been caused by agricultural practice[58].

Sixteen percent of monitored river water bodies are in poor or bad status and are severely polluted. For those surface water bodies at risk of not achieving their WFD objectives, the significant pressures are outlined in **Figure 5-11**.



(Source: EPA 2025**Error! Bookmark not defined.**)

Figure 5-11: Sources of Significant Pressures on At Risk Surface Water Bodies

[57] EPA 2017. Research 200: Health and Water Quality Impacts Arising from Land Spreading of Biosolids. Available at: https://www.epa.ie/publications/research/land-use-soils-and-transport/research-200-health-and-water-quality-impacts-arising-from-land-spreading-of-biosolids.php Accessed: February 2026

[58] IFI 2024. Fish Kills in Ireland. Available at: https://opendata-ifigeo.hub.arcgis.com/

5.3.5 Air Quality and Climatic Factors

5.3.5.1 Ambient Air Quality in Ireland

Clean air is important to a population's general health. Ireland has in general good air quality and as such the population receives a health benefit from having access to clean fresh air. At a national scale, Ireland has good air quality which is consistently rated among the best in Europe. This is due largely to the prevailing clean westerly airflow from the Atlantic and the relative absence of large cities and heavy industries.

For ambient air quality, the EPA report *Air Quality in Ireland 2024* (EPA, 2025)[59] states that in 2024, measured particulate matter PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone, dioxins, polycyclic aromatic hydrocarbons (PAH), and all other monitored pollutant concentrations were all below their individual limit and target values as set out in the EU CAFE Directive (2008/50/EC) and Fourth Daughter Directive (2004/107/EC); refer to **Table 5-4**. In December 2026, the EU Air Quality Directive will be transposed into Irish legislation. This will implement new pollution control measures and set out requirements for air quality modelling, in addition to introducing the monitoring of ultrafine particles and black carbon.

Table 5-4: Selected Pollutants measured in 2024 and their adherence to EU legal limit values

Pollutant	Number of stations where parameter monitored in 2024	Compliance with EU limit values
PM_{10}	107	No exceedance
$PM_{2.5}$	103	
NO_2	37	
Ozone (O_3)	23	
Sulphur dioxide (SO_2)	15	
PAHs	5	
Heavy metals	5	
Dioxins	22	

(*Source: EPA, 2025*)

5.3.5.2 Other Transboundary Issues

The Gothenburg Protocol to abate acidification, eutrophication and ground-level ozone was adopted in 1999. It sets out national ceiling limits up to 2020 for four key transboundary pollutants. The EU adopted its provisions as part of the National Emissions Ceiling (NEC) Directive (2001/81/EC). The revised NEC Directive (2016/2284/EU) requires Ireland to limit the annual national emissions of the following transboundary pollutants: sulphur dioxide (SO_2), nitrous oxide (N_2O), non-methanogenic volatile organic compounds (NMVOC), ammonia (NH_3) and fine particulate matter ($PM_{2.5}$). Ireland's emission ceilings under the first NEC Directive applied until December 2019 with reference to 2005 as the base year. Article 4(1) and Annex II of the revised directive then sets out new reduction commitments for the aforementioned, which applies from 2020 to 2029, and from 2030 onwards; see **Table 5-5**.

The EPA report *Ireland's Air Pollutant Emissions 2023 (1990-2030)* (EPA, 2025) outlines the current levels. Note that Ireland is utilising reporting flexibilities under the revised NECD for Nitrous Oxide and NMVOCs. Unadjusted, emissions of these pollutants have exceeded the 2020 limit every year since 2010. The adjustments mean Ireland has been meeting the 2020 target since 2011, however further action is needed to ensure Ireland can meet the more stringent 2030 commitments.[60]

[59] EPA 2025. Air Quality in Ireland 2924. Available at: https://www.epa.ie/publications/monitoring--assessment/air/EPA-Air-Quality-in-Ireland-Report-2024-FLAT.pdf

[60] EPA (2024) Ireland's Air Pollutant Emissions 2023 (1990-2030). Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/Ireland's-air-pollutant-emissions-2022-1990-2030.php

Table 5-5: Ireland's Actual Emissions for 2023, projected emissions for 2025 and 2030 and Reduction Commitments for NEC relevant Pollutants

Pollutant	Emissions (Kilotonnes)			2020-2029 and 2030 Reduction Commitments (% reduction compared with 2005 levels) based on latest inventory estimates	
	2023	2025	2030	2020-2029	2030
Total SO_2	7.3	7.57	7.19	-65%	-85%
Total Nox	59.02	43.73	32.08	-49%	-69%
Adjusted NMVOC*	40.40	41.85	42.92	-25%	-32%
Total NH_3	116.36	110.10	111.05	-1%	-5%
Total $PM_{2.5}$	9.31	9.53	10.01	-18%	-41%

**Article 4(3) of the National Emission reduction Commitments Directive provides that emissions of NOx and NMVOC from categories 3B (manure management) and 3D (agricultural soils) are not accounted for the purpose of complying with 2020 and 2030 emission reduction commitments.*

Note: These are the projected emissions with the With Additional Measures (WAM) scenario, which includes the implementation of additional planned policies and measures such as the Climate Action Plans and AgClimatise.

SO_2 emissions from Ireland have seen a generally consistent downward trend since 1990 and have been compliant with the NECD for all years since 2010. The main sources are combustion related, originating from the sulphur found in fossil fuels such as gas and oil (15.1 % and 51.2% of Ireland's energy use, respectively[61]). They come predominantly from the residential/ commercial sector (66.7%) and the industrial sector (18.7%). Emissions are projected to reduce even further to 2030, totalling a 90.3% reduction since 2005. Emissions of Nitrous Oxide contribute to acidification of soils and surface waters, tropospheric ozone formation and nitrogen saturation in terrestrial ecosystems. Nitrous Oxide emissions originate from manure management, agricultural soils and fuel combustion. Transport is the largest contributor to NOx (38.1%), with agriculture also contributing greatly (34.9%). NOx emissions have decreased by 7.4% in 2023 from 2022 and are predicted to continue decreasing, and projections are compliant with emission reduction commitments.

Following the submission of the 2020 inventory in 2022, Ireland was served with an infringement notice by the European commission for non-compliance with the established emission reduction commitment in January 2023 and a reasoned opinion in November 2023 for ammonia. EPA reported in its submission to UNECE that agriculture is the largest source of ammonia in Ireland with a share of 99.4% of the national total in 2022[14]. Emissions in 2023 were 4.1% lower than in 2022. The emission trend for ammonia from agriculture over the period of 1990-2030 has been shown in **Figure 5-12.** Additional Measures are required for Ireland to meet the ammonia 2030 Emission reduction Commitment.

Figure 5-13 shows the current projections in NH_3 emissions based on the latest National Air Pollution Control Programme Report (May 2024). As is apparent from **Figure 5-13**, the gap to compliance throughout both periods under Directive 2016/2284 is projected to remain tight. NH_3 will remain a concern due to this small gap to compliance and the extent of the policy challenge required to achieve the actions projected in these scenarios across a large multi-agent sector such as agriculture[62].

[61] Central Statistics Office (2025) Environmental Indicators Ireland 2025 – Economy, Emissions and Energy. Available at: https://www.cso.ie/en/releasesandpublications/ep/p-eiieee/environmentalindicatorsireland2025economyemissionsandenergy/energy/. Accessed February 2026

[62] www.gov.ie/pdf/?file=https://assets.gov.ie/292729/4dafb6cc-cdb0-4770-9a9f-bcd537cd74a2.pdf#page=null

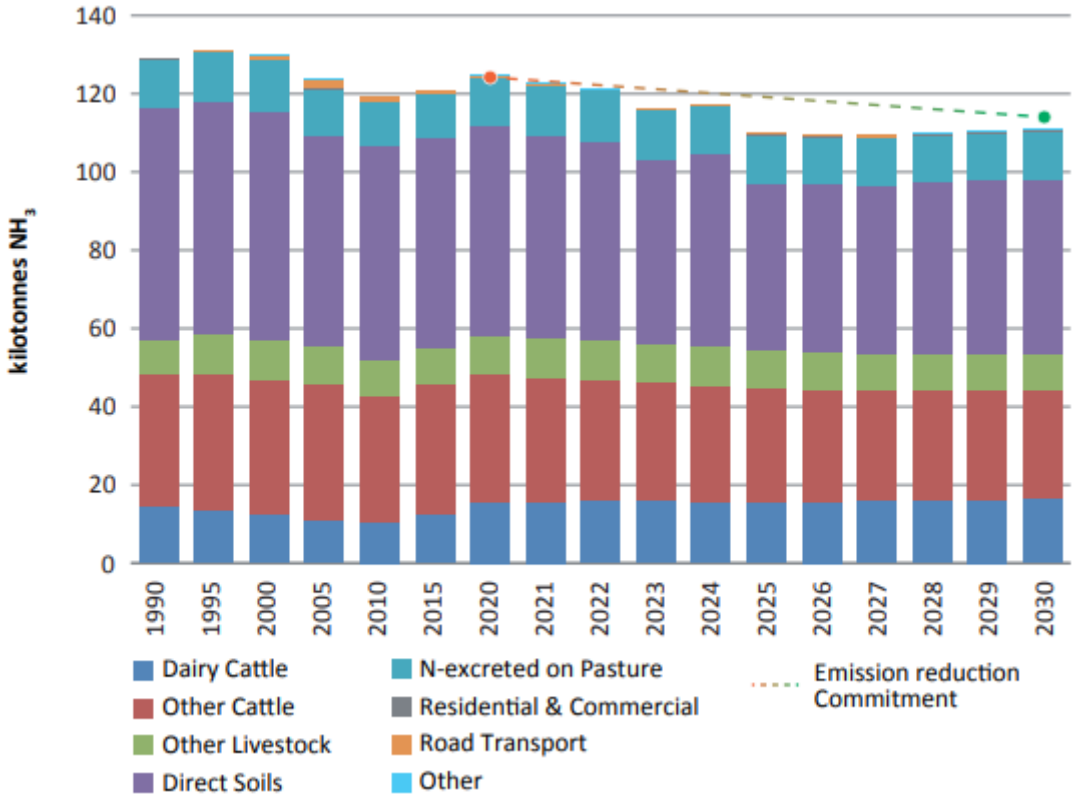
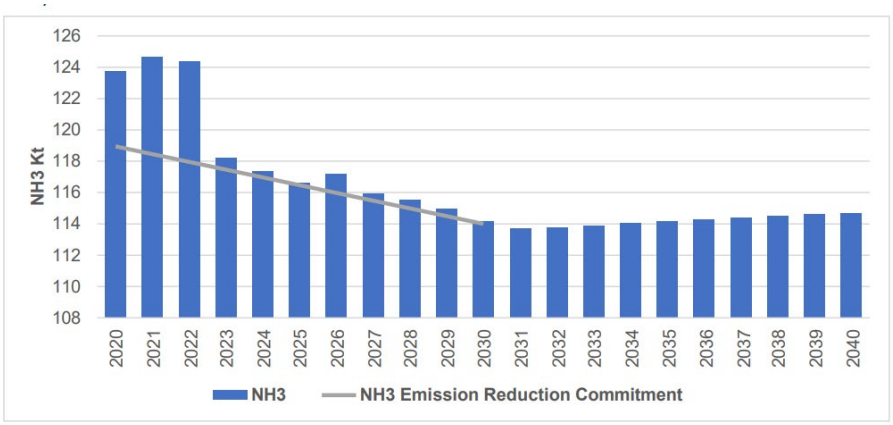


Figure 5-12: Trend in ammonia emissions 1990-2030 (WAM) and emission reduction commitments[73]



(based on EPA 2023)

Figure 5-13: 2023 Inventory, Projections (WEM) and NECD Obligation – NH3 in kt

Non-methane volatile organic compounds (NMVOCs) are emitted as gases from the storage of animal manures and fertilisers in agriculture, and from the food and drink industry. NMVOCs contribute to the formation of ground level (tropospheric) ozone, with some species such as benzene and 1,3 butadiene being directly hazardous to human health. NMVOC emissions are 34.7% lower than 1990. Agriculture is the largest source accounting for 39.8%. Production of food and beverages (beer and spirits) accounts for 27.7%.

PM is ubiquitous and there are many sources of dust including vehicle exhausts, surfaces such as soils and roads, industry emissions, construction activities as well as formation from reactions between different pollutant gases. PM_{10} (dust particles with a diameter less than 10 µg) is small enough to be inhaled into the lungs however fine particulate matter ($PM_{2.5}$, diameter less than 2.5 µg) is considered a better measure of anthropogenic sources of particulate matter. The main source of particulate matter $PM_{2.5}$ is combustion of fuels in the residential & commercial sectors (47.7%). The construction industry contributed 12.7% of $PM_{2.5}$.

Fuel switching from coal and peat to oil and natural gas has resulted in a significant reduction in emissions. However, localised air quality issues exist, which must be addressed.

5.3.5.3 Climate

Greenhouse Gas Emissions

Greenhouse gases (GHGs) in the atmosphere are rising as a result of human activity, in particular the burning of fossil fuels for heating, energy and transport, in addition to other activities such as agriculture, the residential and commercial sectors, as well as waste.

The EPA in its report, Ireland's Final Greenhouse Gas Emissions 1990-2023 (April 2025)[63] stating Ireland's GHG latest emissions data. Ireland's national emission reduction objectives as set in the Climate Action and Low Carbon Development (Amendment) Act 2021, are to achieve a 51% emissions reduction (including LULUCF) by 2030 compared to 2018 and achieve a climate neutral economy by no later than the end of 2050. There are also annual binding emission allocations over the 2021-2030 period to meet that target. The EPA reported that for 2022, total national GHG emissions (excluding LULUCF) are estimated to have decreased by 6.8% on 2022 levels to 54.93 million tonnes carbon dioxide equivalent (Mt CO_2eq).

The European Union's Effort Sharing Regulation (EU 2018/842) sets 2030 targets for emissions outside of the Emissions Trading Scheme (known as ESR emissions) and annual binding national limits for the period 2021-2030. The ESR encompasses the sectors outside the scope of the EU Emissions Trading System (ETS) (such as Agriculture, Transport, Residential, Public Services and Commercial Services and Waste). Ireland's target is to reduce GHG emissions by at least 42% by 2030 compared with 2005 levels, with a number of available flexibilities. Ireland's ESR emissions annual limit for 2023 is 40.52 Mt CO2eq and it is reported that Ireland's 2023 greenhouse gas ESR emissions are 42.72 Mt CO2eq[64].

Agriculture is the largest contributor to the overall emissions at 37.7% of the total (excluding LULUCF). Transport and Energy Industries are the second and third largest contributors at 21.5% and 14.3% respectively. Residential and *Manufacturing Combustion* emissions account for 9.7% and 11.5% respectively. These five sectors accounted for over 90% of national total emissions in 2023. Wastewater treatment and discharge falls under the waste sector and this sector also includes solid waste disposal, composting, waste incineration and open burning of waste. The GHG emissions from waste sector were recorded at 1.5% in 2023[64]. The largest contributor to GHG emissions amongst these is the solid waste disposal due to methane emissions.

Decreases in emissions were observed in the three largest sectors except for transport, waste and commercial services in 2023, with increases in emissions of +6.0%, +4.9% and +0.2%, respectively. This has slightly improved with only transport and LULUCF sectors with increased emissions 0.3% and 40.9% respectively; refer to **Table 5-6.**

Table 5-6: Emissions Changes 2022 – 2023

Sector, Mt CO_2 eq		2022	2023	% Change
Agriculture		21.795	20.782	-4.6%
Transport		11.760	11.791	+0.3%
Energy Industries		10.003	7.845	-21.6%
Residential		5.753	5.346	-7.1%
Manufacturing Combustion		4.334	4.133	-4.6%
Industrial Processes		2.288	2.155	-5.8%
F-Gases		0.741	0.699	-5.7%
Commercial Services		0.741	0.699	-2.5 %

[63] EPA (April 2025 Ireland's Final Greenhouse Gas Emissions 1990- https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/EPA-Final-GHG-Report-Final.pdf

[64] EPA (July 2024) Ireland's Provisional Greenhouse Gas Emissions 1990-2023. Available at: https://www.epa.ie/publications/monitoring--assessment/climate-change/air-emissions/irelands-provisional-greenhouse-gas-emissions-1990-2023.php

Sector, Mt CO_2 eq		2022	2023	% Change
Public Services		0.696	0.677	-2.7%
Waste		0.881	0.846	-4.0%
LULUCF		3.983	5.614	+40.9%
Total excluding LULUCF		**59.003**	**55.007**	**-6.8%**
Total including LULUCF		**62.986**	**60.620**	**-3.8%**

Source: *EPA – Latest Emissions Data Latest emissions data \| Environmental Protection Agency (epa.ie) Note: The Latest Emissions Data page presents final 1990-2023 Inventory data (updated July2024) and the EPA's latest 2023-2030 projections estimates (updated May 2024)*

Indirect Emissions from Wastewater Sludge and Bioresource Management

Transportation is a significant aspect of wastewater sludge and bioresources management in terms of environmental impacts. From 1990 to 2023, the transport sector experienced the largest rise in GHG emissions, surging by 129.2% from 5,143.3 kt CO2 eq to 11,790.8 kt CO2 eq. Notably, road transport alone witnessed an increase of 133.6%. In 2023 the transport sector accounted for 21.4% of Ireland's total GHG emissions. The extent of emissions from sludge management depends on the distance travelled to transport sludge and the fuel used for transport. There is a potential for 'fugitive' methane losses from biogas production during the anaerobic digestion (AD) process. This methane is lost to the environment due to 'leakage' in the AD process and is, therefore, not available for energy production.

5.3.5.4 Noise

Regulation of noise comes under the remit of the Environmental Noise Directive [END] (2002/49/EC), with the requirement for Member States to produce noise maps and compile noise action plans based on those maps. END was transposed into Irish law through the Environmental Noise Regulations 2018 (S.I. No. 549/2018).

Exposure to noise is recognised as being both an environmental pressure to wildlife as well as human beings and can affect human health and general well-being by causing stress, anxiety and disruption of activities (e.g. sleep). Exposure to excessive noise has also been linked to an increased risk of heart attack, stroke and premature death. People generally are exposed to the most noise from transport-related sources, particularly road traffic. Airports, railways and industrial activities are the other major sources of noise. Urban areas can exacerbate the impacts of noise to human health, in particular because air pollution levels are often higher, creating in-combination effects. Ireland currently has no large industrial facilities that fall under the remit of END.

5.3.5.5 Environmental Pressures/ Problems: Air Quality and Climatic Factors

In general, Ireland has good air quality and generally meets its EU emissions limit values. However, pollutant monitoring indicates that exceedances are occurring of the stricter WHO guideline values, e.g. fine particulates and ground-level ozone, indicating that air quality problems may be more widespread in Ireland than previously thought.

Increasing population and the demand for electricity, heating fuels, construction materials and vehicle ownership are some of the national drivers for air emissions in Ireland. Ireland also has a large agricultural and food export industry, which is the driver for 99.4% of Ireland's ammonia emissions.

GHG emissions in Ireland are also showing a declining trend with per capita emissions decreased from 11.4 tonnes CO2eq/person in 2022 to 10.4 tonnes CO2eq/person in 2023[65]. However, Ireland continues to have one of the highest per capita emissions in Europe. These emissions have decreased by 1.2% since 1990.

Under the European Union's Effort Sharing Regulation (EU 2018/842), Ireland's target was recently amended to reduce ESR emissions by 42% by 2030 compared with 2005 levels, with a number of flexibilities

[65] EPA (2025) Climate Change Monitoring Assessment Latest Emissions Data. Available at: https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/ Accessed: February 2026

available to assist in achieving this. The ESR includes the sectors Transport, Residential, Public Services and Commercial Services and Waste.

EPA's GHG emissions inventory data from 2024 shows that Ireland's provisional GHG emissions for 2023 are 42.79 Mt CO_2eq which is 2.27 Mt CO_2eq more than the Ireland's annual limit of 40.52 Mt CO_2eq for 2022[80]. This national value does not consider the stationary combustion and aviation operators that are within the EU's emissions trading scheme. This indicates that Ireland is not in compliance with its 2023 Effort Sharing Regulation annual limit. The data reveals an exceedance by 0.36 Mt CO_2eq after using the ETS flexibility. Agriculture and Transport accounted for 76% of total ESR emissions in 2023.

Climate change is challenging for Irish agriculture both in the context of greenhouse gas emissions and the need for adaptation of farming practices to be more resilient to the impacts of climate change. In Ireland the Agriculture sector was directly responsible for 37.7% of national GHG emissions in 2022, mainly methane from livestock, and nitrous oxide due to the use of nitrogen fertiliser and manure management. GHG emissions are projected to increase with expansion of animal numbers, however, technologies to reduce emissions are being introduced including low emission slurry spreading and stabilised urban fertilisers. Notwithstanding that, the percentage of emissions resulting from reuse of biosolids in agriculture is minimal in comparison to livestock and manure management sources.

In terms of transboundary emissions, Ireland is failing to meet EU targets on ammonia emissions under the National Emissions Ceiling (NEC) Directive, of which agriculture is the main source. Progress is mixed progress in terms of reducing emissions from other sectors such as transport and energy. Measures at a national level are required to tackle this and improve the outlook, however even with projections looking at scenarios with additional measures applied, some transboundary pollutants are projected to remain above the 2030 ceiling limits (NMVOCs and NH3), while Nitrous Oxide is projected to just meet its 2030 limit. Ammonia emissions from agriculture are also a national as well as a transboundary issue (particularly for sensitive habitats where atmospheric deposition can cause impacts). However, ammonia emissions from biosolids reuse are very small in absolute terms compared with other agricultural sources, notably livestock systems and synthetic-fertiliser practices. With climate change come a host of environmental impacts such as changes to precipitation patterns which can result in increased intensity or duration of events. This also has implications for flooding and land drainage capacity, as well as seasonal flows, surface-groundwater interactions and the adequacy of water supply for abstraction.

The agriculture sector overall has a critical role to play in achieving national ambitions, including the implementation of the National Planning Framework, the Climate Action Plan, assisting economic recovery and a transition to a circular and resource efficient economy, supporting rural development, and reducing Ireland's emissions in every sector to meet our climate commitment to net-zero greenhouse gas emissions by 2050. The Climate Action and Low Carbon Development (Amendment) Act 2021 sets Ireland on the path to a 51% reduction in emissions by the end of this decade and to net-zero emissions no later than 2050.

The issues for air quality and climatic factors and the wastewater sludge and bioresource management therefore relate to:

- Impact of carbon emissions from transportation of treated sludge;
- Cumulative impacts of biosolids reuse with existing significant agri-sector sources and
- Climate change mitigation and adaptation, including to effects from severe weather events including droughts, frequent flooding and increased precipitation that can influence land spreading of biosolids.

5.3.6 Material Assets

There is no clear definition of material assets under the SEA Directive, or indeed the EIA Directive. Material assets primarily relate to the infrastructural assets that enable an area or a state to function as a place to live and work and can be taken to be infrastructure including settlements (towns and villages etc.), transport and utilities. It typically overlaps with other areas such as population, climate, land and soils etc. Natural resources such as land use and soils also have material asset value and are covered in **Section 5.3.3**.

5.3.6.1 Water Supply and Wastewater

Water supply

The EPA Drinking Water Quality in Public Supplies Report published in 2025, reported that over 99.8% of public water supplies complied with bacterial and chemical limits but 497,000 people were served by "at-risk"

supplies on the EPA's Remedial Action List (RAL), down from 561,000 people in 2022; this increase was mainly due to the presence of persistent trihalomethane (a byproduct of water treatment processes). The latest version of the RAL was published in Q2 2025[66]; 42 drinking water supplies across the country require some form of remedial action/ treatment improvement related to e.g., inadequate disinfection, inadequate treatment for *Cryptosporidium*, elevated trihalomethanes, elevated pesticides, turbidity etc. The counties with a water supply or supplies currently on the RAL are: Carlow, Clare, Cork, Donegal, Galway, Kerry, Kildare, Kilkenny, Limerick, Longford, Louth, Mayo, Meath, Monaghan, Offaly, Tipperary, Waterford, and Wexford.

In addition to the challenge of providing new infrastructure to service the growing population, the ageing infrastructure is a big challenge for water services sector with the average of water mains being 65 to 85 years old in comparison to the EU average of 36 years.

Uisce Éireann is committed to the Drinking Water Safety Plan approach. Uisce Éireann latest report shows they have substantially completed DWSPs for 225 water supply zones (from 212 in 2022) which supply 85% of consumers (almost 3 million people).[67]

Wastewater Treatment and Management

Uisce Éireann reports that currently 1.2 billion litres of wastewater from homes and businesses are collected through 26,000 kilometres of sewers. About 60,000 TDS/year of wastewater sludge and bioresources are treated ensuring appropriate environmental standards prior to reutilising it in agriculture.

Outside of the urban wastewater treatment regime, septic tanks and other domestic wastewater treatment systems are used by rural homeowners to treat wastewater from their homes. There are nearly half a million of these systems in Ireland and the majority are septic tank systems, with some more complex filter systems and mechanical treatment plants.

The total sludge generated during 2023 accounted for 58,964 tonnes dry solids (TDS). This was treated and 53,244 TDS was used as a fertiliser on soil and agricultural land and the remaining 5,720 TDS was sent for composting. The amounts of sludge that was subjected to composting was ultimately spread on agricultural lands as well.

5.3.6.2 Transportation of Treated Sludge

Transportation is a significant aspect of wastewater sludge and bioresources management in terms of environmental, social, and financial impacts. In Ireland, approximately 75% of the WWTPs are small with less than 2000 P.E, where the costs for transporting sludge accounts for a large proportion of total treatment costs. The cost for sludge transport ranges from approximately €10 to €25 per wet tonne, with 1 tonne approximately equal to 1m^3 of liquid sludge and can vary depending on the WWTP location. The current annual transport cost is approximately €16 million.

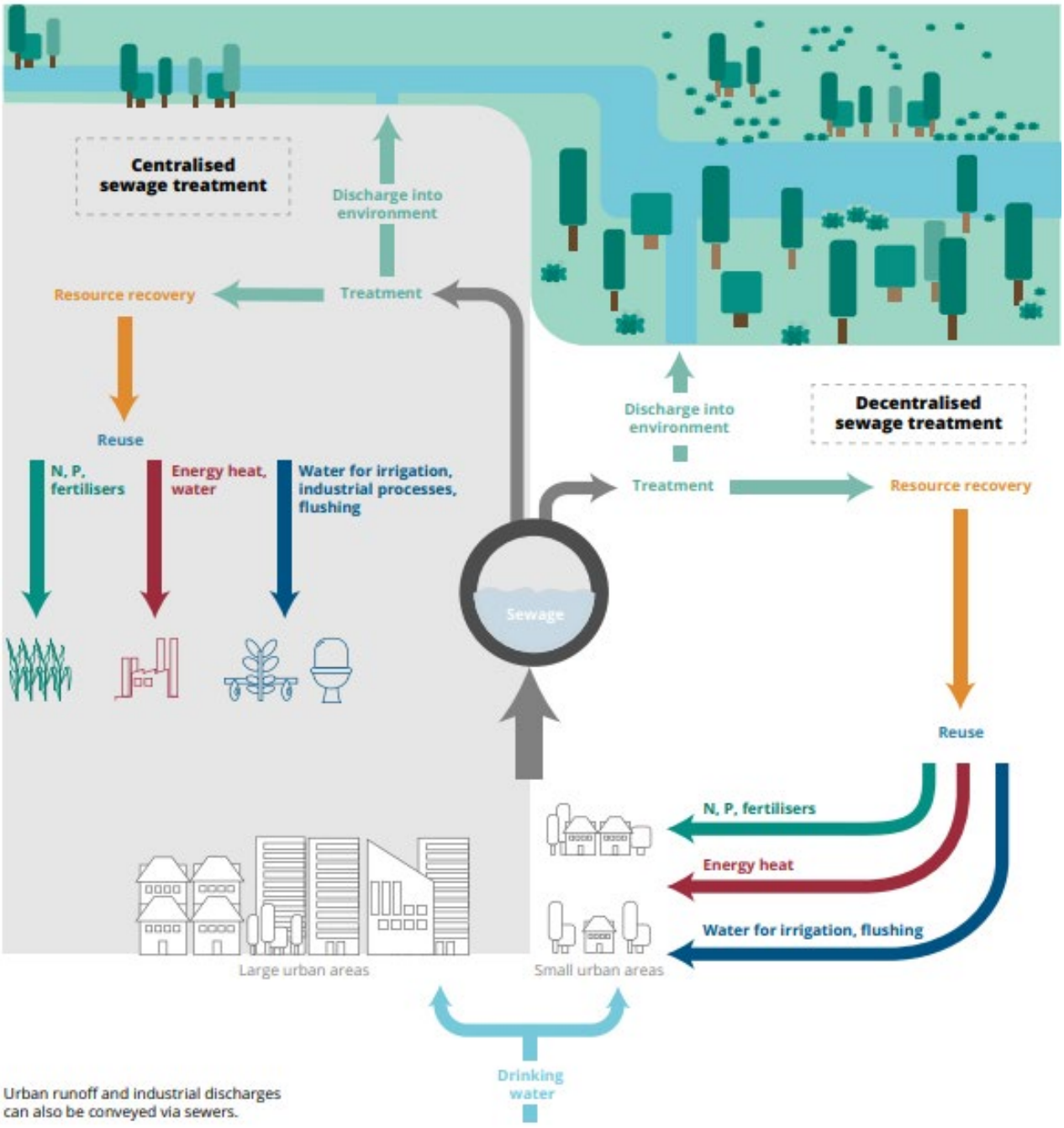
5.3.6.3 Circular Economy and Wastewater Management Activities

The current outlet for wastewater sludge is almost exclusively agriculture, however this is coming under increasing pressure and the existing landbank available to Uisce Éireann for land spreading of sludge is likely to reduce. While alternatives do exist for reuse and recovery of sludge, the majority are still at a small scale in Ireland. An EEA report titled "Beyond water quality- sewage treatment in circular economy" states that UWWTPs can act as 'resource hubs' essential for resource recovery in addition to waste management. Reclaimed water, energy, nutrients and organic materials all have proven potential for reuse, recycling and recovery.[68] The Urban Waste-water Treatment Directive that was revised in 2024 requires Member States to incorporate principles of energy neutrality and circular economy in addition to net-zero principles in wastewater treatment and management activities. **Figure 5-14** provides an overview of implementing principles of circularity in sewage treatment process.

[66] EPA (2025) Available at: https://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/Q2-2025-RAL-for-web.pdfAccessed February 2026

[67] EPA (2025) Drinking Water Quality in Public Supplies 2024. Available at: https://www.epa.ie/publications/compliance--enforcement/drinking-water/annual-drinking-water-reports/FINAL-EPA_DrinkingWaterQualityinPublicSupplies2024-v1.4.pdf

[68] EEA (2022). Beyond water quality —Sewage treatment in a circular economy. Available at: https://www.eea.europa.eu/en/analysis/publications/beyond-water-quality-sewage-treatment/beyond-water-quality-sewage-treatment



(Source: EEA, 2022 Figure ES168)

Figure 5-14: Implementing Circularity in Sewage Treatment

Nutrient Recovery

The recovery and reuse of phosphorus which was identified as a finite critical resource by the Commission in 2014[69] is considered as a high priority. There are a number of existing recovery processes but these are not

[69] EC, (2014), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the review of the list of critical raw materials for the EU and the implementation of the Raw Materials Initiative (COM/2014/0297). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0297 Accessed: February 2025

cost-effective. Phosphorus can be recovered from sewage sludge in the form of struvite based on the precipitation of phosphorus minerals.

The Ringsend Phosphorus Fixation Plant as a part of the Ringsend WWTP Upgrade Project is the first of its kind in Ireland where phosphorus is recovered from liquors generated from the dewatering of sludges. Murphy Ireland is operating the facility for a one-year period. It is also the largest phosphorus recovery plant in Europe by reactor volume. It utilises Ostara's WASSTRIP® technology that recovers phosphorus and nitrogen (in the form of ammonia) from water streams as a magnesium ammonium phosphate (struvite) precipitate. This is then used as a sustainable fertiliser product called Crystal Green which is insoluble in water and is sold globally to markets including those for turf, ornamental and agriculture. Biological treatments such as Nereda and Enhanced Biological Phosphorus Removal (EBPR) are planned to be introduced in phased upgrades, saving up to 50% of the energy costs in future.[70]

Energy Generation

Sewage sludge has the potential to be used for generating heat and power (Capodaglio and Olsson, 2019[71]). Energy recovery of the chemical, thermal and hydrodynamic energy contained in sewage can provide electricity, biogas, steam and hot water. At the WWTPs in Ireland, where anaerobic digestion occurs, the biogas produced is converted into heat and electricity and reused within the WWTPs in a sustainable manner. Biogas typically comprises 60% methane and 40% carbon dioxide. When biogas is upgraded to greater than 97% purity methane, it is termed biomethane. In Ireland there are currently two operational biomethane facilities that can inject methane into the national grid and 43 facilities that produce biogas**Error! Bookmark not defined.**.

5.3.6.4 Existing Environmental Pressures/ Problems: Material Assets

Increased development including residential, agricultural and industrial expansion continues to put pressure on existing water sources with regards to quantity as well as on the treatment facilities used to treat both drinking water and wastewater. This is particularly true given the planned intensification of agricultural activities, as well as increased loadings to wastewater treatment facilities as the population continues to grow. The impact of municipal wastewater discharges remains a significant pressure impacting on water bodies, from inputs of nitrogen and phosphorus causing eutrophication. Inadequate treatment in terms of infrastructure (or lack thereof), insufficient treatment capacity, or the level of treatment carried out, all contribute to contamination of receiving waters.

The key issues for material assets and the wastewater sludge and bioresource management, therefore, relate to:

- Challenges related to phosphorus recovery and its scalability in WWTPs across Ireland;
- Availability of sufficient storage facilities for biosolids during winter months;
- Resilience of water and wastewater infrastructure towards climate change;
- Sustainable use of bioresources; and
- Planning and development.

5.3.7 Cultural Heritage

The main issue for cultural heritage associated with the implementation of the draft Strategy is the resulting potential for both direct and indirect impacts on archaeological and architectural features and their settings as a result of siting of wastewater treatment infrastructure.

5.3.7.1 Overview of Cultural Heritage Protection in Ireland

The main records of heritage sites and features include those listed as follows:

[70] Murphy Ireland (2023). Ringsend WWTP: Phosphorus Fixation. Accessed: February 2026.

[71] Capodaglio, Andrea & Olsson, Gustaf. (2019). Energy Issues in Sustainable Urban Wastewater Management: Use, Demand Reduction and Recovery in the Urban Water Cycle. Sustainability. 12. 266. 10.3390/su12010266.

Record of Monuments and Places (RMP)

The RMP is the statutory list of all known archaeological monuments in Ireland as compiled by the Archaeological Survey of Ireland, part of the Department of Housing, Local Government and Heritage.

National Inventory of Architectural Heritage (NIAH)

The NIAH identifies, records and evaluates the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations for the inclusion of particular structures in their Record of Protected Structures at county Development Plan level.

Record of Protected Structures (RPS)

The NIAH surveys provide the basis for the recommendations to the planning authorities for the inclusion of particular structures in their RPS. Under the Planning and Development Act (PDA) 2000 as amended, local authorities are required to compile and maintain an RPS in their development plans. Sites included in the RPS are awarded automatic protection and may not be demolished or materially altered without grant of permission under the Planning Acts.

Architectural Conservation Areas (ACA)

ACAs comprise, as stated in the PDA, '*the character of a place, area, group of structures or townscape, taking account of building lines and heights, that is of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest or value, or contributes to the appreciation of protected structures*.' Provisions for the protection of ACAs are made by planning authorities as part of development plans, which includes the boundaries of ACAs.

National Monuments

The term "national monument," as outlined in Section 2 of the National Monuments Act (1930), refers to a monument whose preservation is of national significance due to its historical, architectural, traditional, artistic, or archaeological value. There are over 1,000 individual monuments at 760 locations, which have been taken into ownership or guardianship by the State. These are monuments the preservation of which is a matter of national importance by reason of the archaeological, architectural, historical, traditional, or artistic interest attaching to it. These sites are legally protected under the National Monuments Acts. The Consent of the Minister is required for interference with such National Monuments or ground disturbance around or in proximity to them. There are over 1,000 individual monuments at 760 locations in ownership or guardianship of the Minister and those subject to a Preservation Order and a list of these Monuments is published on our website www.archaeology.ie.

United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Properties

The WHS includes cultural and natural heritage sites around the world considered to be of outstanding value to humanity. There are two UNESCO World Heritage Properties within Ireland, Brú na Bóinne in County Meath and Skellig Michael in County Kerry. The following sites have been submitted by Ireland for consideration the tentative World Heritage Site list:

- The Royal Sites of Ireland: Cashel, Dún Ailinne, Hill of Uisneach, Rathcroghan Complex and Tara Complex;
- The Passage Tomb Landscape of County Sligo; and
- Transatlantic Cable Ensemble.

5.3.7.2 Character and Types of Resource

Archaeological resources include prehistoric ritual/ burial landscapes (passage tombs, megalithic complexes), settlement and field systems (e.g., ringforts, fulacht fia), medieval (monastic sites, castles, ecclesiastical ruins), and industrial archaeology (milling, mining, canals). Many archaeological sites are key components of broader cultural landscapes rather than isolated points. There is often a high density of archaeological sites in many rural areas — many are subsurface and vulnerable to ground-disturbing development. Certain landscapes have concentrated high-value ensembles (e.g., Neolithic complexes, monastic clusters) and international significance (UNESCO sites).

Architectural resources include historic town centres and streetscapes, vernacular rural housing and farmsteads, country houses and demesnes, ecclesiastical and civic buildings, and industrial-era structures (bridges, mills, rail heritage). Conservation areas and protected structures highlight concentrated architectural value. Historic urban cores often contain complex, interwoven archaeological and architectural layers.

5.3.7.3 Other Heritage

Coastal Heritage

There are a number of water-related sites such as buildings and structures listed for their engineering importance within the National Industrial Engineering Heritage (NIEH) maintained by the Engineering Department of Trinity College. There are a number of inland and coastal water-related engineering features listed, for example: the engineering complexes of the Grand and Royal Canals, water mills, bridges and weirs, lighthouses and breakwaters.

Transboundary/Shared Heritage

It is noted that a large number of heritage assets predate the border with Northern Ireland. Such features, including bridges and mill races for instance, traverse the border. Some wrecks occur in shared bays and coastal areas such as Carlingford Lough and There are associated transboundary qualities of these features which includes the inter-relationships of sites, buildings and places and their heritage setting.

Sites and Properties

In addition to the monument registers, there are a number of properties and areas managed by cultural heritage groups in Ireland. These are structures or areas that have been passed to the care of responsible bodies for restoration, public access and amenity value. Examples which are within proximity to water bodies include for instance the Sieges of Kinsale and Cork, Connemara National Park (covering 4,942 acres of scenic countryside and coastal habitats), and the Burren landscape and visitor centre.

5.3.7.4 Existing Environmental Pressures/ Problems: Cultural Heritage

Wastewater treatment infrastructure to support increasing population has potential to impact on architecture and archaeological features / sites as a result of siting of the infrastructure. Cumulatively, this results in impacts on the overall cultural heritage resource.

5.3.8 Landscape

Ireland is a signatory to the European Landscape Convention, which aims to promote landscape protection, management and planning and to organise European co-operation on landscape issue. Ireland ratified the Convention in 2002, and it came into effect in 2004. Ireland, as a party to the Treaty, is required to undertake general measures to recognise landscapes in law, establish landscape policies with public participation and to integrate landscape into its existing policies.

The National Landscape Strategy for Ireland (2015-2025) was produced in line with Ireland's obligations under the convention. It outlines six key objectives and actions, one of which is to develop a National Landscape Character Assessment. It proposed that Landscape Character Assessments would be prepared at local and intra-local authority level however, there has been limited to no progress on developing these. It is intended that these regional and local landscape character assessments would inform and guide landscape policy, action plans and local authority development plans.

In the absence of national or regional guidance and assessments, local authorities currently conserve and protect scenic value as areas of high amenity, high sensitivity, areas of outstanding natural beauty, protected views and similar designations, but the approach is uncoordinated and can lead to different prioritisations in neighbouring counties. Each local authority is responsible for the designation of these within their individual jurisdictions, with each development plan providing objectives to protect such scenic values. It is noted the National Landscape Strategy includes the definition for landscape as provided in the European Landscape Convention done at Florence on 20 October 2000 (Landscape Convention):

'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.'

However, it does not specifically mention 'seascape.' The Landscape Convention however states '*The Convention covers natural, urban, peri-urban and rural areas, encompassing land, inland water, coastal and marine areas*.'

Further, seascapes are increasingly being recognised as being a key element of the coastal and marine environment. Seascape characterisation should form an integral part of any overall landscape character assessment (LCA) where there is any coastal element. For instance, some local authorities have already undertaken LCAs which also consider seascape, e.g. Donegal and Clare. Northern Ireland as an example has undertaken regional landscape and seascape character assessments, and the digital data is available from DAERA.[72]

In December 2023, EPA published a Good practice guidance on Strategic Environmental Assessment (SEA) and Landscape that aims to ensure that landscape considerations are integrated as part of the SEA of plans, policies and programmes in Ireland. REFRAME project, funded by EPA have developed a robust LCA Toolkit designed for agricultural contexts, targeting agri-environmental and rural development schemes. The toolkit aims to have broader applications, including forward planning, strategic environmental assessment, and other land use sectors such as forestry, tourism, and renewable energy. The main aim of this toolkit is to reposition landscape character as a fundamental environmental element in land use planning and management.

Northern Ireland has several areas designated for their landscape quality located on or close to the border, such as Ring of Gullion Area of Outstanding Natural Beauty (AONB). Cuilcagh Lakelands UNESCO Global Geopark crosses the Northern Ireland and Republic of Ireland border and potentially may be impacted by the Nitrates Action Programme.

5.3.8.1 Existing Environmental Pressures/ Problems: Landscape

The National Landscape Strategy 2015 – 2025 is the means by which the State provides a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape with a key action to develop a National Landscape Character Assessment. To date, this has not been published. The represents a major knowledge and data gap.

Existing pressures on landscape and visual resources as a result of wastewater management activities are limited and are primarily related to secondary impacts to sensitive views and landscapes resulting from the siting of developments, including wastewater-related infrastructure, without sensitive regard to these resources.

In this context, the key issues associated with the draft Strategy and landscape relate to:

- Potential impacts on landscape and visual amenity from siting of wastewater treatment infrastructure; and
- Potential impacts on landscape character through siting of infrastructure and/ or degradation of landscape features such as rivers as a result of pollution.

5.3.9 Inter-relationships

In accordance with the SEA Directive, the interrelationship between the SEA environmental topics must be considered. **Table 5-7** highlights the key interrelationships identified in this SEA. These potential interrelationships have been considered in the assessment of the different alternatives. A key interrelationship is between population and human health, air quality and climate. Another key interaction is between air quality, water, biodiversity, land and soils with material assets. In these cases, emissions to environmental receptors (air, surface and groundwaters, and soils) from agricultural activities have implications for the quality of human health as well as the natural environment.

[72] DAERA Landscape digital data available at: https://www.daera-ni.gov.uk/articles/download-digital-datasets

Table 5-7: Inter-relationships between SEA Topics

	Biodiversity Flora & Fauna	Population & Human Health	Land & Soils	Water	Air Quality	Climatic Factors	Material Assets	Cultural Heritage	Landscape
Biodiversity, Flora & Fauna									
Population & Human Health	✓								
Land & Soils	✓	✓							
Water	✓	✓	✓						
Air Quality	✓	✓	X	✓					
Climatic Factors	✓	✓	✓	✓	✓				
Material Assets	✓	✓	✓	✓	✓	✓			
Cultural Heritage	✓	✓	✓	✓	X	✓	✓		
Landscape	✓	✓	✓	✓	X	✓	✓	✓	

5.4 Evolution of the Baseline in the Absence of the Draft Strategy

The SEA legislation requires that consideration is given to the likely evolution of the current baseline where implementation of the draft Strategy does not take place. **Table 5-8** summarises the key points.

Table 5-8: Likely Evolution of the Baseline without Implementation of the draft Strategy

Environmental Area	Discussion on the Evolution of the Baseline in the Absence of the draft Strategy
Population and Human Health	The draft Strategy sets out the actions to achieve goals and objectives to ensure the safe and sustainable management of wastewater sludges. The draft Strategy adheres to the requirements of current legislation and promotes innovation to address the issue of known contaminants. Furthermore, the draft Strategy actively supports research projects to address the unknown potential contaminants – all ensuring a safer and cleaner environment. In the absence of the draft Strategy then there is a risk of increased contaminants such as heavy metals, pathogens, PFAS, microplastics having an indirect, and potentially direct, adverse impact to human health.
Biodiversity, Flora and Fauna	The draft Strategy recognises the importance of biodiversity and commits to the requirements of the Uisce Éireann's own Biodiversity Action Plan[73].The draft Strategy aligns with current legislative requirements and supports innovation and research into different technologies and methodologies to provide further protection to biodiversity. Without the implementation of the draft Strategy, there would be continued pressure on biodiversity as a result of ongoing and potentially increased or unmonitored organic pollution from use of biosolids with implications for prolonged or intensified adverse impacts to both habitat and species.
Land and Soils	Currently 100% of wastewater treatment sludges in the form of biosolids are land spread on agricultural lands. It is recognised the importance that Ireland's soils play in storing carbon, in regulating both water flow and water quality and in growing food and raw materials. Soils are under threat from excess nutrients, compaction, soil sealing and loss of soil biodiversity, in Ireland and across the EU. Soil health must be prioritised to ensure food security, protect the soil biome, and safeguard the important environmental services that soil provides.

[73] 21668_Ervia_IrishWaterBiodiversityActionPlan_v7.pdf

Environmental Area	Discussion on the Evolution of the Baseline in the Absence of the draft Strategy
	Ireland faces challenges in achieving the objectives of the EU Soil Strategy[74] and in implementing the proposed soil monitoring law and getting this right would significantly advance the protection of Ireland's soil health[75]. The draft Strategy supports research and innovations in relation to organic pollutants to ensure that potential risks to soils are mitigated. Therefore, in the absence of the draft Strategy, there will be limited support for research, and innovations to manage the issue of organic pollutants in the upcoming years particularly for new emerging contaminants such as PFAS.
Water	In the absence of the draft Strategy directives outlined under Article 11 of the WFD (Annex VI Part A) would continue to be implemented and enforced. These constitute: the Bathing Water Directive, Birds Directive, Drinking Water Directive, Seveso Directive, Environmental Impact Assessment Directive, Sewage Sludge Directive (under review), Urban Waste-water Treatment Directive (revised in 2024), Plant Protection Products Directive, Habitats Directive and Integrated Pollution Prevention Control Directive. The draft Strategy aligns with the requirements of these directives including enhanced monitoring, energy neutrality and circular economy in line with the recast UWWTD. Therefore, in the absence of draft Strategy, the positive impacts related to reduction of wastewater sludge and the promotion of alternatives other than land spreading will not be realised. The draft Strategy also considers the use of nature-based solutions into wastewater treatment sites to enhance water quality.
Air and Climate	Air quality in Ireland is of a high standard across the country, meeting all EU air quality standards, according to the EPA. However, nationally Ireland is failing to meet EU targets on greenhouse gas emissions and ammonia. The draft Strategy seeks to advance research in relation to nutrient recovery as a resource including ammonia. The absence of the draft Strategy could affect these co-benefits as the current method of sludge waste management contributes to total emissions of ammonia. Additionally, there is a risk of failing to meet net zero ambitions and circular economy targets for the wastewater management sector in absence of the implementation of the draft Strategy.
Material Assets	In the absence of the draft Strategy, the current methods of wastewater sludge management and extent of resource recovery and resource efficiency and waste minimisation will continue to pose challenges in relation to landbank security, legislative and regulatory changes, depletion of finite resource Phosphorus, storage capacity for biosolids, data availability and reporting, progress towards sustainability ambitions, issue of emerging contaminants and transportation associated costs and emissions.
Cultural Heritage	In the absence of the draft Strategy, cultural heritage concerns would continue to be dealt with as part of the planning processes and related environmental assessments at lower planning tiers and at the project level.
Landscape	In the absence of the draft Strategy, landscape concerns would continue to be dealt with as part of the planning processes and related environmental assessments at lower planning tiers and at the project level.

[74] EU soil strategy for 2030 - European Commission

[75] https://www.epa.ie/publications/monitoring--assessment/assessment/state-of-the-environment/EPA-SOE-Report-2024-BOOK-LOWRES-FINALfor-WEB.pdf

6 FRAMEWORK FOR ASSESSMENT

6.1 Introduction

Strategic Environmental Assessment, as its name suggests, is set at a strategic level, therefore it is not possible for the baseline environment to be described (and assessed) in as much detail as could be undertaken for a project-level EIA. Instead, SEA uses a system of objectives, targets and indicators to set a framework for assessment of the plan.

In order to streamline the assessment process, this report has used broad themes, based on the environmental topics listed in the SEA Directive, to group large environmental datasets, e.g. human health, soil, air quality, etc. Assigned to each of these themes is at least one high-level Strategic Environmental Objective (SEO) that specifies a desired direction for change, e.g. reduce soil contamination, against which the future impacts of the plans can be measured. These high-level SEOs are then paired with specific targets. The progress towards achieving these specific targets is monitored using Indicators, which are measures of identified variables over time.

6.2 Development of Strategic Environmental Objectives

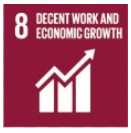
Establishing appropriate criteria for the assessment of the effects of the update to the existing National Wastewater Sludge Management Plan started at scoping stage where a series of proposed SEA objectives and guide questions were developed. These objectives and questions are reflective of the extent of the assessment criteria listed in the SEA Directive; the scope of the draft Strategy; wider environmental protection objectives at a national, European and international level (identified in **Chapter 4**); consultation feedback from scoping; and the baseline information collated in **Chapter 5**.

Each of the draft Strategy alternatives and the draft measures have been assessed against these SEOs to establish where they will contribute (or not) to achieving the desired outcomes; see **Table 6-1.**

Interlinkages with relevant UN Sustainable Development Goals (SDGs) is also outlined. It should be noted that not every target for each SDG may relate directly to specific water quality aspects as they are defined by the UN at a global level, however it aims to show how the draft Strategy can contribute more generally to the national policy effort on achieving the SDGs through the implementation of its actions.

Table 6-1: SEA Objectives

Related to SEA Topic(s)	SEA Objective(s)	Assessment Criteria (to what extent will the draft Strategy Actions/Measures…)	Relevant UN SDGs
Population and Human Health (PHH)	**Objective 1:** (a)To protect and reduce risk to human health from wastewater processes and products. (b) Ensure food safety from the reuse or deposition of wastewater sludge products on agricultural lands.	• Ensure the quality standards for wastewater treatment can be achieved; • Ensure the quality standards for wastewater sludge products can be achieved; • Undertake appropriate, sustainable and safe reuse of wastewater sludge products. • Promote awareness of the sustainable and safe reuse of wastewater sludge products.	 GOAL 3: Ensure healthy lives and promote well-being for all at all ages.
Biodiversity, Flora and Fauna (BFF)	**Objective 2:** Preserve and protect terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species from the reuse or deposition of wastewater sludge products in or on sensitive receptors.	• Contribute to achieving environmental protection objectives under the Water Framework Directive, Habitats Directive, and the Birds Directive? • Contribute to integrated climate, biodiversity, soil and water benefits.	 GOAL 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Related to SEA Topic(s)	SEA Objective(s)	Assessment Criteria (to what extent will the draft Strategy Actions/Measures…)	Relevant UN SDGs
Land and Soil (LS)	**Objective 3:** Safeguard soil quality, fertility and quantity from the application or deposition of wastewater sludge products on lands and soil.	• Protect the national soil resource. • Protect soils against pollution and prevent degradation of the soil resource. • Support sustainable development and land use management.	 GOAL 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.
Water (W)	**Objective 4 (a):** Protect water quality (surface waters, groundwaters and marine waters) from wastewater management processes and sludge products. **(b)** Contribute to achieving the objectives under the WFD, i.e. achievement or maintenance of at least Good Environmental Status (GES) and Good Ecological Status (GEcS).	• Support the protection of water quality and status using appropriate treatment and reuse processes and application methods for wastewater sludges.	 GOAL 6: Ensure availability and sustainable management of water and sanitation for all.  GOAL 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
Air Quality (AQ)	**Objective 5:** Minimise emissions to air from sludge management processes.	• Avoid adversely impacting on air quality. • Minimise transboundary atmospheric depositions on sensitive receptors.	 GOAL 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
Climatic Factors (CF)	**Objective 6:** (a) Reduce GHG from sludge management processes. (ii) Ensure resilience of wastewater treatment infrastructure and processes to the effects of climate change.	• Reduce GHG emissions within the wastewater management sector. • Adopt methods or technologies to increase resilience towards climate change impacts. • Deliver on circular economy and net zero principles.	 GOAL 13: Take urgent action to combat climate change and its impacts
Material Assets (MA)	**Objective 7:** Ensure resilience and sustainability of new and upgraded wastewater facilities and processes.	• Ensure effective use of investment for sustainable wastewater infrastructure and processes. • Support continued investment and promotion of new innovations and research.	 GOAL 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.  GOAL 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.  GOAL 12: Ensure sustainable consumption and production patterns.

Related to SEA Topic(s)	SEA Objective(s)	Assessment Criteria (to what extent will the draft Strategy Actions/Measures…)	Relevant UN SDGs
Cultural Heritage (CH)	**Objective 8:** Protect places, features, buildings and landscapes of cultural, historical archaeological or architectural heritage from wastewater infrastructure developments or processes.	• Protect places, features, buildings and landscapes of cultural, archaeological or architectural heritage. • Ensure wastewater management processes and developments are appropriately sited and managed.	 GOAL 11: Make cities and human settlements inclusive, safe, resilient and sustainable.
Landscape (LandS)	**Objective 9:** Protect landscape character and visual amenity from wastewater infrastructural development.	• Avoid damage to designated landscapes and/or seascapes as a result of implementing final Strategy.	

7 CONSIDERATION OF ALTERNATIVES

7.1 Introduction

The consideration of alternatives is a requirement of the SEA Directive (2001/42/EC). Article 5(1)[76] states that: '*where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated.*'

The Directive does not prescribe at what stage consideration of alternatives should be undertaken, however, to present a useful input into the policy/plan making process, all guidance points to considering alternatives as early as possible. Guidance also recognises that multiple layers of alternatives may exist, particularly for policy documents of this nature.

This chapter of the Environmental Report considers the reasonable alternatives which have been developed through the evolution of the draft Strategy.

7.2 Approach to Alternatives for the Draft Strategy

Both Uisce Éireann (UÉ) and the SEA team have been conscious that consideration of alternatives is an iterative process and have therefore engaged on this matter from the early stages, first discussing it in relation to SEA scoping and undertaking further consideration and analysis on alternatives throughout the SEA process. The basis for alternatives discussions was the 2015 EPA Guidance: *Developing & Assessing Alternatives in SEA*[77]. This guidance points to four key criteria for identification of alternatives and broad categories of alternatives that might be considered as outlined in **Figure 7-1**. In the context of the draft Strategy, the criteria considered were:

- **Realistic**: Do the alternatives have the capacity to achieve the principles of the draft Strategy, and those of other national plans;
- **Reasonable**: Do the alternatives consider baselines and trends across environmental disciplines, particularly land, soil and water, and also reflect the legal requirement, such as those of the rUWWT Directive and the Habitats Directive;
- **Viable**: Are the alternatives technically possible and feasible; and
- **Implementable**: Are the alternatives capable of being put into action, within realistic timeframes, and for which there are adequate resources in this cycle of the strategy.

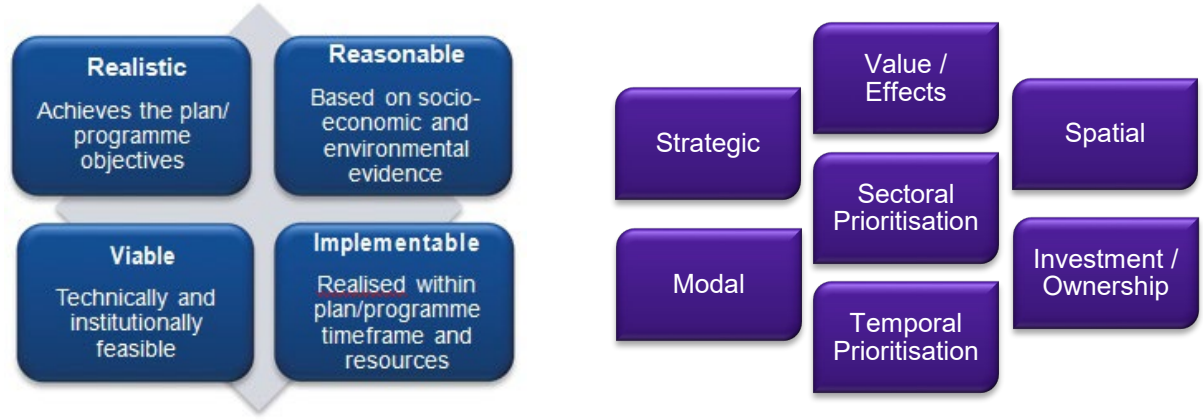


Figure 7-1: Criteria for Alternatives and Categories Considered (Source: EPA Guidance, 2015)

[76] Directive 2001/42/EC On the assessment of effects of certain plans and programmes on the environment, EC 2001

[77] Developing and Assessing Alternatives in SEA, EPA 2015

Following the scoping stage, a suite of outline alternatives were developed through discussions between the SEA team and Uisce Éireann. A workshop was held on 25th November 2024 to advance development and analysis of alternatives, and a further workshop was also held to refine alternatives on 16 January 2025. These workshops were attended by UÉ and RPS. Key points discussed at these workshops are summarised below:

- Issue of emerging contaminants and associated monitoring and traceability in biosolids;
- High levels of contaminants in leachate from landfills and recycling centres;
- Need for quality certification for biosolids;
- Land availability issues and alternative outlets to land spreading;
- EU requirement of spatial mapping for land spreading;
- Efficient and sustainable technologies for thermal drying and other treatment technologies;
- Increasing number of facilities and associated logistics and carbon footprint;
- Increased reduction in sludge volume and introduction of new centres to reduce the need of transport; and
- Pilot studies on the effects of land spreading biosolids on agricultural lands.

Having regard to the high level nature of the strategy, the issues raised in workshops between the Strategy and SEA teams and scoping feedback received during scoping consultation, the alternatives considered for the draft Strategy are presented in **Table 7-1**.

Table 7-1: Alternatives Considered

Category	Scope of Alternatives Considered	Outline of Alternatives
Source	Acceptance of Leachate	**Leachate 01** – Business as usual where UÉ facilities accept leachate from Landfill and Recycling Centres **Leachate 02 –** UÉ will work with the waste operators and Local Authorities to agree an exit road map which results in self-sufficiency for the sector in relation to the byproduct.
Quality Assurance	Certifications schemes	**Quality 01** - Business as usual relying on mandated risk management without any supplementary certification schemes in place. **Quality 02** – Introduce a certification scheme to increase transparency of land spreading.
	Reporting	**Reporting 01** - Deliver on reporting as per the requirements of the European Union (EU); or **Reporting 02** – Supplement requirements of the European Union (EU) reporting with sensitivity mapping and analysis.
Treatment	Sludge Treatment	**Sludge Treatment 1** –Focus on lime stabilisation and anaerobic digestion (AD) as the main methods for sludge treatment. **Sludge Treatment 2** – Expand the use of advanced anaerobic digestion (Advanced AD) for sludge treatment to increase energy recovery potential and volume reduction.

Category	Scope of Alternatives Considered	Outline of Alternatives
		Sludge Treatment 3 – Introduce advanced thermal conversion (ATC) for energy and nutrient recovery and volume reduction.
Transport	Transport	**Transport 01 -** Business as usual; or **Transport 02** - Reduce / minimise distance and quantities of sludge.
Reuse	Landspreading	**Landspreading 01** – Continue to land spread biosolids as usual. **Landspreading 02** – Produce a robust monitoring programme that establishes an evidence base in the short term to support landspreading and identifying other suitable locations, where required.

7.1 Assessment Parameters

The approach used for assessing alternatives for the draft Strategy was an objectives-led assessment. Each alternative has been assessed against a set of strategic environmental assessment objectives (See **Chapter 6** for details of the objectives). The assessment compares the likely impacts in terms of the Strategic Environmental Objectives to see how alternatives perform in relation to the stated environmental objectives. The following notation is used in the assessment tables:

Symbol	Intended Meaning
Plus (+)	Indicates a potential positive environmental impact
Minus (-)	Indicates a potential negative environmental impact
Plus/minus (+/-)	Indicates that both positive and negative environmental impacts are likely
Uncertain (?)	In the absence of further detail, the impact is unclear
Zero (0)	Indicates no significant impact

Under each alternative a discussion is presented to support the assessment parameters shown and the reason for choosing the preferred alternative. Assessments include qualitative and where possible quantitative information.

7.2 Alternatives Considered

7.2.1 Source Alternatives

7.2.1.1 Leachate and Runoff from Recycling Centres Alternatives

In the last 30 years, there have been significant advances in waste and landfill management practices in response to European Union (EU) directives. These have led to changes in leachate composition, in the volumes of leachate produced and in its treatability. Furthermore, increasingly stringent wastewater discharge requirements mean that the co-treatment of leachate in wastewater treatment plants (WWTPs) with other forms of wastewater can now be a challenge for some WWTPs. Key challenges faced by WWTP

operators treating landfill leachate include high (i) ammonium-nitrogen concentrations in leachate and (ii) the increased cost of treating wastewater to increasingly stringent standards[78].

Landfill leachate is a complex liquid that forms as water percolates through waste materials in a landfill. Its composition varies depending on waste type, landfill age, and environmental conditions. Typically, the leachate comprises of high concentrations of dissolved organic matter, including volatile fatty acids, phenols, and other degradation products of organic waste. It may also contain heavy metals such as cadmium, lead, mercury, and arsenic, originating from batteries, electronic waste, and industrial materials and microbial contaminants such as pathogenic bacteria, viruses, and other microorganisms which can all be present in leachate, posing a risk to groundwater and surface water. Runoff from recycling and waste transfer centres will also contain a variety of contaminants, which will also depend on the materials being process and site management practices. Similar to landfill leachate the runoff may/will contain heavy metals from electronic waste and batteries and organic pollutants from plastics, oils and other processed materials. Nutrients with elevated concentrations of nitrogen and phosphorus may be present as wells as microplastics if the recycling centre is dealing general waste plastics.

Ireland has already reduced the number of operating landfills from 121 in 1992, to three landfills today and through a series of levies have reduced the amount of material going to these waste facilities[79]. The three landfills still operating are Knockharley (Waste License No. WO146-02) in County Meath, Drehid (Waste License No. WO201-03) in County Kildare and Ballynagran (Waste License No. WO165-02) in County Wicklow. All leachate from these three facilities go to a wastewater treatment facility managed by UÉ. A number of other landfills are no longer operating but still producing leachate that is also discharged to wastewater treatment facilities. With regards to recycling centres, there are 369 recycling centres in Ireland as of January 23, 2025, and a number of these facilities also rely on wastewater treatment facilities managed by UÉ for disposal of their leachate. This leachate is a significant pressure for UÉ in the management of wastewater sludge given the complex nature of its constituents. For this reason, UÉ has considered alternatives to the business as usual scenario with a view to moving toward a more sustainable long-term solution. The following alternatives are assessed for managing leachate and runoff from landfill and recycling centres:

Leachate 01 – Business as usual where UÉ facilities accept leachate from Landfill and Recycling Centres

Leachate 02 – UÉ will work with the waste operators and Local Authorities to agree an exit road map which results in self-sufficiency for the sector in relation to the byproduct.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
L01	+/-	+/-	+/-	+/-	-	-	+/-	0	0
L02	+/-	+/-	+/-	+/-	-	-	+/-	0	0

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape.*

Assessment and Discussion

L01 – This alternative considers the business as usual scenario which is a continuation of accepting landfill leachate and contaminated surface runoff from recycling and waste transfer stations for treatment in UÉ facilities. With the steady decline in the number of landfills in the country and the natural decline in leachate production over time, this would suggest that in the long term landfill leachate is unlikely to be a significant issue. In the short to medium term however, landfill leachate will continue to be produced from both operating and closed landfill and recycling centres, albeit in a reducing volume. An EPA report[80] on the matter from 2017 indicated that the current practice of co-treatment of landfill leachate at WWTPs is appropriate in most circumstances. However, the report did recommend that WWTPs and landfills should have overlapping measurement requirements for common contaminants. For example, total nitrogen (TN) is

[78] Research 214: Suitability of Municipal Wastewater Treatment Plants for the Treatment of Landfill Leachate | Environmental Protection Agency

[79] gov.ie - Introduction of new environment levies will incentivise recycling and help Ireland meet our EU waste targets

[80] Research 214: Suitability of Municipal Wastewater Treatment Plants for the Treatment of Landfill Leachate | Environmental Protection Agency

measured for WWTP influent, but leachate NH_4-N is measured at the landfill. Measuring wastewater NH_4-N and landfill leachate TN would allow for accurate TN and NH_4-N loading to be determined. Furthermore, the report did recommend that nitrogen loading-based tariffs should be implemented to allow landfill operators considering the installation of on-site leachate treatment systems to make economic predictions. This would provide an economic framework for sustainable development of leachate treatment infrastructure.

The monitoring and regimes associated with the waste licenses and the acceptance of leachate in WWTPs does ensure the proper control and management of the final product and is therefore considered to be broadly positive from a human health perspective in the short to medium term and with the reduction of leachate from landfill over time the possible negative effects will be positive over the long term too. However, the reuse of treated sludges in agricultural context that have derived in part from landfill is a concern and may negatively affect watercourses and soil dependent species in the short to medium term. Leachate is highly odorous with a sewage-like smell which together with potentially high levels of ammonia will be a concern from an air quality and climate perspective. Moving the leachate in sealed tankers will mitigate some of the issues but the addition of another odorous material at the WWTP will be of concern to the operators. Therefore, there is a risk of negative effects for air quality and climate from leachate which may be exacerbated by the movement of the leachate from source (landfill) to treatment facility (WWTP). The current practice of co-treating leachate with conventional wastewater will not have an effect on material assets, cultural heritage and landscape.

L02 – This alternative considers removing the option of managing landfill leachate or surface water runoff from recycling/transfer stations through UÉ facilities and instead requiring these facilities to treat at source. At the moment, both the landfill and waste recycling/transfer sites are all required to minimise the production of leachate. This is in their own financial interest as costs for depositing leachate at WWTP are high and can be undertaken by a number of different methods such as the segregation of water from clean surfaces to the storm water drains and minimising exposure of waste material to rainwater by covering either with landfill capping or roofing in the case of recycling/transfer sites. However, while the operational cost of discharging leachate to a WWTP is high, the capital cost in developing an onsite treatment facility is likely to be higher depending on the scale of the treatment works. However an exit road map agreed with the operators would prevent this scenario and would allow for cooperative solutions to be developed. This may include scaling up of facilities at source or collaborative arrangement between facilities to reduce financial burdens of individual treatment facilities. In the medium to long term, the reduced need for transport of material offsite would reduce the transport related emissions with positive effects for AQ and CF. Long term positive effects for MA are also anticipated where UÉ facilities can focus on WW streams and waste facilities can better manage their own operations, introducing self- sufficiency and driving efficiencies in the volume produced. Opportunities for collaboration of facilities in a cooperative, may address cost benefit concerns for waste operators.

Preferred Environmental Alternative and Reason for Choosing:

L02 is the preferred environmental alternative as it offers an opportunity to develop an exit roadmap to reduce reliance of waste operators on UÉ facilities but retains necessary cover in the short to medium term until suitable alternatives are in place. This will ensure protection of the environment in the long term.

7.2.2 Quality Assurance Alternatives

7.2.2.1 Quality Assurance System

Whilst European and national legislation provides the baseline, the risk management and quality work of water utilities is supplemented with voluntary Biosolid Assurance Schemes in many countries. The purpose of such schemes is to provide food chain stakeholders and consumers with transparency and reassurance that certified treated biosolids can be safely and sustainably recycled to agricultural land. Quality assurance systems are audited by an independent third-party certification body to ensure that participants conform with the scheme standard.

The following two alternatives are assessed for the certification of biosolids:

- **Quality 01** - Business as usual relying on mandated risk management without any supplementary certification schemes in place.
- **Quality 02** – Introduce a certification scheme to increase transparency of land spreading.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
QAS 01	-	-	-	-	0	0	0	0	0
QAS 02	+	+	+	+	0	0	+/-	0	0

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape.*

Assessment and Discussion

Current practices under alternative **Quality 01** recognise that processes involved in the management of wastewater come under an existing regulatory regime. For example, all discharges from wastewater treatment plants are required to be authorized by the EPA. This authorization is obtained through a wastewater discharge license or a certificate of authorization, depending on the size and nature of the discharge. UÉ also undertake monitoring and reporting at each step of the treatment process to ensure a quality and safe product is produced. UÉ itself requires full traceability of all wastewater products, and nutrient management plans where the product is landspread and they have developed an online reporting system and all data is also reported in Annual Environmental Reports (AERs) to the EPA for all licenced wastewater treatment plants. Audits are carried out by independent bodies to verify results and changes made, if required, on the basis of audit findings.

Nutrient management plans are a legal requirement for landspreading of biosolids under S.I. 148, of 1998 (and amendments) Waste Management (Use of Sewage Sludge in Agriculture). The plans are based on the nutrient thresholds set out in S.I. 113 of 2022 (and amendments) European Union (Good Agricultural Practice for Protection of Waters) Regulations and the heavy metal thresholds set out in S.I. S.I. 148, of 1998 (and amendments). The Code of Practice for the use of Biosolids in Agriculture, 1998 (DELG) while not legislation and somewhat dated provides further requirements for the landspreading of biosolids. Adherence to the Code of Practice is a mandatory requirement for the spreading of biosolids on agricultural lands emanating from UÉ facilities.

The NWSMP from 2016, the forerunner to this Strategy, highlighted differing practices associated with lime treatment, especially at offsite locations. The draft Strategy states that auditing of contractor's activities is carried out to ensure compliance with the Code of Good Practice.

Furthermore, a greater awareness across the general public and the wider scientific community on what is actually in wastewater sludge is leading to concern in relation to land spreading on agricultural land. This includes concerns raised by the EPA[81] in Ireland and others such internationally.

While the control of pathogens is well understood and accounted for in existing regulations[82] and codes of good practice, these regulations and codes of practice have not evolved to address other potentially serious contaminants now known to be present in wastewater sludges, specifically microplastics, forever chemicals, etc., all potentially of concern for human and environmental health. The rUWWTP, 2024 does require larger WWTP to monitor for micropollutants and PFAS.

In terms of other Member States including Germany[83], Poland[84], Denmark and UK, a concern regarding the presence of high concentrations of microplastics, of varying sizes, in sludge designated for agricultural use has been established. The literature review suggests that while composts and digestates serve as valuable organic fertilisers, they also pose a risk as sources of microplastics and PFAS.

The Microplastics Position Statement from Assured Biosolids Ltd. From November 2023, highlighted that >90% of microplastics from treated wastewater is retained in the solid sludge. However, it also states that

[81] EPA (2024) Ireland's State of the Environment Report 2024. Available at: Ireland's State of the Environment Report 2024

[82] S.I. 148 of 1998 – Waste Management (Use of Sewage Sludge in Agriculture) Regulations (and amendments) and Code of Good Practice for use of Biosolids in Agriculture, 1998.

[83] Science Advances (2018) Organic Fertilizer as a vehicle for the entry of microplastic into the environment. Available at: https://www.science.org/doi/full/10.1126/sciadv.aap8060

[84] MDPI (2023) Microplastic Pollution in EU Farmland Soils: Preliminary Findings from Agricultural Soils (Southwestern Poland). Available at: https://www.mdpi.com/2077-0472/13/9/1733

there is a lack of evidence surrounding the topic of microplastics and their risk to environment and human health and therefore recommends further investigation to produce robust evidence base.[85]

R.L. Hough in December 2024 presented a re-assessment of environmental risks from sewage sludge from new contaminants including microplastics, fibers, organic and other emerging chemicals, pharmaceuticals and personal care products (PPCPs). The study reveals that unregulated substances, including microplastics and persistent organic pollutants, may be adversely affecting soil health and ecosystems. Experts advocate for a precautionary approach and stronger legislation to mitigate these risks and protect the integrity of soils.[86]

The Danish Environmental Protection Agency[87] have set out an indicative limit values for PFAS in sewage sludge intended for agricultural use. The Agency published indicative cut-off values for PFAS in this context. These limits were aligned with the soil quality criteria for PFAS, based on the assumption that these limits would ensure the protection of soil quality and water, as well as the short-term growth of crops.

An abstract from Chaudhary and Suthar (2024) suggested that temperature can play a crucial role in influencing efficacy during pyrolysis to aid removal of microplastics from sludge. The reduction of microplastics load in sewage sludge demonstrated a marked increase with elevated pyrolysis temperatures. While all temperatures showed a decrease in microplastic, with no particles in biochar at 950 degrees.[88]

Considering the above, the business-as-usual scenario should be sufficient to protect the environment from significant negative effects of pathogens (notwithstanding some compliance challenges) however it does not address the wider concerns of other contaminants and as such has potential for negative effects particularly in relation to PHH, BFF, W, LS and MA.

Quality 02 – While there is legislation in place for the management and control of the land spreading of treated biosolids in Ireland there is still concern among some stakeholders and therefore a need for greater transparency.

The introduction of an independently audited and certified Quality Assurance Scheme (QAS) may go some way to address this matter and will provide an additional independent layer ensuring that the legislative controls and Codes of Practice are implemented fully and correctly. The areas to be considered under a QAS are:

- Environmental protection to reduce risks of water pollution by providing additional controls to the current legislation and Codes of Practice[89][90] to prevent nutrient runoff into rivers and lakes.
- Regulatory Compliance ensuring compliance with EU and Irish environmental laws, including the EU Sewage Sludge Directive and the Good Agricultural Practice Regulations and to provide documented proof that treated biosolids application follows best practices.
- Promote farmer and public confidence that sludge is a valuable fertiliser substitute. The QAS will enhance transparency by demonstrating responsible bioresource management by tracking the bioresource from facility to field and ensuring proper handling and application rates.
- Protection of soil and crop quality and public and environmental health by ensuring biosolids is treated to remove harmful pathogens, heavy metals, and other contaminants of concern before

[85] Biosolids Assurance Scheme (UK) (2023) Assured Biosolids Limited (ABL) Biosolids Assurance Scheme (BAS) Position Statement on the Potential Impact of Microplastics on biosolids recycling to agricultural land. Available at: https://assuredbiosolids.co.uk/wp-content/uploads/2023/11/Microplastics-Position-Statement-Nov-2023.pdf

[86] The James Hutton Institute (2024) Hidden threats to soil revealed in sewage sludge research. Available at: https://www.hutton.ac.uk/hidden-threats-to-soil-revealed-in-sewage-sludge-research/

[87] Ministry of Environment of Denmark, Environmental Protection Agency (2023): Derivation of cut – off values for PFAS in Sewage Sludge Revised Edition. Available at: https://www2.mst.dk/Udgiv/publications/2023/03/978-87-7038-497-1.pdf

[88] Chaudhary and Suthar (2024) Fate of Microplastic During Pyrolysis of Sewage Sludge. Available at: https://micro2024.sciencesconf.org/559711/document

[89] Code of Good Practice Biosolids in Agriculture-Guidelines for Farmers.pdf

[90] Code of Good Practice Biosolids in Agriculture-Guidelines for Local Authorities.pdf

application to land and that more stringent testing and monitoring is undertaken to maintain soil fertility and prevent degradation.

- Recognition that some sludge will not be suitable for land spreading on agricultural land due to the nature of contaminants and some lands may not be suitable for spreading due to existing levels of accumulated contaminants.

If a QAS is implemented fully then the effects would be broadly positive for human health, biodiversity, soil, and water in the long term and further ensure, through independent monitoring and auditing of certain activities, that biosolids are properly treated before being applied to lands. It would also be largely positive for material assets by ensuring no loss of agricultural land from production. Quality 02 is not anticipated to have significant effects for climate, cultural heritage or landscape. With regards to air quality, auditing the process controls and the application methodologies; confirming they are (and have been) implemented correctly will ensure there is no effect on air quality.

Preferred Environmental Alternative and Reason for Choosing:

The preferred environmental alternative is **Quality 02** which provides an additional independent layer of assurance to make certain there are no environmental effects from management of the wastewater sludge and biosolids treatment processes and improve public perception through increased transparency.

Focused monitoring and reporting of activities together with independent auditing on a regular basis is critical to provide quality assurance that the activities associated with these processes are being undertaken correctly and that products delivered will have no negative environmental effects.

7.2.2.2 Reporting

The Sewage Sludge Directive (86/278/EEC) sets out rules on how farmers can use treated biosolids as a fertiliser to prevent it harming the environment and human health, by ensuring that the nutrient needs of the plants are considered and that the quality of the soil and of the surface and ground water is not impaired[91]. The Directive was transposed into Irish law under S.I. 148 of 1998 and amended by S.I. 267 of 2001. The addition of nutrient management planning (NMP) was one of the amendments in S.I.267. In 2019, an EU Regulation amended the Directive (document No. 31986L0278[92]) to align reporting obligations and now includes a requirement for Member States to present spatial data sets of the information listed in Article 10 of the Directive (as amended).

The alternatives contemplated in this section consider the implementation of the basic reporting requirements as per Article 10 of the Directive or inclusion of additional information on where biosolids can be spread e.g. sensitive biodiversity areas or areas prone to flooding.

The following two alternatives are assessed for spatial mapping:

- **Reporting 01** - Deliver on reporting as per the requirements of the European Union (EU); or
- **Reporting 02** – Supplement requirements of the European Union (EU) reporting with sensitivity mapping and analysis.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
Rpt 01	+	+	+	+	0	0	+/-	0	0
Rpt 02	+	+	+	+	0	0	+/-	+	+

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils/Sediments; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape.*

Assessment and Discussion

[91] Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:31986L0278

[92] EUR-Lex - 01986L0278-20220101 - EN - EUR-Lex

Rpt 01 –There is a requirement from some local authorities for the inclusion of spread land maps for the NMP. However, this is not consistent across all local authorities and where it is does exist, the presentation of the spatial data varies. The introduction of the basic requirement and a consistent approach and methodology on how the data is collated, managed and presented is critical. The mapping would provide a greater understanding of the potential effects of landspread biosolids and would undoubtedly be used by the local authorities, the EPA and other stakeholders. If introduced, managed, monitored and enforced correctly by the appropriate authority it would be seen as broadly and directly positive for PHH, BFF, LS, and W. It is difficult to see the spatial mapping having any effect positive or negative for AQ, CF, CH and LandS. It may have some indirect positive effect for MA by ensuring better protection of amenity areas but this may not be known for some time.

The Department of Agriculture Food and Marine (DAFM) has rolled out an online organic nutrient movements system designed to address requirements under the Nitrates Regulations. This new portal will help record organic nutrient movements across farmlands, and the IT infrastructure is being upgraded to capture information on spreading lands where stabilised biosolids are reused on agricultural land. Uisce Éireann will support and feed data into the online reporting portal as it is developed and will ensure all necessary information on spreading lands is provided as needed.

Uisce Éireann are also working with the EPA on spreadlands mapping. As part of UÉ engagement with DAFM and the EPA, a map will be produced which identifies sensitive lands and their suitability for land spreading.

Recently, an amendment to the Sewage Sludge Directive (SSD) included a requirement for Member States to report the geographic location or geometry to identify the places where biosolids are reused on land. UÉ will work closely and collaborate with the Department of Housing, Local Government and Heritage (DHLGH) to assist with this European spatial data request.

Rpt 02 considers the opportunity of introducing a more comprehensive spatial approach by incorporating sensitivity mapping into the process. Sensitivity mapping involves the identification and assessment of areas that are particularly vulnerable to environmental change in specific parameters, including habitats of high ecological value, areas of cultural significance, and regions susceptible to climate change impacts. This approach goes beyond the EU's baseline requirements by integrating local ecological knowledge and stakeholder input, thereby enhancing the robustness of the spatial mapping.

Implementing sensitivity mapping would allow for a more nuanced understanding of the interactions between bioresource management and the environment. It would enable the identification of areas where bioresource activities could be restricted or managed more carefully to mitigate adverse impacts. Furthermore, this alternative promotes proactive environmental stewardship and supports the objectives of the EU Biodiversity Strategy[93] by prioritising the protection of sensitive ecosystems and may provide additional comfort to the public.

Similar to **Rpt 01** this alternative is directly positive for PHH, BFF, LS, and W. Again, it is difficult to see this enhanced spatial mapping having any effect positive or negative for AQ, and CF, but it may provide greater protection to CH and LandS by ensuring sensitive CH or LandS areas are not affected and therefore seen as indirectly positive. It may have some indirect positive effect for MA by ensuring better protection of amenity areas

Preferred Environmental Alternative and Reason for Choosing:

Rpt 02 is the preferred environmental alternative as it will deliver not only on reporting obligations set out under the sewage sludge directive (86/278/EEC), as amended but it would also allow for enhanced compliance under other EU Directives, notably the Habitats and Birds Directives, the Floods Directive, the Water Framework Directive, the SEA Directive and the EIA Directive. These key environmental protection objectives are underpinned by the principles of the mitigation hierarchy which advocates for avoidance as the first tier of mitigation. Sensitivity mapping would allow for better outcomes where sensitivities are understood and accounted for in decision making.

[93] Biodiversity strategy for 2030 - European Commission

7.2.3 Treatment Alternatives

7.2.3.1 Sludge Treatment

At the WWTPs, following the processes of sludge thickening and dewatering, the sludge cake output then undergoes a treatment process. As shown in the **Figure 7-3** below, one treatment pathway incorporates treatment methods of thermal drying, digestion and pasteurisation, digestion and hydrolysis, composting and lime stabilisation to produce dry solids (up to 95% D.S.), which are then reused on land. The other pathway involves a direct thermal treatment of the dewatered sludge through methods such as incineration, gasification and pyrolysis.

Thermal drying has been an effective method that utilises direct and indirect application of external heat source to evaporate water from dewatered sludge. This results in generation of a microbiologically safe and stabilised product (biosolids) that have less than 10% of moisture content. However, thermal drying relies on non-renewable energy sources in the main and as it has very high energy demands, it has proved to be practically and economically unviable in most cases. Since the publication of the current NWSMP, a significant number of thermal sludge dryers have ceased to operate across the country due to the associated high energy and maintenance requirements and operational nuisances (i.e. odour, poor sludge consistency etc.). The current NWSMP also recognised the potential for fire hazards associated with thermal drying.

Table 7-1 below provides an overview of all the treatment methods that were utilised for sludge treatment in 2024 as shown in **Figure 7-4**.

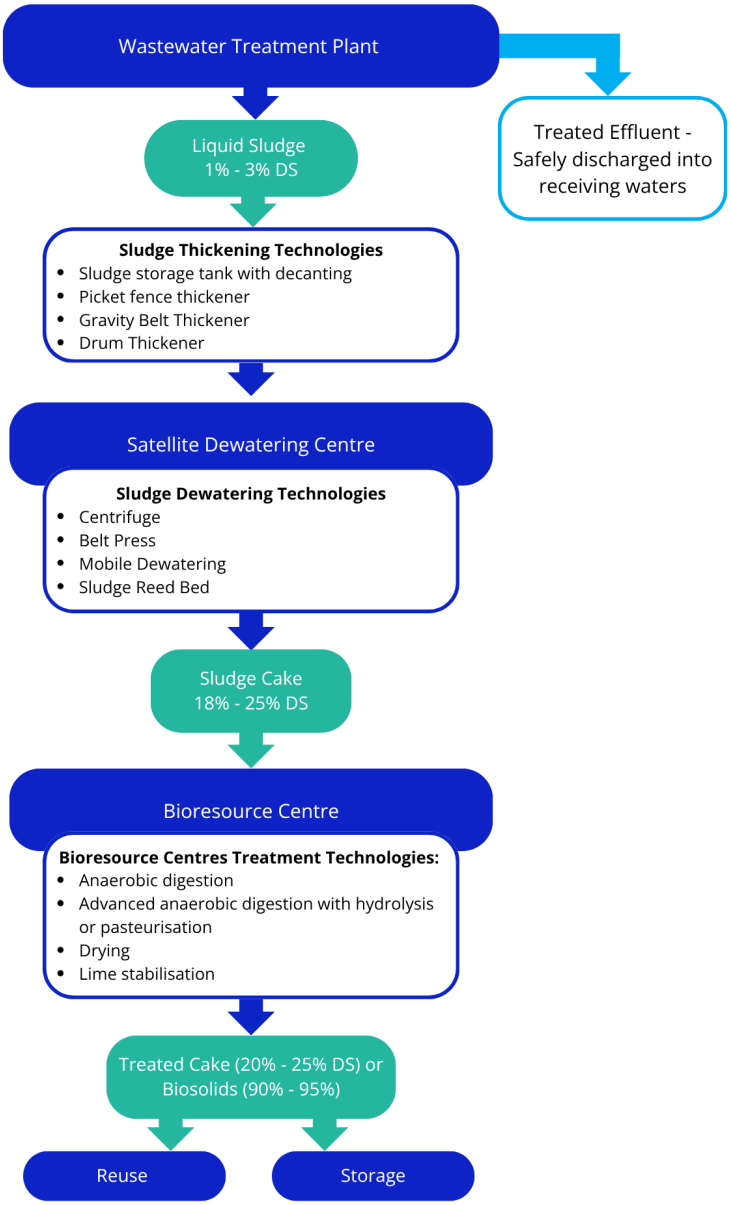


Figure 7-2: Wastewater Treatment Process for Production of Treated Sludge/Biosolids

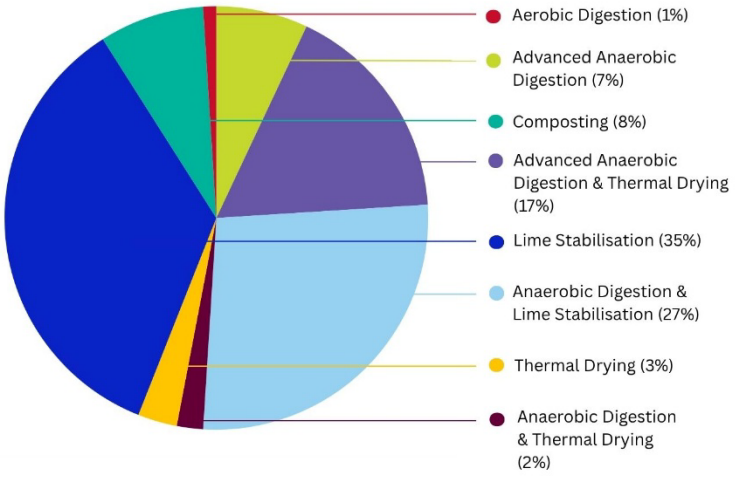


Figure 7-3: Sludge Stabilisation Treatment Processes Utilised in 2024 (Source: Draft NBioS).

Table 7-2: Overview of the Stabilisation Treatment Processes deployed in 2024 (Based on Draft NBioS)

Treatment Type	Conventional						ATC			
Treatment Method	Aerobic Digestion/	Anaerobic Digestion	Advanced AD+ Pasteurisation/ Hydrolysis/THP	Composting	Lime Stabilisation	Thermal Drying	Incineration	Pyrolysis	Gasification	Hydro-thermal Conversion (HTC)
Pathogen Removal	+++	++	+++	+++	+++	+++	+++	+++	+++	+++
Emerging Contaminant removal	0	0	0	0	0	0	+++	+++	+++	++
Nutrient recovery + soil enhancement	+++	+++	+++	+++	+++	+++	++	++	++	+++
Energy recovery	0	+	++	0	0	+	++	++	++	+
Volume reduction	+	+	++	+	+	+++	+++	+++	+++	+++
Energy Requirement	+	+	+	0	0	+++	+++	++	+++	++
Opportunities (emerging) of alternatives to land spreading	0	0	+	0	0	++	++	+++	++	++

Note: '+' denotes the extent to which a treatment method achieves the said outcome in the first column.

In light of this, the following alternatives have been considered during the development of the draft Strategy.

- **Sludge Treatment 1**:Focus on lime stabilisation and anaerobic digestion (AD) as the main methods for sludge treatment.
- **Sludge Treatment 2**: Expand the use of advanced anaerobic digestion (Advanced AD) for sludge treatment to increase energy recovery potential.
- **Sludge Treatment 3**: Introduce advanced thermal conversion (ATC) for energy and nutrient recovery.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
Sludge Treatment 01	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-
Sludge Treatment 02	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-
Sludge Treatment 03	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils/Sediments; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape.*

Assessment and Discussion

Sludge Treatment (ST) 01 aims to focus on lime stabilisation and AD for treating sludge as the main treatment methods that are utilised currently to produce stabilised biosolids.

Lime stabilisation accounted for 35% of stabilisation treatment methods used in 2024 and involves treatment of sludge by the addition of lime, to raise the pH of the sludge to ensure predetermined quality targets are met. Some WWTPs have a lime stabilisation facility but the majority of these are off-site private facilities that accept wastewater sludge on a contract basis. This process is considered positive for MA due to low capital requirement and operating costs in the short- to long-term. It is also considered positive for LS and W, as lime-treated sludge can help improve soil productivity in the short- to medium-term and reduces the risk of waterborne diseases in the short- to medium-term. However, this method does not result in significant reduction of the sludge volume which can have potential negative effects for MA in the short- to long-term associated with increased demand for sludge management with the growing population. Additionally, volatilization of ammonia as a part of the chemical reaction during the process can result in negative effects for LS, W, AQ, CF and PHH from the reduction in nitrogen content, nutrient loading and generation of odour.

In 2024, UÉ stabilised 53% of wastewater sludge via anaerobic digestion or advanced anaerobic digestion. This accounts for 37,100 tds/annum.

AD process produces biogas that can be subsequently converted to biomethane. Biomethane when converted to electricity can significantly reduce energy costs for operating wastewater treatment plants. This is therefore, considered to be broadly and directly positive for CF in the short- to long-term as production and utilisation of biomethane can help reduce GHG emissions whilst also contributing towards that national target of 1 TWh of Biomethane by 2025. Additionally, direct positive effects for MA and indirect positive effects for PHH are anticipated in the short- to long-term as it supports circular economy principles by using waste as a resource . However, it is noted that there are about 43 facilities in Ireland producing 580 GWh of biogas and two biomethane facilities as reported in the National Biomethane Strategy 202494. Increased requirement of sludge treatment will result in construction of further AD plants. Increased AD plants will have positive implications for CF as it will contribute towards the national climate targets as set out in Climate Action Plans. . As with any infrastructural development, depending on the nature and scale, there is a potential for direct and indirect, negative, localised, permanent, and cumulative environmental effects across SEOs. These developments where applicable will be subject to the outcomes of planning and environmental assessments/licensing. Local effects for AQ and PHH e.g. potential for odour issues, as well as transport effects from moving material to and from a plant are anticipated in the short- to long-term. If poorly managed, spills or run-off may have negative effects on LS, W and BFF. There is potential for negative effects on LandS and CH, which will depend on the scale of the plant and the sensitivity of landscape

[94] DECC(2024). National Biomethane Strategy. Available at: https://www.gov.ie/en/department-of-climate-energy-and-the-environment/publications/national-biomethane-strategy/

character/amenity value of the receiving environment and whether the development occurs near heritage features.

Sludge Treatment (ST) 02 aims to take a step further from AD and explore opportunities to scale up Advanced Anaerobic Digestion (Advanced AD) for sludge treatment. Advanced AD utilises technologies such as thermal hydrolysis process (THP), microbial hydrolysis, enhanced enzyme hydrolysis, thermophilic digestion and pre- or post-pasteurisation that can optimise resource recovery whilst reducing sludge volume. Currently, UÉ have deployed Advanced AD at some of the large WWTPs which incorporates pasteurisation or the thermal hydrolysis process (THP) to enhance anaerobic digestion resulting in a higher biogas yield, increased energy, and reduces the sludge quantity by up to 50%. Since the publication of the NWSMP 2016, Uisce Éireann have developed and implemented a Biogas Optimisation Programme that contributes towards UÉ's commitments for circular economy, GHG emissions reduction and net zero carbon ambitions.

In light of this, alternative ST02 is considered to be directly positive for both MA and CF and indirectly positive for PHH in the medium- to long-term as it aims to expand the use of advanced AD treatment methods at WWTPs that will contribute towards optimised biogas production, energy generation and reuse and enhanced resource recovery. However, it is acknowledged that this alternative currently has low feasibility as this treatment method is at a relatively nascent stage and therefore is unlikely to be delivered at a desired scale in the short term or within this cycle of the Strategy. It will also require infrastructural development that will help establish with AD plants and complementary technologies with potential for both positive and negative, direct and indirect, localised, permanent, and cumulative environmental effects across SEOs depending on the nature and scale of the development. Notwithstanding this, alternative ST 02 should be brought forward for consideration within the Strategy, to fully leverage the anticipated benefits of this technology in the future.

Sludge Treatment (ST) 03 aims to introduce Advanced Thermal Conversion technologies, seeking opportunities for co-benefits of nutrient/resource recovery at appropriate scale. Similar to ST01 and ST02, this alternative will reduce sludge volume whilst contributing towards valorisation of the bioeconomy.

UÉ have identified four ATC technologies that are more technically viable for Ireland: mono-incineration; co-incineration; hydrothermal carbonisation (HTC), gasification and pyrolysis. Incineration requires high capital and operating costs and will produce ash with a limited potential for recovery of struvite from the ash produced. Gasification can produce syngas and some biochar from feedstock. Pyrolysis at lower temperatures can produce biochar from which phosphorus can be potentially recovered and at higher temperatures, it can bio-oil and syngas that can be used for energy or transport fuel. Currently, this process is deployed at medium scale WWTP facilities (up to 100,000 P.E.). HTC produces hydrochar that can be used as a solid fuel. ATC technology trials and implementation at large scale WWTPs is considered to be indirectly positive for MA as most of these technologies can contribute towards new energy and climate neutrality targets and increased circularity by recovering valuable components such as struvite, syngas and biochar, whilst producing similar amounts of energy as Advanced AD. Furthermore, all these technologies achieve high volume reduction of sludge, similar to thermal drying, thereby having additional benefits in terms of MA and LS.

It is noted from Table 7-1 above, that the conventional methods are not able to remove the emerging contaminants which is a growing concern. Utilising and scaling up ATC will also have positive impacts for PHH, BFF, LS and W, as most of these technologies have the potential to remove the emerging contaminants in addition to pathogens. However, it is acknowledged that the ATC technologies will have high energy requirements compared to the conventional methods. Notwithstanding that, the benefits offered outweigh the drawbacks associated with potential high costs associated with high energy requirements for operation.

As with any infrastructural development, depending on the nature and scale, there is a potential for direct and indirect, positive and negative, localised, permanent, and cumulative environmental effects across SEOs. These developments where applicable will be subject to the outcomes of planning and environmental assessments/licensing.

Preferred Environmental Alternative and Reason for Choosing:

The three alternatives **ST01, ST02** and **ST03** are considered preferred as conventional thermal dryers is not considered economically feasible anymore. All these alternatives have merits in terms of improving the energy efficiency of the sludge treatment process along with resulting in energy generation and reuse, reduction in carbon emissions and enhanced resource recovery. Anaerobic Digestion technology is currently being delivered and has scalability in the short to medium term and as such is the preferred environmental

option as it will contribute towards the achievement of the CAP24 targets for biomethane generation and scalability in the short to medium term. This should be continued whilst the Advanced AD and ATC technologies are scaled up.

It is noted that ST02 and ST03 alternatives will require greater development of infrastructure, giving rise to potential localised, permanent, direct and indirect negative effects for all environmental receptors depending on location. There is some progress already been made under ST02 with deployment of AAD technology at some WWTPs offering enhanced energy generation. ATC technologies are fairly nascent in Ireland and would require supporting infrastructure for scalability. Innovations in the sector are anticipated and this should be supported to ensure there is not an over reliance on any one technology. The focus should allow for the delivery of the most sustainable, energy efficient and cost effective options and as such ST02 and ST03 cannot be discounted at this stage.

7.2.4 Transport Alternatives

7.2.4.1 Transport

One of the challenges of wastewater sludge and bioresource management is transport logistics. There are potential environmental and economic impacts associated with sludge transportation.

The following two alternatives are assessed for transportation of sludge:

- **Transport Alternatives 01** - Business as usual; and
- **Transport Alternatives 02** - Reduce / minimise distance and quantities of sludge.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
Transport 01	-	0	0	0	-	-	-	0	0
Transport 02	+	0/+	0	0/+	+	+	0/+	0	0

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils/Sediments; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape*

Assessment and Discussion

Transport 01 relates to business as usual approach in relation to transportation of treated sludge/biosolids to the nearest suitable spread lands. The total volume of sludge in Uisce Éireann's wastewater treatment plants is approximately 1,000,000 m^3 / annum. The volume of sludge varies depending on the treatment type and the use of thermal drying facilities. The transport costs can vary depending on the WWTP location.

As sludge volume continues to increase with expected increase in population growth, the transportation of sludge and associated total costs per annum would subsequently increase in the coming years. This is considered to have direct negative effects for CF, AQ and MA in the short-, medium- and long-term due to GHG emissions, emissions of transport related air pollutants and transportation costs if the current business as usual model remains. This alternative would result in increase in air pollutants notably additional nitrogen dioxide and particulate matter generated from the transport, having indirect negative effects in the short-, medium- and long-term for PHH in the form of respiratory and cardiovascular health issues.

Transport 02 seeks to explore opportunities to deploy various thickening and dewatering technologies that are energy efficient, low carbon and cost effective to help reduce the sludge volume to a greater extent. This can, in turn, reduce the number of trips required to transport the treated sludge prior to spreading on agricultural lands. Uisce Éireann's are also, in parallel developing Bioresource Centres (BCs) and Satellite Dewatering Centres (SDCs) to help optimise the balance between sludge treatment and transport costs. Uisce Éireann will also continue to use the National Bioresource Strategic Decision Support Tool (DST) to optimise transport strategies and ensure lower carbon transport options are used. Therefore, positive effects are anticipated from taking this alternative forward, for CF, AQ and MA in particular with direct reductions in transport emissions in the short-, medium- and long-term due to a decrease in transport carbon emissions, air pollution and transport costs. Indirect benefits are also anticipated for PHH, BFF, W and LS due to the reduction in emission of harmful transport related pollutants (e.g. nitrogen dioxide and particulate matter) will also occur in the short-, medium- and long-term.

Preferred Environmental Alternative and Reason for Choosing:

Transport 02 emerges as the preferred environmental option. Under Climate Action and Low Carbon Development (Amendment) Act 2021, Ireland must pursue carbon neutrality by 2050. This measure will help Ireland to manage the increased volume of sludge resulting from growth in population whilst ensuring compliance with national climate ambitions articulated in both the 2021 Act and the Climate Action Plan 2024. It also supports Uisce Éireann in achieving compliance with obligations under the revised Urban Wastewater Directive through implementation of technologies contributing towards energy efficiency, nutrient circularity and zero carbon ambitions. Additionally, Transport 02 has potential to result in positive, long-term effects on BFF, W, LS, AQ and PHH by resulting in reduction of harmful pollutants associated with traffic movements and will help UÉ achieve its sustainability framework ambitions.

7.2.5 Reuse Alternatives

7.2.5.1 Landspreading

The following two alternatives are assessed for landspreading treated biosolids:

- **Landspreading 01**: Continue to land spread biosolids as usual.
- **Landspreading 02**: Produce a robust monitoring programme that establishes an evidence base in the short term, to support land spreading and identifying other suitable locations, where required.

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
Landspreading 01	+/-	+/-	+	+/-	0	0	+/-	0	0
Landspreading 02	+	+	+	+	+	+	+	+	+

***Key**: **PHH:** Population & Human Health; **BFF:** Biodiversity, Flora & Fauna; **LS:** Land & Soils/Sediments; **W:** Water; **AQ:** Air Quality; **CF:** Climatic Factors; **MA:** Material Assets; **CH:** Cultural Heritage; **LandS:** Landscape.*

Assessment and Discussion

Landspreading 1 aims to continue the practice of land spreading treated biosolids on agricultural lands. This involves a nuanced evaluation of both the benefits and challenges presented. The current practice is considered to be positive for LS and MA in particular in the short- to long-term as it will offers significant cost and soil fertility benefits through provision of nutrients such as nitrogen, phosphorous and potassium, which are vital for optimal crop growth. However, land spreading of biosolids presents a number of challenges including legislative requirements, food safety concerns, compliance of third party contractors, and availability of outlets. These were identified for the current NWSMP that was published in 2016. Since its publication, further challenges have emerged, primarily land bank availability and concerns regarding emerging contaminants including PFAS and microplastics. Landspreading biosolids therefore, is also considered to be potentially negative for PHH, BFF, LS, and W in the short- to long-term due to potential exposure to contaminants including PFAS, POPs and heavy metals, resulting in an accumulation in soils, potentially affecting food sources, and ecosystems posing risks to human health and habitats and species. This will have subsequent negative effects for MA resulting from increased costs associated with mitigating negative impacts on human health and terrestrial and aquatic ecosystems.

In light of the above, Landspreading 1 whilst being a circular and sustainable option, could pose a potential risk to population and wider environment. Therefore, it is considered positive that the draft Strategy aims to explore alternative options to land spreading to develop a sustainable and resilient options in the wake of the current challenges.

Landspreading 2 relates to development of a robust monitoring programme that helps establish an evidence base and subsequently identifying suitable alternative outlets in the short term. The current NWSMP acknowledged that an extensive amount of international monitoring and research has been conducted in relation to monitoring persistent organic pollutants. Evidence from various countries, recast

UWWTD, and research findings such as those of the EPA research project on fate of microplastics[95] underscores the need for proactive engagement from Ireland to address the pressing issue in relation to contaminants in biosolids.

In light of the potential negative impacts from Landspreading 1, this alternative would allow for an expansion of the monitoring to be done in Ireland to collate data on potential contaminants including PFAS and microplastics at existing biosolid application sites in addition to data on soil quality and nutrient levels. This additional monitoring could be facilitated through a partnership arrangement with research institutions and/ or other public bodies with access to landbanks suitable for landspreading. The data collated of this programme will support an evidence base and inform the decision-making regarding the suitability of specific locations for biosolids application and/or sustainability of continuing to land spread biosolids as a whole. This alternative is therefore considered to be positive for all SEOs as it will help inform the selection of sites for landspreading if continued along with improving evidence base in Irish context to drive future policies in relation to sludge management. It is recommended that the monitoring programme supports adaptive management with respect to emerging data, changing environment and legislative requirements. It should also encourage a feedback loop to allow for early stakeholder engagement.

Preferred Environmental Alternative and Reason for Choosing:

The establishment of a comprehensive monitoring program is the preferred environmental alternative for managing biosolid reuse in Ireland, driven by increasing concerns regarding the potential environmental and public health implications from contaminants in treated biosolids.

Whilst Ireland continues to rely on this cost-effective and circular method of reusing biosolids, there is a shift in some other EU countries where landspreading of biosolids has been limited or stopped completely due to the potential risks associated with contaminants in sewage sludge. This necessitates a thorough evaluation of current practice to ensure the safety and sustainability of biosolid reuse. It is acknowledged that the levels of contaminants will be different in Ireland from other countries due to difference in soil type, industrial loading and climate etc. It is critical to establish an evidence base during the cycle of draft Strategy by establishing a control site and conducting a comparative analysis of soil sample with the existing land spread sites to deduce the level of contaminants. The monitoring of sites will help identify level of contaminants and any associated geographical specificity that influences these levels in Ireland. As noted above, this could be carried out I partnership with research institutions and / or other public bodies with access to a landbank suitable for landspreading. The outcome of this evidence could either support land spreading in Ireland or drive the need for identifying alternative outlets such as implementing ATC technologies sooner.

[95] EPA, Nash et. al (March 2023). Sources, Pathways and Environmental Fate of Microplastics (2016-W-LS-10) EPA Research Report. Available at: https://www.epa.ie/publications/research/epa-research-2030-reports/research-430-sources-pathways-and-environmental-fate-of-microplastics.php Accessed: May 2025.

8 ASSESSMENT OF PREFERRED SCENARIO

8.1 Introduction

The purpose of this section of the Environmental Report is to evaluate as far as possible the environmental effects of implementing the draft Strategy and to set out measures envisaged to prevent, reduce and as far as possible offset any significant adverse effects on the environment. The preferred scenario identified in **Chapter 2** has been progressed, and the draft Strategy sets out objectives and measures to be implemented over the course of the strategy.

8.2 Assessment Parameters

The approach used for assessing the draft Strategy has broadly been an objectives-led assessment. Each proposed action has been assessed against a set of strategic environmental objectives (SEO); refer to **Chapter 6** for details. The assessment identifies likely significant effects (positive and negative) with reference to achieving the identified SEO to see which objectives/measures would contribute to achieving the SEOs and which, if any, contradict them. The assessment is reported in the form of a matrix assessment using the following symbols:

Symbol	Intended Meaning
Plus (+)	Indicates a potential positive environmental impact
Minus (-)	Indicates a potential negative environmental impact
Plus/minus (+/-)	Indicates that both positive and negative environmental impacts are likely
Uncertain (?)	In the absence of further detail, the impact is unclear
Zero (0)	Indicates no significant impact

Schedule 1 of SEA Regulations includes criteria for determining the likely significance of effects on the environment. The EPA Guidelines on preparation of EIAR also provides context for assessment of effects. Both have guided the assessment of the draft Strategy. Criteria include:

QUALITY: In accordance with S.I. No. 435/2004, as amended, consideration has been given to pathways for positive, negative and neutral effects of the draft NBioS on the receiving environment. The primary effect of the draft NBioS is to manage biosolids from the wastewater process sustainably. Many of the principles and priorities under consideration will have *direct* impacts on material assets as a result. However, a number also have the potential to impact on other environmental receptors both directly and indirectly. These *secondary and indirect* effects have been taken into account in the assessment which follows. *Cumulative effects* arise for instance where several developments may each have an insignificant effect but together have a significant effect or where several individual effects of the draft NBioS have a combined effect. *Synergistic effects* interact to produce a total effect greater than the sum of the individual effects so that the nature of the final impact is different to the nature of the individual impact.

SIGNIFICANCE: In accordance with S.I. No. 435/2004, as amended, significant effects on the receiving environment are identified, described and assessed. Other non-significant effects are also noted for robustness but only those that are significant are mitigated.

EXTENT: The draft NBioS will apply nationally to the Republic of Ireland. It is a 2nd tier plan in the UÉ planning framework and will influence others in that tier and below. As such the assessment will be primarily focussed on activities occurring at the national scale.

LIKELIHOOD: Impacts arising from the implementation of the draft NBioS will be likely or unlikely to occur. Likelihood relates to what can reasonably expected to occur.

DURATION: In line with the SEA Directive, short, medium and long-term impacts will be considered during the assessment. The identification of relevant timeframes for short, medium and long-term have had regard particularly to the period the draft Strategy will cover a 25-year period up to 2050 approx. Consideration has

also been given to Climate Action and Low Carbon (Amendment) Act 2021 which commits Ireland to reducing greenhouse gas emissions by 51% by 2030; and the Programme for Government ambition for net zero emissions target by 2050. For the purpose of the SEA, a short-term horizon to 2030, a medium term horizon between 2030 and 2035 (to reflect the review cycle) and the long term horizon of 2050 have been considered.

8.3 Integration of the SEA and AA Processes

To assist the Uisce Éireann (UÉ) team in integrating environmental considerations into the programme, the SEA and AA teams have worked with the UÉ team to provide advice and guidance on various aspects of the draft Strategy. This included meetings and discussion to discuss overall strategy and specific areas e.g., to strengthen environmental outcomes. Specifically, the SEA and AA teams:

- Hosted a workshops with the plan team on alternatives and cross-cutting issues (see **Chapter 7**);
- Provided feedback in relation to existing planning processes and broad environmental considerations (see **Chapter 9**); and
- Developed mitigation measures and recommendations for inclusion in the draft updated Strategy (see **Chapter 9**).

8.4 Assessment of Overall Draft Strategy

The key aspects for environmental assessment are broadly laid out in Chapter 3 of the draft Strategy document. The chapter identifies four strategic objectives. These objectives are underpinned with strategic aims and actions that will help achieve these objectives upon implementation of the draft Strategy**. Figure 8-1 to Figure 8-4** below reproduces the headline objectives, aims and actions as presented in the draft Strategy. The environmental assessment presented in the following sections follows the actions below in a sequential manner for clarity, making reference to supporting chapter text where relevant.

STRATEGIC OBJECTIVE	STRATEGIC AIM	Action	Refer to Section for more details
1 - Sustainable management of wastewater sludge and bioresources	Achieving net zero carbon	1.1 Implement Biogas Optimisation Programme and incorporate methane emissions monitoring and control into biogas producing sites.	Section 4.4
		1.2 Development of heat strategies and support heat recovery.	Section 6.3
	Adopting circular approaches	1.3 Continue to develop potential opportunities for Co-Digestion in line with development of National Policy or Legislation.	Section 4.4
		1.4 Implement resource recovery technologies.	Section 4.4
		1.5 Maximise circularity and valorisation of circular bioeconomy.	Section 4.4
		1.6 Increase understanding of alternative outlets, market demand and specification requirements for these outlets.	Section 7.0
	Gaining value from innovation	1.7 Carry out demonstration on advanced thermal conversion (ATC) technology, and based on outcome implement ATC technology.	Section 12.3
		1.8 Continue to support current and future bioresources research projects, monitor specific evidence based findings and incorporate into risk assessment method.	Section 12.3
		1.9 Invest in renewable energy optimisation and generation.	Section 4.4
	Securing long-term funding	1.10 Quantify long term investment needs for our bioresource assets.	Section 9

Figure 8-1: Strategic Objectives Aims and Actions - Sustainable Management of Wastewater Sludge and Bioresources

STRATEGIC OBJECTIVE	STRATEGIC AIM	Action	Refer to Section for more details
2 - Protect and restore our environment	Contributing to positive biodiversity	2.1 Implement nature based solutions such as sludge reed beeds (SRBs) on smaller sites (<2K P.E.), and SRBs are considered on all capital projects.	Section 5.4
		2.2 Manage our assets to ensure biodiversity 'net gain'.	Section 5.4
		2.3 Implement actions from our 'Biodiversity Action Plan' in delivery of bioresources projects.	Section 1.4
	Meeting our commitments under the recast UWWTD (rUWWTD) and the Sewage Sludge Directive	2.4 Manage wastewater sludge and bioresources throughout the asset lifecycle to meet our existing regulatory requirements.	Section 11
		2.5 Ensure all new regulatory requirements of the rUWWTD are met e.g. enhanced monitoring, energy neutrality, and circular economy.	Section 11.1
		2.6 We are engaging with Regulators and Stakeholders regarding the development of a revised Code of Good Practice for the Use of Biosolids in Agriculture.	Section 11.1
		2.7 Implement National emerging contaminants monitoring programme and carry out additional analysis as needs emerge.	Section 11.1
	Protecting our water and land environment	2.8 Continue on-going regulatory monitoring and UÉ traceability data collection.	Section 11.1
		2.9 Implement a National Biosolids Assurance Scheme.	Section 11.3
		2.10 Engage with key stakeholders and consult on PFAS limits.	Section 4.6
		2.11 Implement alternative uses if needed.	Section 4.6
		2.12 Bioresources response plan to be reviewed and further developed to manage land outlet.	Section 4.6
		2.13 Promote source control management, advocating legislation around source control and improving wastewater sludge quality.	Section 4.6
		2.14 Carry out risk assessments for industrial / pharmaceutical effluent discharging into our wastewater treatment plants.	Section 4.6
		2.15 Provide storage facilities for treated bioresources Nationally.	Section 8.2

Figure 8-2: Strategic Objectives Aims and Actions – Protect and Restore our Environment

STRATEGIC OBJECTIVE	STRATEGIC AIM	Action	Refer to Section for more details
3 - Support our communities, growth and the bioeconomy	Engaging with communities	3.1 Develop a culture of acceptance and community education & awareness regarding quality assurance and circularity of bioresources.	Section 11.3
	Supporting the development of the circular bioeconomy	3.2 Engage with EU, Regulators and key stakeholders regarding the development of the proposed new EU Circular Economy Act.	Section 1.3
	Providing for growth	3.3 Embed growth and demand analysis capability to forecast and plan for future investment requirements.	Section 4.3
		3.4 Engage and collaborate with key stakeholders to support local, regional and national planning policy.	Section 4.3

Figure 8-3: Strategic Objectives Aims and Actions – Support our Communities Growth and the Bioeconomy

STRATEGIC OBJECTIVE	STRATEGIC AIM	Action	Refer to Section for more details
4 - Efficient operation of wastewater sludge and bioresources centres	Managing our assets	4.1 Phase out leachate acceptance at our wastewater treatment plants in consultation with Regulators, Local Authorities and waste operators.	Section 3
		4.2 Continue to utilise licenced waste transport operators and auditing of contractors to ensure compliance with Standard Operating Procedure (SOP).	Section 7
		4.3 Review dry solids monitoring on all new and upgraded wastewater sludge treatment assets to improve dewatering quality.	Section 5.1
		4.4 Review and update Standard Operating Procedures (SOPs) for wastewater sludge and bioresource treatment assets.	Section 11.1
	Ensuring efficient transportation	4.5 Continue to develop a National Bioresource Decision Support Tool, optimising low carbon transport.	Section 7.2
	Implementing efficient technologies	4.6 Implement sustainable efficient pre treatment drying technology in parallel with ATC to optimise Resource Recovery.	Section 6.3

Figure 8-4: Strategic Objectives Aims and Actions – Efficient Operation of Wastewater Sludge and Bioresources Centres

8.4.1 Sustainable Management of Wastewater Sludge and Bioresources

Strategic Aims	Proposed Actions in the draft Strategy
Achieving Net Zero	**Action 1.1:** Implement Biogas Optimisation Programme and incorporate methane emissions monitoring and control into biogas producing sites.
	Action 1.2: Development of heat strategies and support heat recovery.
Adopting Circular Approach	**Action 1.3:** Continue to develop potential opportunities for Co-Digestion in line with development of national policy or legislation.
	Action 1.4: Implement resource recovery technologies.
	Action 1.5: Maximise circularity and valorisation of circular bioeconomy.
	Action 1.6: Increase understanding of alternative outlets, market demand and specification requirements for these outlets.
Gaining value from innovation	**Action 1.7:** Carry out demonstration on advanced thermal conversion (ATC) technology and based on outcome implement Advanced Thermal Conversion technology.
	Action 1.8: Continue to support current and future bioresources research projects, monitor specific evidence based findings and incorporate into risk assessment method.
	Action 1.9: Invest in renewable energy optimisation and generation.
Securing long-term funding	**Action 1.10:** Quantify long term investment needs for our bioresource assets.

Ref.	*PHH*	*BFF*	*LS*	*W*	*AQ*	*CF*	*MA*	*CH*	*LandS*
Action 1.1	+/-	0/-	0/-	0/-	0/-	+	+/-	0	0
Action 1.2	+/?	+/?	+/?	+/?	+/?	+/?	+/?	0/?	+/?
Action 1.4	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/0	+/0
Action 1.5	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Action 1.6	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-
Action 1.7	+	+	+	+	+	+	+	0	0
Action 1.8	+/-/?	+/-/?	+/-/?	+/-/?	+/-	+/-	+/-/?	+/-	+/-
Action 1.9	+	+	+	+	+	+	+	0	0
Action 1.10	+	+	+	+	+	+	+	0	0/-
Action 1.11	0	0	0	0	0	0	+	0	0

Key: *PHH: Population & Human Health; BFF: Biodiversity, Flora & Fauna; LS: Land & Soils; W: Water; AQ: Air Quality; CF: Climatic Factors; MA: Material Assets; CH: Cultural Heritage; LandS: Landscape.*

Discussion:

Action 1.1 relates to implementation of the Biogas Optimisation Programme (BOP) that has been initiated by UÉ to improve and optimise biogas production and usage along with addressing common challenges across the AD plants in relation to biogas usage, reporting, cleaning and adopting innovative biogas technologies where appropriate. Biogas recovery from WWTP can aid in achieving greater energy security and reducing emissions associated with the management of wastewater. Beyond self-sufficiency surplus biogas can also be upgraded to biomethane at larger AD sites which could in turn contribute to the national biomethane target of 5.7 TWh by 2030 which has been committed to in the Government's National Biomethane Strategy published in 2024. Efficient energy generation and optimisation of biogas will also contribute to the energy neutrality and circular economy requirements of the rUWWTD. Therefore, this action is considered to be directly positive for CF as it will help recognise the full potential of biogas for renewable energy generation which in turn will contribute towards achievement of reduced GHG emissions and net zero carbon targets. The action will likely have indirect positive effects for PHH and MA over medium- to long-term due to the co-benefits of implementing approach of circular economy and renewable energy generation. Notwithstanding ths positive effects, biogas also has potenital for negative effects on PHH, BFF, W, LS, AQ (odour, particulates) and MA. This is related to direct emissions from leakage, aeorosols, particulates, and also indirect emissions to soil and water from the resulting digestate which may contain contaminants that have pathways to groundwater, surface water and food production systems depending on where the digestate is spread.

Action 1.2 relates to the development of heat strategies and a commitment to support heat recovery. Biogas produced at some AD plants is converted into heat and electricity which is sustainably reused within the WWTPs. It also discusses the potential for heat generation from bio-oil or syngas produced from the pyrolysis process and its utilisation in district heating. It is noted that there is still a need to review the scalability and feasibility of pyrolysis for a very large scale WWTP and this will be addressed with the advancement in technology and research. The action in itself is considered broadly positive for most SEOs particularly CF, and MA. Similarly provision of support for heat recovery will have direct positive effects for CF and MA in particular, over the medium- to long-term as it promotes energy efficiency and circular economy within the sector. Indirect positive effects can be expected for PHH also.

The Strategy does note it will explore opportunities to integrate efficient drying systems (including but not limited to infrared drying, solar-regenerative dryers, contact disc dryers and thin film sludge dryers) along with ATC technologies into the existing asset base with AD and AAD technology. This commitment is considered to be directly and indirectly positive for BFF and MA in the short-, medium- and long- term as implementation of such technologies can enhance recovery of valuable materials/nutrients from bioresources thereby resulting in improved nutrient cycling in the ecosystems and reduction in waste generation. Resource recovery will have positive impacts for CF by contributing to climate change mitigation through reduced greenhouse gas emissions from adoption of energy efficient technologies for resource recovery and potential carbon sequestration from recovered organic matter. Indirect positive effects are likely to occur for PHH, BFF, LS, AQ and W, as adoption of resource recovery technologies can lead to a decrease in volume of sludge, and subsequently minimised air pollution risks, waste pollution and nutrient loading. As with any infrastructural development, there is potential for positive and negative, direct and indirect, localised, permanent, and cumulative environmental effects across SEOs depending on the nature and scale of the development to deploy these technologies (e.g., solar farms). However, no significant effects are anticipated if these synergistic technologies are deployed in existing facilities. Given the level of information provided in the draft Strategy, there is also some uncertainty regarding the extent of the effects on the environmental receptors at this stage as a result of Action 1.2.

Action 1.3 relates to development of potential opportunities for co-digestion in line with national policy and legislation. It is recognised in the draft Strategy co-digestion can be developed particularly with food waste as a substrate due to its high methane yield, fast digestion kinetics and local availability. Food waste is a global issue and the urgency and challenge of addressing food waste is highlighted at international level through Goal 12.3 of the UN SDGs: "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains".

Co-digestion of sewage sludge with food waste has the potential for indirect, positive effects in the medium- to long- term for most SEOs. Diverting food waste from landfills/composting and replacing fossil energy reduces GHG emissions (point and fugitive) with benefits for CF and AQ. Reduced pressure for landfill/composting facilities has indirect positive effects for BFF, W, LandS and CH arising from land-use change. The co-digestion process can also improve sludge stabilisation with indirect positive impacts for LS, W, BFF where volumes of digestate can be minimised. The increased organic matter content with food waste

can improve opportunity for plant-available nitrogen and phosphorus, enabling recycling of nutrients to land and reducing demand for mineral fertilisers. However, the potential for landspreading of digestate to impact negatively on PHH (odour), LS and W (contamination), BFF (pollution), MA (contamination), remains depending on the sensitivity of the receiving lands. Siting of facilities and introduction of standard operating procedures will be key to avoiding unnecessary negative effects. In this regard, the UÉ Guide to Route and Site Selection[96] should be used.

Action 1.4 relates to implementation of resource recovery technologies. There are many possible technologies which can enhance recoverability. This may include removal of phosphate thereby reducing pollution risk to rivers and lakes, recovery of ammonia reducing losses of nitrates, recovery of heat from biogas leading to displacement of fossil fuel and improved CF, AQ and MA outcomes. Indirect positives are also anticipated for PHH, W, BFF, LS and MA from the various recovery streams by reducing risk of pollution and supporting the bioeconomy. This action is considered to be directly and indirectly positive for most SEOs in the short-, medium- and long- term as implementation of such technologies can enhance recovery of valuable materials/nutrients from bioresources thereby resulting in improved bioresource economy. The Bioresources UK Water Industry Research (UKWIR) study (July 2024)[97] carried out a detailed review of all sludge constituents which are or can be used to create bioresources for beneficial reuse. A total of 79 resources were identified as being deemed viable for recovery. Resource recovery has potential for positive indirect impacts for CF by contributing to climate change mitigation through reduced greenhouse gas emissions from landfills and potential carbon sequestration from recovered organic matter. It also has potential for positive impacts for MA by bolstering the bio-resource economy, recovering valuable nutrients and minerals as well as energy. Indirect positive effects are likely to occur for PHH, BFF, LS, AQ and W, as adoption of resource recovery technologies can lead to a decrease in landfill related methane emissions, waste pollution and nutrient loading and emissions, decreased need for artificial fertilisers and offset of emissions from various heating through to LS, W and AQ. As with any infrastructural development, there is potential for positive and negative, direct and indirect, localised, permanent, and cumulative environmental effects across SEOs depending on the nature and scale of the development to deploy these resource recovery technology.

Action 1.5 relates to maximisation of circularity and valorisation of circular bioeconomy. The benefits of this are many including but not limited to: reuse of nutrients (nitrogen, phosphorus), carbon and water reducing the need for extracting virgin material; reduced pollution as less waste goes to landfill /incineration, and renewable energy replaces fossil fuels; creates economic value; can build resilience for materials such as fertiliser, reducing dependence on imports and supports the wider circular economy. These benefits have direct and indirect positive impacts for most SEOs. However, potential negative effects are also possible. Not all valorised products are automatically safe or clean: biosolids or digestate can contain contaminants (metals, pharmaceuticals, PFAS) and if poorly treated, regulated or managed, spreading recovered materials can harm water (W), soil biodiversity (LS, BFF), human health (PHH) and material assets (MA). Energy requirements can also lead to additional AQ and CF impacts, if renewables cannot be used as a fuel source. As with any supporting infrastructural development, there is potential for direct and indirect negative effects on all SEOs from construction and operation of new/upgraded facilities.

Action 1.6 relates to increasing knowledge of bioresource alternative outlets and associated specification requirements along with market demand. This is considered to be indirectly positive for PHH, BFF, LS, W, AQ, CF and MA in the medium- to long- term as greater awareness and regulatory alignment can reduce risks associated with contaminants, enhance land application strategies, reduce methane and nitrous oxide emissions by diverting sludge from landfills to productive usage, expanding market demand for bioresources will create job opportunities, innovation and resource efficiency. There are no significant effects anticipated for CH and LandS from enhanced knowledge regarding alternative outlets and market demand. Chapter 13 of the draft Strategy focuses on ongoing research that has been carried out in terms of resource recovery and valorisation of treated wastewater sludge and bioresources that can help with the development of new cost-efficient and efficient solutions for bioresource management. It also provides information regarding Research and Innovation (R&I) actions, research areas of interest and a list of research projects that Uisce Éireann have been involved in the past and the future projects.

Action 1.7 includes two sub-actions: (a) carrying out demonstration of Advanced Thermal Conversion (ATC) technology and (b) based on the demonstration outcome, implement the Advanced Thermal Conversion

[96] Irish Water A Guide to Route and Site Selection, V03 2024

[97] UKWIR Study entitled 'Response to the National Bioresources Strategy – Prioritisation of Resource Recovery Opportunities'

(ATC) technology. There is already some progress in terms of ATC technology to ensure sustainable long-term resilience to our agricultural land reuse outlet. Progressing a demonstration of ATC technology is indirectly positive for all SEOs as it is likely to yield valuable evidence that can improve waste management and reduce future landfill pressures, inform decision making and allow for mitigations and enhancements to be considered before scalability is introduced. This will result in broadly positive indirect impacts for all SEOs. It is assumed the second sub-action refers to pyroysis also. As no details are given about number or size of plants deploying ATC technology, the impacts of this would be uncertain. Not withstanding that, there are positive impacts expected for MA and CF in relation to the circularity it brings to the industry with potential for production of biochar and recovery/ recycling of nutrients etc. However, negative impacts are also possible as pyrolysis does not necessarily remove all pathogens at lower temperatures so the digestate may contain contaminants which would impact negatively on W, LS, BFF, and PHH. The nature and scale of the implementation would need to be understood and assessed at lower tiers when this information is available.

Action 1.8 relates to supporting current and future bioresources research projects, monitoring evidence based findings and incorporate them into risk assessment method . This is considered a positive commitment. Increasing concerns regarding potential impacts of landspreading is a challange for UÉ and this has been compounded by a lack of evidentuary testing to support risk assessment. UÉ is engaging in studies at an international scale but will benefit from national data also. Indirect positive effects are anticipated for PHH, AQ, W, BFF, LS, MA and CF as this action will provide an evidence base for decision making. No significant effects are anticipated for CH or LandS.

Action 1.9 relates to provision of investments in renewable energy optimisation and generation. This is considered to be directly positive for LS, AQ, CF and MA in the medium- to long-term. The shift towards energy recovery and bioresource valorisation will result in reduced volume of sludge directed to landfills which is positive for LS and AQ. Additionally, indirect positive impacts for AQ will arise from renewable energy generation as it will reduce the reliance on fossil fuels and associated emissions of particulate matter, sulphur dioxide (SO_2), and nitrogen oxides (NOx). Investing in anaerobic digestion (AD), thermal hydrolysis, and other renewable energy solutions can reduce methane emissions through biogas/biomethane production and carbon sequestration via biochar, having positive effects for CF. Optimisation of renewable energy generation can develop new energy markets and reduce operational costs for WWTPs which is positive in terms of MA. Indirect positive effects are anticipated for PHH, BFF and W, as reducing emissions and pollution from traditional sludge management methods (such as incineration and landfilling) by deploying renewable energy solutions can improve air quality and public health, prevent habitat degradation and contamination of watercourses due to leachate reduction from landfills. In terms of LandS, permanent negative effects in the medium- to long- term are likely to occur with the development of new facilities deploying renewable energy solutions outside industrial zones. However, positive effects are also anticipated to occur if sludge-derived biochar is used for land restoration, thereby also improving land use efficiency. There are no significant effects anticipated for CH.

Action 1.10 relates to quantification of long-term investment needs for UÉ's bioresource assets. This action is considered to be indirectly positive for MA in the medium- to long-term. Quantifying long-term investment for bioresource asset management will allow for better planning and allocation of funds to improve resource and energy efficiency, biosolid quality and management practices and monitoring of contaminants and nutrient runoff. This would lead to reduced contamination risks, improved soil fertility, enhanced land quality, reduced emissions of air pollutants and GHGs.

Recommendation:

- **Action 1.3**: Apply the UÉ Route and Site Selection Guidance, V03 2024 (and subsequebt updates) for all developments arisng from the draft NbioS as approrpiate.

- **Action 1.3**: Proper digestate management, emission controls, and transport planning are essential to maximize benefits and minimize risks of co-digestion. A Standard Operating Procedure or similar would improve outcomes under this action. In this regard, UÉ's invest to outcome procedures, includes a suite of SOP's and manuals to ensure each project lifecycle is outcome focused.

- **Action 1.6**: Understanding of alternative outlets should be underpinned by environmental safeguards to prevent unintended negative consequences.

8.4.2 Protect and Restore our Environment

Strategic Aims	Proposed Actions in the draft Strategy
Contributing to positive biodiversity	**Action 2.1:** Implement nature-based solutions in projects such as Sludge reed beds (SRBs) on similar sites (>2K P.E.) and SRBs are considered on all capital projects.
	Action 2.2: Manage our assets to ensure biodiversity 'net gain'.
	Action 2.3: Implement actions from our 'Biodiversity Action Plan' in delivery of bioresources projects.
Meeting our commitments under the revised UWWTD and the Sewage Sludge Directive	**Action 2.4:** Manage wastewater sludge and bioresources throughout the asset lifecycle to meet our existing regulatory requirements. **Action 2.5:** Ensure all new regulatory requirements of the rUWWTD are met e.g. enhanced monitoring, energy neutrality, and circular economy. **Action 2.6:** We are engaging with Regulators and Stakeholders regarding the development of a revised Code of Good Practice for the Use of Biosolids in Agriculture. **Action 2.7:** Implement national emerging contaminants monitoring programme and carry out additional analysis as needs emerge.
Protecting our water and land environment	**Action 2.8:** Continue on-going regulatory monitoring and UÉ traceability data collection. **Action 2.9:** Implement a National Biosolids Assurance Scheme. **Action 2.10:** Engage with key stakeholders and consult on PFAS limits. **Action 2.11:** Implement alternative uses if needed. **Action 2.12:** Bioresources response plan to be reviewed and further developed to manage land outlet. **Action 2.13:** Promote source control management, advocating legislation around source control and improving wastewater sludge quality. **Action 2.14:** Carry out risk assessments for industrial/pharmaceutical effluent discharging into our wastewater treatment plants. **Action 2.15:** Provide storage facilities for treated bioresources nationally.

Ref.	*PHH*	*BFF*	*LS*	*W*	*AQ*	*CF*	*MA*	*CH*	*LandS*
Action 2.1	+	+	+	+	+	+	+	0	+
Action 2.2	0/+	+/0	+/0	+/0	0	0	0	0	0/+
Action 2.3	+	+	+	+	+	+	+	0	+
Action 2.4	+	+	+	+	+	+	+	0	0
Action 2.5	+	+	+	+	+	+	+	0	0
Action 2.6	+	+	+	+	+	+	+	0	0
Action 2.7	+	+	+	+	+	+	+	0	0
Action 2.8	+	+	+	+	+	+	+	0	0

Ref.	PHH	BFF	LS	W	AQ	CF	MA	CH	LandS
Action 2.9	+	+	+	+	0	0	+	0	0
Action 2.10	+	+	+	+	+	0	+	0	0
Action 2.11	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-
Action 2.12	0	0	0	0	0	0	+	0	0
Action 2.13	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0	0
Action 2.14	+	0	+	0	0	0	+	0	0
Action 2.15	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-

Key: *PHH: Population & Human Health; BFF: Biodiversity, Flora & Fauna; LS: Land & Soils; W: Water; AQ: Air Quality; CF: Climatic Factors; MA: Material Assets; CH: Cultural Heritage; LandS: Landscape.*

Discussion:

Action 2.1 relates to implementation of nature-based solutions such as sludge reed beds (SRB) in projects. Sludge reed beds use shallow beds planted with macrophytes e.g. *Phragmites australis*. As the sludge passes through the reed bed, it is dewatered and consolidated, reducing volume and moisture content, while microbes and plants help break down organic matter, reduce pathogens and capture nutrients (nitrogen and phosphorus). Such systems can significantly reduce energy consumptions and carbon emissions as well as costs associated with the traditional wastewater treatment process. Reed beds can act as natural carbon sequesters, removing carbon from the atmosphere and can result in creation of sustainable, biodegraded, chemical-free fertiliser for reuse. They can also improve odour issues especially if used to enhance more outdated treatment systems at the plants in the short-term. Reedbeds also enhance biodiversity at the sites through habitat creation and can improve landscape in the receiving environment. Some limitations may be encountered in terms of land area requirements, seasonal performance variation in an Irish climate, slower treatment rates than mechanical systems, and the need for periodic desludging and monitoring. A series of five pilot sites have been delivered in Carlow part of a €800,000 pilot programme at the wastewater treatment plants in Clonegal, Fenagh, Ballon, Myshall and Raheendoran, Co. Carlow. The inclusion of NBS such as reedbeds is considered to be directly and indirectly positive in the short-, medium- and long-term for PHH, BFF, LS, W, AQ, CF and LandS. Reed beds naturally filter and reduce harmful emissions, such as odour and particulate matter, while also preventing direct contact with untreated sludge which will improve air quality (AQ) and enhance public health (PHH). The reed beds create new wetland habitats that can support aquatic plants, insects, birds, and other wildlife, enhancing local biodiversity (BFF). In terms of LS, W and MA, utilising reed beds can promote nutrient cycling and efficient filtration through their natural processes thereby improving soil health, water quality, reduced costs and energy use. Nature-based solutions like reed beds contribute to carbon sequestration through the absorption of carbon dioxide (CO_2) by the plants and soil and help reduce methane emissions, having positive effects for CF as well. No significant effects are anticipated for CH with the utilisation of reed beds.

Action 2.2 relates to management of UÉ's assets to ensure biodiversity 'net gain', however, despite this as an action, it is really the only mention of biodiversity net gain in the draft Strategy. Notwithstanding this, it is acknowledged that UÉ seeks to achieve biodiversity net gain across all new infrastructure projects by 2030(see UÉ Biodiversity Action Plan). UÉ have also advised the SEA team that biodiversity guidance for UÉ developments has been developed to demonstrate biodiversity net gain for infrasturcture projects, however this is not publicly available. In the context of this draft Strategy, any potential to implement Action 2.2 is focussed on enhancing biodiversity (BFF) through the biodiversity protection and restoration measures that would enhance ecological connectivity, restore of ecosystems and reduce pollutants. Nature-based solutions also feature strongly. Employing nature-based solutions helps protect, restore, and enhance water quality; improves climate resilience; increases biodiversity; and has significant potential to deliver more

sustainable solutions. Opportunities for the incorporation of sludge drying reed beds (SDRBs) and other nature-based solutions into wastewater treatment sites are examples.

Managing assets to ensure biodiversity 'net gain' has potential for direct and indirect long-term positive effects on BFF, W and LS in particular. Knock-on indirect positive effects could also be anticipated in the medium- to long-term for PHH through improved well-being in communities where nature enhancements can accompany WW infrastructure. Biodiversity-focused initiatives such as habitat restoration and the implementation of nature-based solutions can have a positive impact also on the landscape (LandS) by providing visually appealing natural environments. No significant effects for AQ, CF, CH or MA are anticipated.

Action 2.3 relates to implementation of actions from UÉ's 'Biodiversity Action Plan' (BAP) in delivery of bioresources projects. The version of the BAP on the UE website (May 2026) proposes seven objectives with underlying actions relating to development of site-specific Biodiversity Management Plans; increasing biodiversity awareness; ensuring 'no net loss' of biodiversity in UÉ's developments; implementation of All Ireland Pollinator Plan actions across UÉ's sites; promoting use of nature based solutions; management of Invasive Alien Species (IAS) at UÉ's sites and collaborating with other stakeholders and wider community to protect and enhance biodiversity. The current BAP is at an advanced stage of update and is expected shortly. This will include a shift toward biodiversity net gain (BNG) on all proejcts. This is considered to be directly positive for BFF, LS and W, in the short, medium and long-term through enhancement of habitats and species diversity (BFF), improved soil and water quality (LS and W). Indirect positives are also anticipated for CF, MA and LandS as a result of increased carbon sequestration (CF) via restored ecosystems, reduction in energy usage and increased amenity use for local communities (MA) and improved landscape aesthetics (LandS) via creation of green corridors, and integration of nature-based solutions into bioresource projects. Indirect positive effects are also likely to occur for PHH and AQ in the medium- to long-term as improving biodiversity through the restoration of natural habitats such as forests, wetlands, and grasslands can improve air quality and subsequently improved human wellbeing from ecosystem and eco-services improvements. The impact on CH is generally neutral and it should be ensured that biodiversity actions do not disturb or conflict with important historical or cultural sites. The progress report on the Biodiversity Action Plan that was published by UÉ in August 2024 outlines the progress made against each of the BAP's seven objectives and associated actions along with the challenges faced during implementation and next steps required. Objective one has been completed and the six other objectives are on-going as they have actions which are currently being implemented. UÉ have committed to continue to progress these objectives and their associated actions. It is stated on UÉ's website that the BAP will be reviewed and revised, if required in absence of a National Restoration Plan. The update is at an advanced stage and a revised BAP is expected shortly.

Furthermore, in recognition of wider issues relevant to protection of biodiversity, that are not covered under the Habitats Directive, e.g. ecological networks, disturbance of habitats and species etc., UÉ have committed to ensuring in the draft Strategy that whilst carrying out bioresources management activities they will comply with the obligations under the Birds and Natural Habitats Regulations 2011-2016. This is a positive statement and addition to the draft NBioS in Chapter 5. It is also noted and welcomed that AA is undertaken to assess any potential impact on European sites. These additional details, although not included as a standalone actions are considered to be directly positive for BFF with potential for indirect positive benefits for PHH, LS, W in the short- to long-term.

Action 2.4 relates to management of wastewater sludge and bioresources throughout the asset lifecycle to meet UÉ's existing regulatory requirements. There are several statutory requirements for monitoring and reporting which would fall under this action alongside best practice approaches which all support the management of wastewater sludge and bioresources. Examples of statutory requirements include: on-going regulatory monitoring including enhanced monitoring under the rUWWTD; reporting as part of the annual Sludge Returns data and Annual Environmental Reports to the EPA; and reporting geographic location of landspreading under the SSD. Best practice examples include development of: a revised Code of Good Practice (CoGP) for the Use of Biosolids in Agriculture; Standard Operating Procedures (SOP's) and control procedures to ensure that the wastewater sludge and bioresource treatment and reuse process is controlled and monitored; independently audited quality system such as a Biosolids Assurance Scheme (BAS) for biosolids bioresource management activities. Action 2.4 is considered to be directly positive for MA and indirectly positive fort PHH, BFF, LS, W and AQ in the short- to medium-term as compliance with regulatory requirements and best practice will ensure safe disposal or treatment of wastewater sludge, thereby minimising pollution and improving public health, soil quality and water quality. It will also help ensure the efficient use of resources, preventing waste and encouraging the recovery and recycling of valuable

materials, having direct positive effects for MA in short- to medium-term. No significant effects are anticipated for CH and LandS at this stage.

Action 2.5 relates to ensuring all new regulatory requirements of the rUWWTD are met. Overall this action will contribute positively to sustainable wastewater and biosolids management, supporting environmental protection, resource efficiency, and the achievement of climate action targets. Proactive engagement to improve pollutant monitoring will also strengthen compliance and safeguard long-term ecosystem and human health. Compliance with rUWWTD regulatory requirements will ensure safe disposal or treatment of wastewater sludge, with positive effects on PHH, BFF, LS, W, AQ and MA in the short- to medium-term in the form of improved public health, soil quality and water quality, resource efficiency, waste prevention and recovery and recycling of valuable materials. No significant effects are anticipated for CH and LandS at this stage.

It is noted that current monitoring frameworks for pollutants and contaminants, particularly emerging substances, do not fully meet the scope envisaged by the rUWWTD. This represents a regulatory and operational gap that requires attention. Further development of comprehensive, scientifically based monitoring protocols will be required to ensure effective identification and management of all relevant pollutants. Addressing this gap is essential to fully realising the Directive's environmental and public health objectives.

Action 2.6 relates to engagement with regulators and stakeholders regarding the development of a revised Code of Good Practice for the Use of Biosolids in Agriculture[98,99]. The current Codes date to 2008 and by current standards have significant gaps. They do not reflect the advances made under the Water Framework Directive (WFD), instead focussing on traditional pathogens, metals and nutrient risks at the field scale. They do not address the newer emphasis on catchment-scale water quality objectives, micropollutants, or the specific constraints (timing, buffer zones, prohibited areas) that modern river-basin management plans and wastewater treatment obligations impose. Also, they generally do not reflect the most recent Nitrates Action Programme (NAP) limits, derogation conditions, required administrative records or the centralized sludge-management planning expectations. There is also greater regulatory and scientific attention to pharmaceuticals, PFAS and other emerging contaminants since 2008; most 2008 guidance will not cover testing/limits or management of many of these substances. The draft NBioS states that research and recommendations into organic contaminants should be reviewed regularly, and additional analysis should be undertaken as needs emerge to mitigate against any risk to soils or health. The review of the Code of Good Practice for Use of Biosolids in Agriculture is seen as a vehicle to review monitoring and limits for organic pollutants and UÉ have noted it as a likely avenue for them to make recommendations for additional monitoring to mitigate against potential risks.

Any progress in updating the 2008 codes is considered positive. The draft Strategy states that a multi stakeholder working group was set up in 2024 to review and update the Code of Good Practice to consider developments in monitoring technologies. This engagement is considered to be indirectly positive for PHH, BFF, LS, W, CF and MA in the short- to medium-term as a revised code will enhance monitoring the production and application of biosolids and will help reduce potential risks for diseases and environmental contamination along with reducing the need for synthetic fertilisers. The requirement to use certain application methods prescribed in the GAP Regulations[100], and the Code of Practice, will minimise the effects on AQ during application. No significant effects are anticipated for CH and LandS at this stage.

Action 2.7 relates to implementation of national emerging contaminants monitoring programme and carrying out additional analysis on emerging contaminants as needs emerge. Implementing a national monitoring programme for emerging contaminants and undertaking additional analysis will improve understanding and management of potentially harmful substances in wastewater sludge and biosolids, enhancing public health protection (PHH) by reducing exposure risks. It is acknowledged that UÉ are actively engaging with and/ or planning collaborations on projects with other national and internation organisations. Better transparency on this engagement would be helpful, as would an understanding of the timelines for the research to bring more certainty.

[98] Code of Good Practice Biosolids in Agriculture-Guidelines for Local Authorities.pdf

[99] Code of Good Practice Biosolids in Agriculture-Guidelines for Farmers.pdf

[100] European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022. (and amendments)

This improved knowledge base will also benefit BFF, LS, W and AQ as it will indirectly support the prevention of environmental degradation and contamination, thereby protecting ecosystem health. This action is considered to have indirect positive effect in the short to medium term for PHH, BFF, LS, W, AQ, CF, MA. No significant effects are anticipated for CH or LandS. In relation to CF and MA, better pollutant assessment can guide more sustainable treatment and resource recovery approaches, contributing to energy efficiency and circular economy goals.

Action 2.8 relates to continuation of on-going regulatory monitoring and traceability pack system and nutrient management plan reviews. The use of sewage sludge in agriculture is highly regulated in Ireland, with high levels of monitoring and control. UÉ operate within this regulatory framework. However, the regulations and guidelines require review to integrate new research, wider environmental legislation and policy, and knowledge. A recent risk assessment at EU level concluded that treated sludge spread onto lands could result in contamination of soils and/or waterbodies by organic compounds, metals and microplastics, and at least some of these contaminants could cause risks for the environment and human health (Huygens, et al., 2022). It is possible that different risk levels for contaminants may be present across Europe, depending on local characteristics and the nature of the sludge applied to land (EEA, 2024). The actual risk in an Irish context is not well understood, however, research undertaken in Ireland has identified at least some concerns/potential risks to the environment (e.g., microplastics (Nash, et al., 2023; Mahon, et al., 2017) and priority metals that are not regulated in the Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998 and 2001 (Healy, et al., 2017)).

Similar to Action 2.4, this action is considered to be indirectly positive for most environmental factors in the short- to long-term as it will ensure that biosolid use is compliant with health and safety standards (PHH), supports soil health (LS) by preventing contamination and optimises the recycling of waste materials and promotes the circular economy (MA). Improved monitoring reduces the risk of biosolid runoff into water bodies, preventing nutrient overload and eutrophication (W), which can negatively affect aquatic life (BFF). Monitoring of emissions during processes such as incineration or drying of sludge and GHG emissions as a part of the regulatory system has the potential for indirect positive effects for AQ and CF as well in the medium- to long-term. No significant effects are anticipated for CH or LandS.

In accordance with S.I. 267 of 2001, all reuse of sludge in agriculture must be carried out in accordance with a Nutrient Management Plan (NMP). The limits on nutrient addition to land are set by S.I. No. 113/2022 - European Union (Good Agricultural Practice for Protection of Waters) Regulations. The current NWSMP requires an NMP to consider environmental impacts, WFD objectives and the potential to impact on the European Sites. The NMP template will be included in the SOPs. The commitment of reviewing the NMPs is considered to be indirectly positive for BFF, LS, W,AQ, CF and MA in the short- to medium- term as it can help identify any additional monitoring requirements of sludge or soil samples in light of emerging contaminants and ongoing EU and international research. This will in turn consolidate the existing evidence base to allow for improved decision making and efficient monitoring of the draft Strategy over the years. No significant effects are anticipated for PHH, CH and LandS.

Action 2.9 relates to implementation of a National Biosolids Assurance Scheme (BAS). This will ensure that biosolids used in agriculture or other applications meet stringent safety standards, having indirect positive effects on PHH, LS, W and BFF as it reduces risks from contamination for human health and soil health and onward pollution or contamination of water resources and local biodiversity. The action is also positive for MA by ensuring efficient and sustainable use of biosolids whilst also reducing waste. The implementation of the BAS will also provide stakeholder reassurance on the protection of the environment and increase the acceptability of biosolids application to agricultural land. The BAS Standard will ensure transparency in relation to aspects of wastewater sludge management including regulatory requirements, treatment, monitoring, recording, reporting and SOPs implementation.

Action 2.10 relates to engagement with key stakeholders and consult on PFAS limits. By engaging with key stakeholders and consulting on PFAS limitations, proactive strategies to reduce PFAS levels in biosolids can be developed. Engagement on this and other emerging contaminants will have indirect positive impacts for PHH, LS, W, BFF, AQ and MA by ensuring open dialogue, use of best available scientific information in decision making, awareness of emerging evidence and consideration of limitations in risk assessments in the short- to long-term. There are no significant effects anticipated for CF, CH and LandS as a result of the consultation on PFAS limitation.

Action 2.11 relates to implementation of alternative uses for wastewater sludges / biosolids if needed. This could arise due to more stringent restrictions, changes in industry or legislative changes for example which would reduce the available agri-land option. Alternative options include utilisation of ATC technologies, reuse

in industry, reuse in non-agricultural land options, all-island treatment approach and in emergency situations, export as a last resort. A feasibility study conducted for the non-agricultural landuse options identified landscaping compost, soil manufacture, composting, energy crops, AD for forestry and cement industry as the outlets with greatest potential. The implementation of alternative uses has potential for direct positive impacts particularly relating to MA, where greater resilience will be integrated into the management of biosolids where a greater diversity of outlets is developed in the medium- to long-term as long as this is not left on hold until there is a risk to the landbank. It should be rolled out more gradually to ensure that there are pathways already available that could be scaled up if need be as the timeline for development of some of these alternative outlets may be influenced by drivers including policy and legislative updates and testing requirements. Indirect negative impacts may occur for PHH, BFF, W, MA, AQ and CF where additional transport is required for biosolids and additional treatment processes are applied with potential for emissions to air, soil or water. Transportation and process emissions may increase carbon footprint on the one hand but energy recovery opportunities could contribute positively to CF also.

Positive and negative impacts are also possible in relation to other uses depending on the nature, scale and location as well as the sensitivity of the receiving environment. While some of the alternatives may be project specific (e.g., landfill capping), others are not (e.g., spreading of biosolids on lands growing energy crops, landspreading within forestry, potential future landspreading of biochar or hydrochar). Some of the alternatives move biosolids away from the food chain which is positive for PHH but since they may involve the landspreading or use of biosolids for land remediation, they have similar potential effects on BFF, W, LS as those that could arise from landspreading onto agricultural lands. Development of many of these outlets has been limited in Ireland.

Detailed environmental risk assessment is required to support decision making at local level. Additionally, provision of alternative outlets may result in infrastructural developments to deploy technologies such as ATC and resource recovery technologies and provide composting and AD facilities etc. Therefore, this commitment is anticipated to have positive and negative, direct and indirect, localised, permanent, and cumulative environmental effects across SEOs depending on the nature and scale of any such development.

Action 2.12 relates to reviewing and developing a bioresourcesresponse plan to manage land outlet and implementing alternative uses if there is risk to the current reuse outlet i.e., agriculture. Proactive planning is essential to ensure readiness and to maintain continuity of sustainable biosolid treatment and reuse. Such preparedness will facilitate compliance with environmental standards, safeguard public and ecosystem health, and support long-term resource efficiency. Indirect positive effects for MA are likely to occur as a response plan introduces certainty within the lifecycle of the process, bringing greater resiliance to the sector and will help ensure the long term ambitions for circular economy within the sector can remain on track and are de-risked from external shocks.

Action 2.13 relates to promoting source control management which is considered broadly positive for PHH, LS, BFF, W, AQ, CF and MA in the medium- to long-term. Source control ensures that fewer contaminants are present in the wastewater stream, thus reducing the risks of harmful exposure to these substances and contamination of environment. Source control ensures better resource recovery by diverting harmful substances early in the process reducing risks associated with biosolids and land management practices. Notwithstanding that, there is a potential for negative effects on PHH, BFF, LS, W, AQ and CF where additional treatment is needed at source leading to increased diffuse emissions and also for MA where additional costs are incurred by industry.

Action 2.14 relates to carrying out risk assessments for industrial / pharmaceutical effluent discharging into WWTPs. This aligns with the requirements in the rUWWTD regarding enhanced monitoring and improved source control to protect sludge quality. Undertaking such risk assessments is considered directly positive for PHH, BFF, LS and W, in the short to long-term as these will help prioritise high-risk discharges, introduction of appropriate pre-treatment or source controls, and improved operational safeguards at wastewater treatment plants. This targeted assessment approach therefore reduces uncertainty around contaminant fate and supports evidence-based mitigation measures. The action is also considered positive for MA in the long term as reduced pollutant loads and better targeted management will result in long-term resilience of WWTPs and improved biosolids and bioresources quality.

Action 2.15 relates to provision of storage facilities for treated biosolids nationally. There is a need for storage facilities during periods when application of biosolids to land is not allowed during winter months from October to February as required by the Code of Good Practice for the use of Biosolids in Agriculture. In recent times, the period of land spreading availability has decreased due to changing climate conditions and heavier rainfall events leading to waterlogged land. To ensure storage requirements are met nationally,

additional storage facilities will be provided to facilitate the predicted increase in sludge as new and upgraded plants are completed. Strategic storage locations will be identified nationally, located at Regional Bioresource Centres (RC) or at a separate facility. Additional storage facilities will ensure that the increased volume of sludge is stored and managed in an appropriate and adequate manner. This will reduce the risks for pollution, contamination and environmental accidents in the medium- to long-term. Notwithstanding that, as with all infrastructural development, provision of additional storage facilities must be mindful of potential for negative effects across SEOs during the construction and operational phases of the development. County development plans / local area plans and robust site selection tools will be essential to identifying suitable locations with appropriate servicing to ensure significant negative effects can be avoided. It is also important that the individual projects are subjected to requirements of relevant environmental assessments and development consents.

Mitigation:

- **Action 2.6** – A timeline for the delivery of the revised Code of Good Practice for the Use of Biosolids in Agriculture should be stipulated to avoid further delays in addressing this key guidance. It is acknowledged that UÉ are not the lead stakeholder in this..

- **Action 2.7**: For transparency, UÉ should maintain a public list of the organisations they are collaborating with on research and innovation in relation to biosolids management, particularly with regard to emerging contaminants. This should include information on specific projects and related timelines.

Recommendations:

- **Action 2.3:** To further complement supporting text in chapter 5 of the draft NBioS, an additional commitment should be included that reaffirms UÉ's commitment to consider wider environment effects beyond ecological matter through application of assessments such as SEA and/or EIA.

- **Actions 2.5 and 2.6:** The draft Strategy should include a specific commitment to review and update the final National Bioresource Strategy in line with the revised Code of Good Practice and revisions to any other relevant legislation including Sewage Sludge Directive and Industrial Directive, if revised before the next anticipated review of the Strategy in 5 years.

- **Action 2.11:** Environmental risk assessments should be used to inform decision making at a local scale on the feasibility / suitability of alternative uses if the risk to land bank materialises.

- **Action 2.15** – The use of site selection tools should be stipulated in this action e.g. constraints analysis, heat mapping etc.

8.4.3 Support our Communities Growth and the Bioeconomy

Strategic Aims	Proposed Actions in the draft Strategy
Engaging with communities	**Action 3.1:** Develop a culture of acceptance and community education & awareness regarding quality assurance and circularity of bioresources.
Supporting the development of the circular bioeconomy	**Action 3.2:** Engage with EU, Regulators and key stakeholders regarding the development of the proposed new EU Circular Economy Act.
Providing for growth	**Action 3.3:** Embed growth and demand analysis capability to forecast and plan for future investment requirements. **Action 3.4:** Engage and collaborate with key stakeholders to support local, regional and national planning policy.

Ref.	*PHH*	*BFF*	*LS*	*W*	*AQ*	*CF*	*MA*	*CH*	*LandS*
Action 3.1	+	+	+	+	+	+	+	+	+
Action 3.2	+	+	+	+	+	+	+	0	+
Action 3.3	+	+	+	+	+	+	+	0	+
Action 3.4	+	+	+	+	+	+	+	+	+

Key: *PHH: Population & Human Health; BFF: Biodiversity, Flora & Fauna; LS: Land & Soils; W: Water; AQ: Air Quality; CF: Climatic Factors; MA: Material Assets; CH: Cultural Heritage; LandS: Landscape.*

Discussion:

Action 3.1 relates to developing a culture of acceptance and community education & awareness regarding quality assurance and circularity of bioresources. This measure is considered broadly positive for all SEOs over the short-, medium- and long-term, as it will result in increased awareness regarding biosolids quality assurance and the importance of biosolid recycling, waste reduction, and sustainable practices and development of the new EU Circular Economy Act for enhanced sustainable waste management. Action 3.1 has the potential for direct positive impacts for all SEOs by ensuring there is clear and accurate information available which can encourage circular economies / activities such as composting, nutrient recycling, and local biomass use. The impact would be reduced pollution, lowers demand for synthetic fertilizers and fossil-based resources, cutting greenhouse gas emissions and preserving soil and water quality. Greater community engagement also accelerates adoption of regenerative practices, strengthens local circular economies, and builds resilience to climate impacts through healthier soils, improved biodiversity, and reduced transport-related emissions.

Action 3.2 relates to engagement with EU, Regulators and key stakeholders regarding the development of the proposed new EU Circular Economy Act. The purpose of the Act[101] is to help create market demand for secondary materials and a single market for waste, notably in relation to critical raw materials. Sludge contains many potential resources (energy, nutrients, raw materials and process by-products) which have potential to be exploited given the right drivers[102]. As noted by the Eureau in their 2024 position paper[103], the full potential of wastewater and sludge in terms of resource recovery should be recognised, if the full benefits

[101] Ursula von der Leyen calls for a more circular and resilient economy | European Circular Economy Stakeholder Platform
[102] Capodaglio, A, Callegari, A. Energy and resources recovery from excess sewage sludge: A holistic analysis of opportunities and strategies ,Resources, Conservation & Recycling Advances, Volume 19, 2023.
[103] Position paper Enabling the circular potential of sewage sludge within the EU legislative framework A critical analysis of the current urban waste water treatment sludge legislation with respect to the circular economy

to the circular economy are to be realised. However, the paper also identifies regulatory and policy hurdles that may limit effectiveness, therefore, stakeholder engagement by UÉ will result in positive impacts by ensuring the optimum outcome for sustainable development and the circular economy. The action is considered to be indirectly positive for PHH, AQ, W, CF, LS, BFF, MA and LandS over the short-, medium- and long-term. Engagement will result in increased awareness regarding the importance of biosolid recycling, waste reduction, and sustainable practices and development of the new EU Circular Economy Act for enhanced sustainable waste and bioresource management.

Action 3.3 relates to embedding growth and demand analysis capability to forecast and plan for future investment requirements. At this stage, this action is anticipated to have direct positive effects for MA in the medium- to long-term as better forecasting leads to efficient use of resources and more sustainable infrastructure investment. Indirect positive effects are anticipated for PHH, LS, BFF, W, AQ, CF and LandS where investments resulting from demand analysis will focus on improved sanitation or waste management systems and energy-efficient or low-emission technologies.

Action 3.4 relates to engagement and collaboration with key stakeholders to support local, regional and national planning policy. This will result in better policy outcomes over medium- and long-term by integrating health, environmental and economic considerations into planning. This is likely to have positive effects for all the SEOs in the short-, medium- and long-term, as it will allow for the incorporation of land management strategies, best wastewater management practices, sustainable energy use, and optimization of resource management into future planning policies.

Mitigation:

- None proposed.

8.4.4 Efficient Operation of Wastewater Sludge and Bioresources Centres

Strategic Aims	Proposed Actions in the draft Strategy
Managing our assets	**Action 4.1:** Phase out leachate acceptance at our wastewater treatment plants in consultation with Regulators, Local Authorities and waste operators. **Action 4.2:** Continue to utilise licenced waste transport operators and auditing of contractors to ensure compliance with Standard Operating Procedure (SOP). **Action 4.3:** Review dry solids monitoring on all new and upgraded wastewater sludge treatment assets to improve dewatering quality. **Action 4.4:** Review and update Standard Operating Procedures (SOPs) for wastewater sludge and bioresource treatment assets.
Ensuring efficient transportation	**Action 4.5:** Continue to develop a National Bioresource Decision Support Tool, optimising low carbon transport.
Implementing efficient technologies	**Action 4.6:** Implement sustainable efficient pre-treatment drying technology in parallel with ATC to optimise Resource Recovery.

Ref.	*PHH*	*BFF*	*LS*	*W*	*AQ*	*CF*	*MA*	*CH*	*LandS*
Action 4.1	+/-	+/-	+/-	+/-	+/-	+/-	+/-	0/-	0/-
Action 4.2	+	+	+	+	+	+	+	0	0
Action 4.3	+	+	+	+	+	+	+	0	0
Action 4.4	+	+	+	+	+	+	+	+	+
Action 4.5	+	+	+	+	+	+	+	0	0
Action 4.6	+	+	+	+	+	+	+	0	0

Key: *PHH: Population & Human Health; BFF: Biodiversity, Flora & Fauna; LS: Land & Soils; W: Water; AQ: Air Quality; CF: Climatic Factors; MA: Material Assets; CH: Cultural Heritage; LandS: Landscape.*

Discussion:

Action 4.1 relates to phasing out leachate acceptance at our wastewater treatment plants. As noted in Chapter 7, landfill leachate is a complex liquid that forms as water percolates through waste materials in a landfill. Its composition varies depending on waste type, landfill age, and environmental conditions. Typically, the leachate comprises of high concentrations of dissolved organic matter, including volatile fatty acids, phenols, and other degradation products of organic waste. It may also contain heavy metals such as cadmium, lead, mercury, and arsenic, originating from batteries, electronic waste, and industrial materials and microbial contaminants such as pathogenic bacteria, viruses, and other microorganisms which can all be present in leachate, posing a risk to groundwater and surface water. Runoff from recycling and waste transfer centres will also contain a variety of contaminants, which will also depend on the materials being processed and site management practices. Similar to landfill leachate the runoff may/will contain heavy metals from electronic waste and batteries and organic pollutants from plastics, oils and other processed materials. Nutrients with elevated concentrations of nitrogen and phosphorus may be present as well as microplastics, if the recycling centre is dealing general waste plastics. As such its removal from the wastewater process would have direct and indirect positive effects for the receiving environment as the

components of the leachate are reduced/ removed. This is considered to be indirectly positive for PHH, BFF, W and LS AQ, CF, MA in the short- to long-term.

However, these positive effects are dependent on the sustainable disposal of the leachates elsewhere. There are limited alternatives available for waste operators currently. At present, it is in the interest of the operator to minimise production of leachates as it is expensive to deposit leachate at a WWTP. Development of on-site capabilities, however, is likely to involve high capital cost which will make a switch to this approach slow. There is no further information in the draft Strategy on what phasing would involve or the timelines proposed. If not done in a coordinated manner, this could increase risk to the environment where some operators are slow to engage or do not have the capital to do so. Without further detail, this action has potential for indirect negative effects for all SEOs as a result. UÉ will engage with relevant stakeholders during the statutory public consultation on the draft strategy, to enable further consideration of appropriate phasing.

Action 4.2 relates to continuing to utilise licenced waste transport operators and auditing of contractors to ensure compliance with Standard Operating Procedure (SOP). This will provide full traceability and have standard operating procedures to optimise desludging and liquid sludge removal. Transportation is a significant aspect of wastewater sludge and bioresources management in terms of environmental and social aspects as it impacts on the overall carbon footprint (CF and MA) and traffic, odour, and noise (AQ, MA, PHH, BFF). Licensed operators are subject to strict regulations and guidelines that ensure safe transport of waste, reducing the likelihood of accidents, spills, and exposure to hazardous materials which could negatively impact on PHH, BFF, W, and LS. This action is indirectly positive for PHH, BFF, W, LS, AQ, CF and MA in the short- to long-term as safer handling and transportation of potentially hazardous materials contributes to overall well-being. There are no significant positive effects anticipated for the remaining SEOs.

The draft Strategy confirms that UÉ Sludge Framework Contractors carry out all elements of the works related to the transportation of sludge in accordance with current legislation, regulations and the requirements set out within the Code of Good Practice. However, it is important to address and acknowledge the current procedural gaps that may affect the overall effectiveness of this approach. Presently, contractors transporting sludge are audited for compliance with the Code of Good Practice. Given that the Code of Good Practice is now outdated, there is a risk that auditing procedures may not fully capture emerging risks or reflect modern best practices. This gap could potentially undermine the consistency and transparency of compliance assurance for sludge and transport operations with indirect negative effects for PHH, BFF, W, LS, AQ and MA. It is noted that Action 2.6 references an update to the Code of Good Practice but the lack of a clear timeline or roadmap to this is concerning as it is not within UÉ remit to update the Code of Good Practice. To address this, the development and implementation of an updated Standard Operating Procedure (SOP) or similar compliance framework for this is recommended. Such a framework would establish clearer operational standards and enhance oversight mechanisms, ensuring that licensed operators and contractors maintain robust safety and environmental protection standards. Strengthening compliance verification will further reduce the risks associated with waste transport and contribute to the overall sustainability of wastewater management systems related to sludge.

Action 4.3 relates to a review of dry solids monitoring to improve dewatering quality. As noted in the draft NBioS, it is important to reduce sludge volume and quantity to optimise transport and storage efficiencies as part of the treatment process. The extent of reduction depends on the size and location of the WWTP, and the technology type in use. Various thickening and dewatering technologies shown are typically used to reduce the volume. Effective monitoring of dry solids is essential to ensure optimum efficiency of equipment and chemicals used in the dewatering process. Inadequate monitoring leads to more chemical costs, higher energy use, more frequent maintenance, and larger volumes of sludge to handle or dispose of. The review of dry solids monitoring will have direct positive effects for MA as it will ensure assets are operating to maximum efficiencies. Indirect positives are also anticipated for PHH, BFF, W, LS, MA, AQ and CF from reducing the need for unnecessary chemical additions, unnecessary energy usage and unnecessary transport. No significant effects are anticipated for CH and LandS.

Action 4.4 relates to review and update of Standard Operating Procedures (SOPs). UÉ have developed SOP's and control procedures to ensure that the wastewater sludge and bioresource treatment and reuse process is controlled and monitored. These SOPs are implemented and embedded by UÉ for effective wastewater sludge and bioresource treatment assets. This action, therefore, is considered to be broadly and indirectly positive for all the SEOs over the short- to medium-term as the draft Strategy will ensure standardisation of the wastewater sludge and bioresource management through the SOPs across all the WWTPs, in line with the revised legislative requirements such as those set out in the rUWWTD.

Action 4.5 relates to continuing to develop a National Bioresource Decision Support Tool, optimising low carbon transport. This action is considered to have direct positive effects for AQ and CF in the medium-term due to reduction in transportation emissions (air pollutants and GHG emissions), particularly from fossil fuel-based vehicles. This will have indirect positive effects for PHH, BFF, LS and W, in the short- to long-term with reduced risks of respiratory and cardiovascular problems, disturbance and deterioration of habitat and species, and reduced potential runoff pollution. By optimising transport and reducing fuel consumption, the lifespan of vehicles, roads, and other material assets will be extended which could lead to reduced maintenance costs and a more sustainable transport network, having indirect positive effects for MA. There are no significant effects anticipated for CH and LandS.

Action 4.6 relates to implementation of sustainable efficient pre-treatment drying technology in parallel with ATC to optimise resource recovery. This action is considered to have direct positive effects for AQ and CF in the medium-term as it offers a more sustainable approach to sludge management by minimizing the need for energy-intensive treatment methods such as incineration. This results in reduced generation of particulate matter, volatile organic compounds (VOCs), and other air pollutants and GHG emissions. The improved recovery processes from pre-treatment drying and ATC will support circular economy principles, reducing reliance on raw materials and conserving natural resources, positively affecting MA in the medium- to long-term. Indirect positive effects are likely to occur for PHH, BFF, LS and W in the short- to long-term as efficient resource recovery process from this reduces pollution and its effects on these environmental parameters. There are no significant effects anticipated for CH and LandS.

Mitigation:

- None proposed.

9 MITIGATION AND MONITORING

9.1 Mitigation Proposals

Chapter 7 and 8 of this Environmental Report have highlighted the potential significant environmental effects of the implementation of the draft Strategy and the reasonable alternatives considered. It has also had regard to the assessment work carried out to inform the Appropriate Assessment. In line with Annex I(g) of the SEA Directive, this chapter presents the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan.

The draft Strategy has benefitted from iterative discussion and assessment feedback to inform the draft as presented for public consultation. Over the course of this iterative feedback, UÉ have amended the emerging draft to address issues raised through the SEA and AA processes, however it is acknowledged that further integration of mitigation will continue during the statutory consultation period as other stakeholder feedback is received.

Section 9.1.1 outlines proposed SEA mitigation and **Section 9.1.2** outlines proposed NIS mitigation for the draft Strategy.

9.1.1 SEA Mitigation for draft Strategy

Mitigation measures are proposed, where there is a likelihood for significant effects to occur for environmental receptors. However, other recommendations have been proposed where improvements can be made to the draft Strategy in the absence of any significant effects identified in the assessment.

Table 9-1: SEA Mitigation for draft Strategy

Reference	Proposed Mitigation/Recommendations
Section 8.4.1 - Sustainable Management of Wastewater Sludge and Bioresources	**Recommendation:** • Action 1.3: Apply the UÉ Route and Site Selection Guidance, V03 2024 (and subsequebt updates) for all developments arisng from the draft NbioS as approrpiate. • Action 1.3: Proper digestate management, emission controls, and transport planning are essential to maximize benefits and minimize risks of co-digestion. In this regard, UÉ's invest to outcome procedures, includes a suite of SOP's and manuals to ensure each project lifecycle is outcome focused. • Action 1.7: Understanding of alternative outlets should be underpinned by environmental safeguards to prevent unintended negative consequences.
Section 8.4.2 - Protect and Restore our Environment	**Mitigation:** • Action 2.6 – A timeline for the delivery of the revised Code of Good Practice for the Use of Biosolids in Agriculture should be stipulated to avoid further delays in addressing this key guidance. It is acknowledged that UÉ are not the lead stakeholder in this. • Action 2.7 – For transparency, UÉ should maintain a public list of the organisations they are collaborating with on research and innovation in relation to biosolids management, particularly with regard to emerging contaminants. This should include information on specific projects and related timelines. **Recommendations:** • Action 2.3: To further complement supporting text in chapter 5 of the draft NBioS an additional commitment should be included that reaffirms UÉ's commitment to consider wider environment effects beyond ecological matter through application of assessments such as SEA and/or EIA. • Actions 2.5 and 2.6: The draft Strategy should include a commitment a specific to review and update the final National Bioresource Strategy in line with the revised Code of Good Practice and revisions to any other relevant legislation including Sewage Sludge Directive and Industrial Directive, if revised before the next anticipated review of the Strategy in 5 years.

Reference	Proposed Mitigation/Recommendations
	• Action 2.11: Environmental risk assessments should be used to inform decision making at a local scale on the feasibility / suitability of alternative uses if the risk to land bank materialises. • Action 2.14 – The use of site selection tools should be stipulated in this action e.g. constraints analysis, heat mapping etc.
Section 8.4.3 - Support our Communities Growth and the Bioeconomy	• None proposed.
Section 8.4.3 - Efficient Operation of Wastewater Sludge and Bioresources Operating Centres	• None proposed.

9.1.2 NIS Mitigation for draft Strategy

An NIS for the draft Strategy has been prepared under separate cover. It includes detailed assessment and associated mitigation measures. This section presents a summary of the plan-specific mitigation measures proposed in the NIS.

1. Produce and implement a Standard Operating Procedure (SOP), to be applied at point of distribution of the biosolids from UÉ to the end-user (contractor). The SOP will set out best practice for use of the biosolids for landspreading or reuse on land (agriculture or non-agricultural) and also confirm the end-user's restrictions for use and application of the distributed biosolids. The process for development of this SOP by UÉ is set out in **Section 7.2.2** of the pre-consultation NIS.
2. Support research to inform the evidence base for future revisions or iterations of the Strategy (or its successors) (**Section 7.2.3** of the pre-consultation NIS).
3. Review the list of parameters to be monitored within biosolids and undertake regular monitoring of same (**Section 7.2.4** of the pre-consultation NIS).
4. Review the draft Strategy and the SOP to account for emerging research, policy etc. (**Section 7.2.5** of the pre-consultation NIS)

9.2 Monitoring Proposals

Article 10 of the SEA Directive requires that monitoring be carried out in order to identify, at an early stage, any unforeseen adverse effects due to implementation of a Plan or Programme, and to be able to take remedial action. Monitoring is carried out by reporting on a set of indicators, which enable positive and negative impacts on the environment to be considered. Monitoring is focussed on aspects of the environment that are likely to be significantly impacted by the implementation of the NBioS. Where possible, indicators have been suggested based on the availability of the necessary information and the degree to which the data would allow the target to be linked directly with the implementation of NBioS.

The proposed programme is outlined in **Table 9-2**.This is intended to be a programme for consultation and comments on the proposals are encouraged and welcomed as part of the SEA process. Over the course of consultation, it is anticipated that refinement of the monitoring programme will include additions and deletions to the table based on feedback relating to practicality of gathering data or suggestions of other more relevant or more freely available data from other sources.

9.2.1 Responsibility for Monitoring

Coordination of monitoring of the NBioS is the responsibility of the UE as the competent authority for the NBioS. It is acknowledged that other Government departments and agencies also gather and host relevant information which is required for NBioS monitoring purposes. These other sources will be reviewed in reporting on monitoring outcomes.

9.2.2 Guidance on Monitoring

The following guidance on approach and best practice for monitoring has been taken into account in developing the proposed monitoring programme for the Strategy:

- Guidance on Strategic Environmental Assessment (SEA) Statements and Monitoring (2023), EPA, Johnstown Castle, Ireland. Available online: https://www.epa.ie/publications/monitoring--assessment/assessment/strategic-environmental-assessment/guidance-on-sea-statements-and-monitoring.php (accessed 05 October 2023).
- EC (European Commission), 2003. Implementation of Directive 2001/42 on the Assessment of the Effects of Certain Plans and Programmes on the Environment. Available at: https://ec.europa.eu/environment/archives/eia/pdf/030923_sea_guidance.pdf (accessed 05 October 2023).

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Table 9-2: Proposed Environmental Monitoring Programme for draft Strategy

SEA Topic	Rationale	Indicator	Target	Data Source	Frequency
Cross-cutting	Concern regarding public and ecosystem health resulting from contaminants in wastewater sludge	Contaminants in wastewater sludge	Achieve the monitoring requirements, particularly Article 21, under the rUWWTD.	• Uisce Éireann • EPA • DAFM	As per rUWWTD
Cross-cutting	To promote producer responsibility in dealing with pollutants.	Levels of pollutants particularly PFAS and microplastics at inlet/outlet points in urban WWTP	Decreasing trend in PFAS and microplastics at urban WWTP	• Uisce Éireann	As per rUWWTD
Cross-cutting	Ensure contractors are transporting and landspreading in accordance with UE contractual requirements	Audit of compliance of bioresource management contractors with the UE standards	100% compliance	• Uisce Éireann	Annual
Air Quality and Climate	To ensure that transport related emissions associated with biosolid reuse are minimised both in terms of km travelled and fuel source.	• Total Km travelled in securing reuse of biosolids • % of Clean and Energy-Efficient Road Transport Vehicles used	• Decreasing trend in total km travelled using National Bioresources Strategic Decision Support Tool (DST). • Increase in % of Clean and Energy-Efficient Road Transport Vehicles used.	• Uisce Éireann	Annual
Water, Land and Soils, Material Assets and Biodiversity	Ensure nutrient recovery and reuse	Quality of Nutrient management plans	100% compliance in NMP reviews	• Uisce Éireann	Ongoing
Climate	To ensure there is energy reduction and recovery to minimise potential for GHG emissions from management of biosolids	• Energy usage in management of biosolids • Energy recovered from management of biosolids	• Decreasing trends in energy usage in treatment assets • Increasing trend in energy recovery • Overall improved balance between energy usage and recovery across the asset base	• Uisce Éireann	Ongoing. Analysis of energy metrics reported to SEAI

10 NEXT STEPS

Table 10-1: Remaining Steps in the draft Strategy, SEA and AA Processes

National Bioresource Strategy	SEA and AA Milestones
Publication of draft Strategy	Publication of Environmental Report and Natura Impact Statement
End of statutory consultation	End of statutory consultation
Review of submissions and changes to the draft Strategy	Review of submissions and assessment of proposed changes to the draft Strategy, ensuring integration of any changes with the changes made to the draft Strategy
Finalisation of draft Strategy	Preparation of SEA Statement
Adoption of the National Bioresource Strategy by the Uisce Éireann	Finalisation of the Natura Impact Statement to support the Uisce Éireann in making the AA Determination
Publication of final National Bioresource Strategy	Publication of SEA Statement, final Natura Impact Statement, and AA Determination

Written submission or observation on the draft Strategy or associated environmental reports can be made up to 5pm on the Tuesday, 21st July 2026 via:

https://www.water.ie/projects/strategic-plans/bioresources

It should be noted that in the interest of transparency, all submissions and observations received during this public consultation will be taken into consideration and will be documented in the Public Consultation Report.

Appendix A

Copy of Scoping Submissions

An Roinn Comhshaoil,
Aeráide agus Cumarsáide
Department of the Environment,
Climate and Communications

Uisce Éireann,
PO Box 448,
South City Delivery Office,
Cork City

29th August 2024

RE: SEA Scoping for the National Wastewater Sludge Management Plan (NWSMP)

Dear Sir/Madam,

The Department of the Environment, Climate and Communications (**DECC**) welcomes the opportunity to input into the scoping stage of the Strategic Environmental Assessment (**SEA**) process relating to the National Wastewater Sludge Management Plan (**the Plan**).

Relevant Plans and Programmes

It is of critical importance that the analysis of climatic factors in the SEA process incorporates the latest quantitative data and analysis against which the proposed Plan can be assessed, in order to ensure that the Plan appropriately supports the State's climate ambition and legally binding target.

As such, we welcome the inclusion of the following relevant plans, programmes and policies and associated environmental assessments in the assessment of the Plan, which our Department has considered during previous SEAs of plans and programmes:

- The Government's new National Adaptation Framework, which was approved in June 2024.
- The recently approved Climate Action Plan 2024 (**CAP24**), which is the third annual update to Ireland's Climate Action Plan. The CAP24 lays out the roadmap of actions to meet our national climate objective of pursuing and achieving the transition to a climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy by 2050.
- Ireland's 4th National Biodiversity Plan 2023-2030 which sets the national biodiversity agenda for the period 2023-2030 and aims to deliver the transformative changes required to the ways in which we value and protect nature.

We further encourage consideration of the following relevant plans, programmes and policies and associated environmental assessments in the assessment of the Plan:

- Water Action Plan 2024 – A River Basin Management Plan for Ireland which is committed to protecting and restoring Ireland's natural waters by complying fully with the requirements of the Water Framework Directive. This, soon to be published (early September 2024), Water Action Plan will accelerate the identification and implementation of the right measures in the right places to both restore and protect all waterbodies.
- The Clean Air Strategy for Ireland provides the high-level strategic policy framework necessary to identify and promote the integrated measures across government that are required to reduce air pollution and promote cleaner ambient air, while delivering on wider national objectives. It outlines how we will enhance and protect the quality of the air that we breathe and realise the full environmental and health benefits of cleaner air.

The further suite of documents set out in the list below, can also provide useful and relevant baseline and benchmarks for quantitively assessing the climate and environmental impacts of the proposed Plan.

- SEAI's report on the National Energy Projections 2023 and associated article
- The Government's Draft Updated National Energy & Climate Plan 2021-2023 (which will be finalised in the coming months)
- Sectoral Emissions Ceilings
- Sectoral Adaptation Plans made under the NAF
- The outputs from the National Dialogue on Climate Action (NDCA)
- EPA's reports Climate Change in the Irish Minds (CCIM)
- The EPA's report on Ireland's Provisional Greenhouse Gas Emissions 1990-2022
- Action 5.1 of the Bioeconomy Action Plan 2023 – 2025
- The Sustainable Development Goals Implementation Plan 2022- 2024
- The Government of Ireland's Land Use Review.
- The EPA's Greenhouse Gas Emissions Projections 2023-2050.
- The EPA's Air Quality data, which details the locations of all monitoring stations currently in operation, along with real-time and historic data from each station.

We encourage the inclusion of the above listed reports as data sources and suggest they be included in the assessments to be set out in the Environmental Report. It is suggested that the Plan should be assessed in terms of its effects on the achievement of the objectives in the plans, policies and strategies in as detailed a manner as possible, by quantifying the impact of the Plan and its effects on the environment and climate objectives set out in them.

EU Legislation

In terms of EU Legislation, we recommend including reference to:

- The Directive (EU) 2023/2413 (the latest recast Renewable Energy Directive), Council Regulation (EU) 2022/2577 (laying down a framework to accelerate the deployment of renewable energy)
- The EIA Directive 2014/52/EU (assessment of the effects of certain public and private projects on the environment)
- The Public Participation Directive 2003/35/EC (public participation in the process of drawing up certain plans and programs related to the environment).
- The Soil Monitoring Law
- The recently enacted Nature Restoration Law

We trust the above is of assistance in the scoping of the SEA process for the Plan.

Yours sincerely,
Planning Advisory Division
Department of the Environment, Climate and Communications

An Roinn Comhshaoil, Aeráide agus Cumarsáide
Department of the Environment, Climate and Communications

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

National Wastewater Sludge Management Plan
Uisce Éireann
PO Box 448, South City Delivery Office
Cork City

07 August 2024

Re: SEA Scoping for the National Wastewater Sludge Management Plan (NWSMP)
Your Ref: n/a
Our Ref: 24/264

Dear Sir/Madam,
Geological Survey Ireland is the national earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and gather various data for that purpose. Please see our website for data availability. We recommend using these various data sets, when conducting the EIAR, SEA, planning and scoping processes. Use of our data or maps should be attributed correctly to 'Geological Survey Ireland'.

The publicly available data referenced/presented here, should in no way be construed as Geological Survey Ireland support for or objection to the proposed development or plan. The data is made freely available to all and can be used as independent scientific data in assessments, plans or policies. It should be noted that in many cases this data is a baseline or starting point for further site specific assessments.

With reference to your email received on the 12 July 2024, concerning the SEA Scoping for the National Wastewater Sludge Management Plan (NWSMP), Geological Survey Ireland would encourage use of and reference to our datasets. This data can add to the content and robustness of the SEA process. With this in mind please find attached a list of our publicly available datasets that may be useful to the environmental assessment and planning process. We recommend that you review this list and refer to any datasets you consider relevant to your assessment. The remainder of this letter and following sections provide more detail on some of these datasets.

Geoheritage
Geological Survey Ireland is in partnership with the National Parks and Wildlife Service (NPWS) in the Department of Culture, Heritage and the Gaeltacht to identify and select important geological and geomorphological sites throughout the country for designation as geological NHAs (Natural Heritage Areas). This is addressed by the Geoheritage Programme in Geological Survey Ireland, under 16 different geological themes, in which the minimum number of scientifically significant sites that best represent the theme were rigorously selected by a panel of theme experts.

CGSs have been adopted in the National Heritage Plan, and will form a major strand of geological nature conservation to complement the various ecological and cultural conservation measures. It is important to note however, that management issues for the majority of geological heritage sites may differ from ecological sites. County Geological Sites are the optimal way of addressing the responsibility of each authority under the Planning and Development Act 2000 and its amendments, to protect sites of geological interest.

Currently 30 local authority areas have completed geological heritage audits, creating an almost national level of audited sites. Completed audits for the 30 local authority areas can be viewed and downloaded here.

As always we are available if you require any further information, please feel free to contact GSI Planning (GSIPlanning@gsi.ie).

Groundwater
Geological Survey Ireland's Groundwater and Geothermal Unit, provides advice, data and maps relating to groundwater distribution, quality and use, which is especially relevant for safe and secure drinking water supplies and healthy ecosystems. Proposed developments need to consider any potential impact on specific groundwater abstractions and on groundwater resources in general.

We recommend using the groundwater maps on our Map viewer which should include: wells; drinking water source protection areas; the national map suite - aquifer, groundwater vulnerability, groundwater recharge and subsoil permeability maps.

For areas underlain by limestone, please refer to the karst specific data layers (karst features, tracer test database; turlough water levels (gwlevel.ie). Background information is also provided in the Groundwater Body Descriptions. Please read all disclaimers carefully when using Geological Survey Ireland data.

GWClimate is a groundwater monitoring and modelling project that aims to investigate the impact of climate change on groundwater in Ireland. This is a follow on from a previous project (GWFlood) and the data may be useful in relation to Flood Risk Assessment (FRA) and management plans. Maps and data are available on the Map viewer.

Geological Survey Ireland has completed Groundwater Protection Schemes (GWPSs) in partnership with Local Authorities, and there is now national coverage of GWPS mapping. A Groundwater Protection Scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater. **The Groundwater Protection Response overview and link to the main reports is here: https://www.gsi.ie/en-ie/programmes-and-projects/groundwater/projects/protecting-drinking-water/what-is-drinking-water-protection/county-groundwater-protection-schemes/Pages/default.aspx**

Geological Mapping

Geological Survey Ireland maintains online datasets of bedrock and subsoils geological mapping that are reliable and accessible. We would encourage you to use these data which can be found here, in your future assessments.

Please note we have recently launched QGIS compatible bedrock (100K) and Quaternary geology map data, with instructional manuals and videos. This makes our data more accessible to general public and external stakeholders. QGIS compatible data can be found in our downloadable bedrock 100k .zip file on the Data & Maps section of our website.

Our 3D models can help stakeholders visualize, understand and characterise geology, for deposit and resource mapping, for flooding and for urban geology applications including basement impact assessment, Sustainable Drainage Systems (SuDS), and subsurface management. Our 3D models offer a key element of geotechnical risk management by identifying areas requiring further site investigation.

Further information on the bedrock and Quaternary 3D models of Dublin is available here and here.

Further information and download instructions for the Quaternary 3D model of Cork are available on the Geological Mapping programme dedicated here and here.

Geohazards

Geohazards can cause widespread damage to landscapes, wildlife, human property and human life. In Ireland, landslides, flooding and coastal erosion are the most prevalent of these hazards. We recommend that geohazards be taken into consideration, especially when developing areas where these risks are prevalent, and we encourage the use of our data when doing so.

Survey Ireland has information available on landslides in Ireland via the National Landslide Database and Landslide Susceptibility Map both of which are available for viewing on our dedicated Map Viewer. Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.

Geological Survey Ireland also engaged in a national project on Groundwater Flooding. The data from this project may be useful in relation to Flood Risk Assessment (FRA) and management plans, and is described in more detail under 'Groundwater' above.

Coastal Vulnerability while seen as a potential geohazard, is discussed in more detail under our marine and coastal unit information below.

Natural Resources (Minerals/Aggregates)

Geological Survey Ireland provides data, maps, interpretations and advice on matters related to minerals, their use and their development in our Minerals section of the website. The Active Quarries, Mineral Localities and the Aggregate Potential maps are available on our Map Viewer.

We would recommend use of the Aggregate Potential Mapping viewer to identify areas of High to Very High source aggregate potential within the area. In keeping with a sustainable approach we would recommend use of our data and mapping viewers to identify and ensure that natural resources used in any proposed developments are sustainably sourced from properly recognised and licensed facilities, and that consideration of future resource sterilization is considered.

Geochemistry of soils, surface waters and sediments

Geological Survey Ireland provides baseline geochemistry data for Ireland as part of the Tellus programme. Baseline geochemistry data can be used to assess the chemical status of soil and water at a regional scale and to support the assessment of existing or potential impacts of human activity on environmental chemical quality. Tellus is a national-scale mapping programme which provides multi-element data for shallow soil, stream sediment and stream water in Ireland. At present, mapping consists of the border, western and midland regions. Data is available at https://www.gsi.ie/en-ie/data-and-maps/Pages/Geochemistry.aspx. This page also hosts urban geochemistry mapping (Dublin SURGE project), Geochemical Mapping of Agricultural and Grazing Land Soil of Europe (GEMAS) and lithogeochemistry (rock geochemistry) from southeast Ireland datasets. Geological Survey Ireland and partners are undertaking applied geochemistry projects to provide data for agriculture (Terra Soil), waste soil characterisation (Geochemically Appropriate Levels for Soil Recovery Facilities) and mineral exploration (Mineral Prospectivity Mapping).

Marine and Coastal Unit

Our marine environment is hugely important to our bio-economy, transport, tourism and recreational sectors. It is also an important indicator of the health of our planet. Geological Survey Ireland's Marine and Coastal Unit in partnership with the Marine Institute, jointly manages INFOMAR, Ireland's national marine mapping programme; providing key baseline data for Ireland's marine sector. The programme delivers a wide range of benefits to multi-sectoral end-users across the national blue economy with an emphasis on enabling our stakeholders. Demonstrated applications for the use of INFOMAR's suite of mapping products include Shipping & Navigation, Fisheries Management, Aquaculture, Off-shore Renewable Energies, Marine Leisure & Tourism and Coastal Behaviour.

INFOMAR data such as bathymetry, backscatter, sediment classification, shipwrecks and survey metadata can be downloaded free of charge in a variety of formats at the INFOMAR Marine Data Download Portal: https://experience.arcgis.com/experience/9213db3d963d4f3cab3a220323d7cd4e/page/Page-1/?views=Download-Vector-Datasets

INFOMAR also produces a wide variety of seabed mapping products that enable public and stakeholders to visualize Ireland's seafloor environment https://www.infomar.ie/maps/downloadable-maps/maps. Story maps have also been developed providing a different perspective of some of the bays and harbors of the Irish coastline. We would therefore recommend use of our Marine and Coastal Unit datasets available on our website and Map Viewer.

The Marine and Coastal Unit also participate in coastal change projects and are undertaking mapping in areas such as coastal vulnerability and coastal erosion. Further information on these projects can be found here.

National Coastal Change Assessment

Geological Survey Ireland is undertaking a National Coastal Change Assessment. As part of this initiative two mapping products will be delivered for the entire Irish coastline: **coastal vulnerability mapping and shoreline change.**

Coastal vulnerability maps will provide an insight into the relative susceptibility of the Irish coast to adverse impacts of sea-level rise through the use of a **Coastal Vulnerability Index** (CVI). Currently the project is being carried out on the east coast and will be rolled out nationally over the next couple of years, detailed information and maps are available here. **Shoreline change rates** for the period 2000 to 2023 are being prioritised and will be released by county on a rolling basis over the next 12 months. Shoreline change rates database and reports will be accessible from GSI web mapping viewers. These suite of coastal mapping products are aimed at coastal managers to prioritise or concentrate efforts on adaptation.

Physiographic Units

Physiographic Units are cartographic representations of the broad-scale physical landscape of a region. They delineate physical regions showing internal uniformity with respect to one or more environmental attributes that can be clearly differentiated from neighbouring regions. They are valuable for regional land-use planning, and in studies of the influence of physical landscape on the ecological environment.

This map is produced in support of the actions to be implemented in National Landscape Strategy for Ireland 2015 – 2025. Physiographic Units map data can be viewed online under the Physiographic Units tab on the online Map Viewer.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to the Geological Survey Ireland Planning Team at GSIPlanning@gsi.ie.

Yours sincerely,

Geoheritage and Planning Programme

Enc: Table - Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes.

Geological Survey Ireland's Publicly Available Datasets Relevant to Planning, EIA and SEA processes

following European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018

(S.I. No. 296 of 2018)

Geological Survey Ireland Programme	Dataset	Relevant EIA Topic	Coverage	Description / Notes / Limitations	Link to Geological Survey Ireland map viewer
Geohazards	Landslide: National landslide database and landslide susceptibility map	Land & Soil/Climate/Landscape	National	Associated guidance documentation relating to the National Landslide Susceptibility Map is also available.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=b68cf1e4a9044a5981f950e9b9c5625c
Geohazards	Groundwater Flooding (Historic)	Water	Regional	Provide information of historic flooding, both surface water and groundwater. [A lack of flooding presented in any specific location of the map only indicates that a flood has not been detected. It does not indicate that a flood cannot occur in that location at present or in the future]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Groundwater Flooding (Predictive)	Water	Regional	Provides information on the probability of future karst groundwater flooding (where available). [The maps do not, and are not intended to, constitute advice. Professional or specialist advice should be sought before taking, or refraining from, any action on the basis of the flood maps]	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc
Geohazards	Radon Map	Land & Soils/Air	National		http://www.epa.ie/radiation/radonmap/
Geoheritage	County Geological Sites as adopted by National Heritage Plan and listed in County Development Pla	Land & Soils/Landscape	Regional	All geological heritage sites identified by Geological Survey Ireland are categorised as CGS pending any further NHA designation by NPWS.	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228
Geological Mapping	Bedrock geology:	Land & Soils	National	1:100,000 scale and associated memoirs.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Bedrock geology:	Land & Soils	Regional	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Sediments	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Quaternary geology: Geomorphology	Land & Soils	National	1:50,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=de7012a99d2748ea9106e7ee1b6ab8d5&scale=0
Geological Mapping	Physiographic units:	Land & Soils	National	Broad-scale physical landscape units mapped at 1:100,000 scale in order to be represented as a cartographic digital map at 1:250,000 scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=afa76a420fc54877843aca1bc075c62b
Geological Mapping	GeoUrban: Spatial geological data for the greater Dublin and Cork areas	Land & Soils	Regional	includes 3D models	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9768f4818b79416093b6b2212a850ce6&scale=0
Geological Mapping	Geotechnical database	Land & Soils	National	Digitised geotechnical and Site Investigation Reports and boreholes which can be accessed through online downloads	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=a2718be1873d47a585a3f0415b4a724c
Goldmine	Historical data sets including geological memoirs and 6" to 1 mile geological mapping records	land & Soils/Water	National	available online	https://secure.dccae.gov.ie/goldmine/index.html
Groundwater & Geothermal	Groundwater resources (aquifers)	Water	National	Data limited to 1:100,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater recharge.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale; long term annual average recharge	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater vulnerability.	Water	National	Data limited to 1:40,000 scale; sites should be investigated at local scale	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Group scheme and public supply source protection areas.	Water	National	Not all PWS / GWS have SPZ / ZOC. Check with IW / coco / NFGWS for private supplies.	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater Protection Schemes	Water	National	Data is limited to scale of 1:40,000. Data does not include all of the source protections areas	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Catchment and WFD management units.	Water	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	karst specific data layers	water	National	For areas underlain by limestone, includes karst features, tracer test database; turlough water levels (gwlevel.ie).	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Wells and Springs	Water	National	Not comprehensive, there may be unrecorded wells and springs	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=7e8a202301594687ab14629a10b748ef
Groundwater & Geothermal	Groundwater body Descriptions	Water	National	Not exhaustive; only those in designated SACs; could be other GWDTEs; for more information contact NPWS / EPA / site investigations	https://www.gsi.ie/en-ie/programmes-and-projects/groundwater-and-geothermal-unit/activities/understanding-ireland-groundwater/Pages/Groundwater-bodies.aspx
Groundwater & Geothermal	Geothermal Suitability maps	land & Soils/Water	National	Also, Roadmap for a Policy and Regulatory Framework for Geothermal Energy, November 2020	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=9ee46bee08de41278b90a991d60c0b9e
Marine & Coastal Unit	INFOMAR - Ireland's national marine mapping programme; providing key baseline data for Ireland's	Water	National		https://secure.dccae.gov.ie/GSI/INFOMAR_VIEWER/
Marine & Coastal Unit	CHERISH - Coastal change project (Climate, Heritage and Environments of Reefs, Islands, and Headla	Water	Regional		http://www.cherishproject.eu/en/
Marine & Coastal Unit	Coastal Vulnerability Index (CVI).	water /Land & Soils	Regional	Currently the project is being carried out on the east coast and will be rolled out nationally	https://www.gsi.ie/en-ie/programmes-and-projects/marine-and-coastal-unit/projects/Pages/Coastal-Vulnerability-Index.aspx
Minerals	Aggregate potential	Land & Soils/Material Assets	National	Consideration of mineral resources and potential resources as a material asset which should be explicitly recognised within the environmental assessment process	https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Active quarries	Land & Soils	National		https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=ee8c4c285a49413aa6f1344416dc9956
Minerals	Historic mines	Land & Soils/Cultural Heritage	National	Inventory and Risk Classification 2009. Environmental Protection Agency, Economic Minerals Division and Geological Survey Ireland (DECC).	https://gis.epa.ie/EPAMaps/default?easting=?&northing=?&lid=EPA:LEMA_Facilties_Extractive_Facilities https://www.epa.ie/enforcement/mines/
Tellus	Geochemical data: multi-element data for shallow soil, stream sediment and stream water	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	Airborne geophysical data including radiometrics, electromagnetics and magnetics	Land & Soils	Regional	A national mapping programme	https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754
Tellus	urban geochemistry mapping (Dublin SURGE project),	Land & Soils	Regional		https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6304e122b733498b99642707ff72f754

Notes:

1. The maps and data listed above are available on the Geological Survey Ireland map viewer https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx

2. Please read all disclaimers carefully when using Geological Survey Ireland data

3. Geological Survey Ireland and Irish Concrete Federation published guidelines for the treatment of geological heritage in the extractive industry in 2008.

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Regional Inspectorate,
Inniscarra,
County Cork, Ireland
Cigireacht Réigiúnach, Inis Cara
Chontae Chorcaí, Éire

T: +353 21 487 5540
F: +353 21 487 5545
E: info@epa.ie
W: www.epa.ie
LoCall: 1890 33 55 99

By email to: nwsmp@water.ie

National Wastewater Sludge Management Plan
Uisce Eireann
PO Box 448
South City Delivery Office
Cork City

31st July 2024 Our Ref: SCP240701.1

Re. SEA Scoping for the National Wastewater Sludge Management Plan

Dear Ms Kyne,

We acknowledge your notice, dated 3rd July 2024, in relation to the SEA Scoping for the National Wastewater Sludge Management Plan (the 'Plan').

The EPA is one of the statutory environmental authorities under the SEA Regulations. In our role as an SEA environmental authority, we focus on promoting the full and transparent integration of the findings of the Environmental Assessment into the Plan and advocating that the key environmental challenges for Ireland are addressed as relevant and appropriate to the Plan. Our functions as an SEA environmental authority do not include approving or enforcing SEAs or plans.

Where we provide specific comments on plans and programmes, our comments will focus on the EPA's remit and areas of expertise (in particular water, air, climate change, waste, resource efficiency, noise, radon and the inter-relationships between these and other relevant topics e.g. biodiversity), as appropriate and relevant to the particular plan or programme.

The EPA will provide additional comments on the SEA Environmental Report and the Plan at the next stage of the SEA process. The appendices to this letter include specific

comments on the SEA scoping report as well as responses to the scoping questions posed in the scoping report.

Domestic Wastewater treatment

We refer you to the *Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems* (2012-W-DS-9) 2014 STRIVE Report. This describes that "*a large infrastructural deficit exists with regard to the available spare capacity at sludge reception facilities, particularly in the west and south coastal areas …, where the concentration of DWWTS and consequent additional sludge volumes are greatest*".

The EPA recognises that appropriate wastewater sludge management is critical to supporting sustainable economic development in Ireland. Significant environmental effects may occur in relation to poorly performing wastewater related infrastructure. The need to provide for adequate infrastructure and capacity for onward disposal of sludge from domestic wastewater treatment systems is of significant importance.

Urban wastewater treatment

Our *Urban Wastewater Treatment in 2022* (EPA, 2023) report describes that complying with the treatment standards in the Urban Wastewater Treatment (UWWT) Directive is an essential step in protecting our environment and is also necessary to avoid European Union fines.

The UWWT Directive requires sewage sludge to be reused whenever appropriate. Sludge is rich in nutrients and the sludge generated in Ireland in 2023 was used as a fertiliser / soil conditioner on agricultural land. A total of 58,964 tonnes of sludge was removed from treatment plants during 2023. This was treated and used as a fertiliser and soil conditioner on agricultural land.

Sludge must be treated to make it stable and free from odours, harmful bacteria and viruses before it is used on land. The treated sludge must then be applied to the land in a way that ensures the nutrients are effectively used for plant growth or assimilated into the soil.

Wastewater treatment sludge - design capacity and future loading

The Plan should clarify which population figures will be considered in estimating future sludge generation quantities. The Plan and the SEA should consider the location and capacity aspects from the perspective of ensuring the necessary sludge management infrastructure is provided to cater for the current and future loadings expected.

Sludge quantity data

The Plan should consider the systems, processes, monitoring and records required to ensure that the quantity of sludge to be removed from wastewater treatment plants (for offsite disposal, reuse or recovery) are accurately recorded and reported on. These should be clearly described in the Plan. A commitment should also be included in the

Plan to ensure the appropriate annual wastewater return information is provided to the EPA in a timely manner.

It should be noted the current sludge quantity removed from wastewater treatment plants may not accurately reflect the potential/ predicted quantity that should be removed, as some plants may not de-sludge at the required frequency. This should also be taken into account in the Plan.

The current sludge management practices operating at WWTPs should be described in the Plan. This should highlight the necessary additional measures/processes required to ensure compliance with the Waste Water Treatment Directive and EPA Wastewater Discharge authorisations. The Plan and SEA should consider the potential increase in wastewater sludge production likely from ongoing and planned sludge handling improvements at several WWTPs.

Context of the plan
The Plan and SEA should consider including a commitment to review/assess the status of sludge handling facilities at WWTPs. Appropriate sludge handling facilities are required at WWTPs to ensure performance of these plants is not adversely affected. Where deficits of appropriate sludge handling facilities/ infrastructure exist, this needs to be addressed in the Plan.

Outlets for the use of wastewater sludge
The Plan should include a commitment that sludge is only applied to agricultural land where it is both environmentally and agronomically safe and appropriate to do so. It should also be ensured that it is applied at levels which ensure that the nutrients can be effectively used for plant growth or assimilated into the soil. The Plan should consider including a commitment to establish a system for improved tracking of sludge spreading, to minimise the risk of overspreading and increasing the risk of runoff and leaching and subsequent risk of water pollution.

Meeting standards for the use of sludge
The Plan should include a commitment to ensure that sludge applied to agricultural lands complies with the *Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998 to 2001* and that an appropriate regime is put in place for the testing of sludge and landbanks to demonstrate compliance.

A commitment should also be included to undertake risk assessments for any significant industrial effluent/pharmaceutical effluent discharging to a municipal wastewater treatment plant, to assess its potential impact on the sludge and on its proposed disposal/recovery options.

Additional consultation considerations
We recommend that you also consider consultation with the National Waste Collection Permit Office (NWCPO) to determine the authorisation requirements for the collection and transport of wastewater sludge. They also gather annual return information from

collectors on the collections and transfers of wastewater sludge. We also recommend that you consult with the lead authorities for the three waste management plan regions.

Integration of the SEA and the Plan

The integration of the SEA process into the Plan should reflect the overall objective of the SEA Directive "to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes".

Fully integrating the findings and recommendations of the SEA into the Plan will be key to strengthening its overall positive commitments while ensuring that any potential significant adverse effects of implementing the Plan are mitigated.

The SEA Environmental Report and the Plan should include a chapter outlining how the recommendations and mitigation measures from the SEA have been incorporated into the Plan. We recommend that the SEA Environmental Report includes summary tables outlining the key findings of the SEA and linking the significant environmental effects identified to the proposed mitigation measures, monitoring programme and, where relevant, Plan policies/measures.

State of the Environment Report

The EPA will be publishing the next iteration of our State of the Environment Report in autumn 2024. Once published, this report should be considered and integrated as appropriate, in the SEA Environmental Report and in implementing the plan over its lifetime.

Environmental Authorities

Under the SEA Regulations, you should consult with:

- Environmental Protection Agency;
- Minister for Housing, Local Government and Heritage;
- Minister for Environment, Climate and Communications;
- Minister for Agriculture, Food and the Marine.

If you have any queries or need further information in relation to this submission, please contact me directly. I would be grateful if you could send an email confirming receipt of this submission to: sea@epa.ie.

Yours Sincerely,

Cian O'Mahony
Scientific Officer
Office of Radiation Protection and Environmental Monitoring

Appendix I – Comments on the Scoping Questions

Q1. Based on the plans, policies and programmes outlined, are there any other key relevant international, national or regional plans, policies or programmes that should be considered in the SEA Environmental Report on the proposed Revision of the NWSMP?

We welcome the inclusion of Figure 2.1 which sets out the overall hierarchy regarding asset management within Uisce Eireann, and also highlighting some other key policy areas considered.

At a European level, the Nature Restoration Law, now adopted may be useful to include, as this will help inform national level nature restoration policy, which may have implications for the Plan.

Q2. Based on the likely significant impacts outlined above, are there any other effects or impacts that should be considered in the SEA Environmental Report on the proposed Revision of the NWSMP?

There may also be merit in considering where there may be competing land uses, such as forestry, land use zoning/development etc, that may possibly limit the existing (or any additional) lands used for landspreading purposes.

Q3. Do you have any comments regarding the draft SEA Objectives presented?

We acknowledge the SEA Objectives as proposed.

Q4.- Do you have any suggestions or comments in relation to the overall approach to alternatives?

We welcome that the EPA guidance on developing and assessing alternatives in SEA is being used in inform the alternatives for the Plan, as this reflects good SEA practice.

Appendix II –Comments on the SEA Scoping Report

Scope of the SEA

There would be merit in including a matrix in the SEA environmental report to show the interrelationships between the various topics considered. This should be accompanied by relevant explanatory text.

Data & Knowledge Gaps

Regarding water quality, consider updating references in the scoping report to point to the latest water quality Water Quality in 2023 – An Indicators Report (EPA, 2023). Similarly for waste and the circular economy, reference should be made the Circular Economy and Waste Statistics Highlights Report 2021 (EPA, 2023).

The Plan should identify any significant data and knowledge gaps, including commitments to address these on a priority basis and where relevant, in association with other government departments/ organisations, during the implementation phase of the Plan. This is with a view to strengthening the evidence base for future reviews and iterations of the Plan.

Range of Effects

The SEA Environmental Report should refer to the full range of effects and of the area likely to be affected. This assessment should consider the duration and frequency of effects as well as short, medium and long-term, cumulative and synergistic effects of the Plan. The EPA's *Good Practice Guidance on Cumulative Effects Assessment in Strategic Environmental Assessment* (EPA, 2020).

Monitoring, Implementation & Reporting

Article 10 of the SEA Directive (2001/42/EC) requires that the significant environmental effects of implementing a plan/programme (the Plan in this instance) are monitored in order, *inter alia*, to identify at an early-stage unforeseen adverse effects and to be able to undertake appropriate remedial action. The SEA environmental report should include a description of the measures envisaged concerning monitoring. The Plan should also include a commitment to implement SEA related environmental monitoring requirements and the associated reporting.

We suggest including a separate section on '*Monitoring, Implementation and Reporting*' in the Plan, setting out the provisions for monitoring and reporting on the implementation of the Plan. There may be merits in aligning the periodic reviews of the Plan with existing cyclical reporting e.g. *Ireland's Environment*, *National Planning Framework*, *Water Framework Directive,* etc.

The *EPA guidance on SEA Statements and Monitoring (EPA, 2020)*, and in particular the reference to some high-level monitoring indicators proposed in Table 1 on page 23 of this guidance, that may be useful to you to consider, as relevant.

The SEA-related monitoring should address positive, negative and cumulative effects where they are likely to occur and should include provision for on-going review to facilitate an early response to any unforeseen environmental issues that may arise. The SEA Environmental Report should specify the monitoring frequency and responsibilities and include provisions for reporting on the monitoring. A similar commitment should be reflected in the Plan.

SEA Statement

Following the completion of the public consultation on the SEA environmental report and the Plan, the final stages of the SEA process will be to integrate the environmental considerations of the SEA environmental report into the Plan, as appropriate. In accordance with article 16 of the SEA Regulations, Uisce Eireann is required to publish a SEA Statement alongside the adopted Plan, summarising:

- how environmental considerations have been integrated into the Plan;
- how the environmental report and consultation comments on it have been taken into account;
- the reasons for choosing the Plan as adopted, in the light of the other reasonable alternatives dealt with (in the Environmental Report and the associated consultation);
- the measures decided concerning monitoring.

The EPA has published *Guidance on SEA Statements and Monitoring* (EPA, 2020), which should be considered in the preparation of the SEA statement.

Integration with other key Plans and Programmes

We recommend including schematics in the Plan and SEA Environmental Report, showing the links and key inter-relationships between the Plan and other key relevant national, regional, sectoral and environmental plans.

Available Guidance & Resources

The EPA has published guidance notes that may be of assistance in preparing the SEA environmental report.

To assist you in preparing the SEA, you can access our SEA process guidance and topic and sector specific guidance documents along with other resources listed below.

Our website contains various SEA resources and guidance, including:

- SEA process guidance and checklists;
- Inventory of spatial datasets relevant to SEA;
- Topic and sector specific SEA guidance (including *Good practice note on Cumulative Effects Assessment* (EPA, 2020), *Guidance on SEA Statements and Monitoring* (EPA, 2020), *Developing and Assessing Alternatives in SEA* (EPA, 2015), and *Integrated Biodiversity Impact Assessment* (EPA, 2012)).

EPA SEA GIS Search and Reporting Webtool

Our SEA GIS Search and Reporting Webtool has been updated recently and is now publicly available at https://gis.epa.ie/EPAMaps/SEA. It allows public authorities to produce an indicative report on key aspects of the environment in a specific geographic area. It is intended to assist public authorities in SEA screening and scoping exercises.

Catchments.ie

Our https://www.catchments.ie/maps/ website provides a single point of access to water quality and catchment data from the National WFD monitoring programme.